December 28, 1999

Carolina Power & Light Company
ATTN: Mr. James Scarola
Vice President - Harris Plant
Shearon Harris Nuclear Power Plant
P. O. Box 165, Mail Code: Zone 1
New Hill, NC 27562-0165

THIS IS A COPY

SUBJECT: NRC INSPECTION REPORT NO. 50-400/99-12

Dear Mr. Scarola:

This refers to the inspection conducted on November 15 - 19, 1999, at your Harris facility. This was a special team inspection covering activities related to the planned expansion of the Shearon Harris spent fuel pool. The objectives of this inspection were to assess the implementation of the construction quality assurance program in construction of the C and D spent fuel pools, evaluate the alternate weld inspection program, and evaluate the plans for commissioning of the equipment for the C and D spent fuel pools (SFP).

The inspection found that CP&L had a comprehensive program to control, inspect, and document welding at the time of original plant construction in accordance with Section III of the ASME Boiler and Pressure Vessel Code, and NRC requirements. The inspection also found that the alternate weld inspection program was adequate to provide assurance that the welds for which documentation was missing, met design requirements. The program for commissioning of the C and D SFP equipment will be examined in an inspection tentatively planned for January 24 - 28, 2000. No violations of NRC requirements were identified during the inspection.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be placed in the NRC Public Document Room.

Sincerely,
original signed by:
Harold O. Christensen/for
Kerry D. Landis, Chief
Engineering Branch
Division of Reactor Safety

Docket No. 50-400
License No. NPF-63

Enclosure: NRC Inspection Report

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.: 50-400

License Nos.: NPF-63

Report Nos.: 50-400/99-12

Licensee: Carolina Power & Light Company (CP&L)

Facility: Shearon Harris Nuclear Power Plant, Unit 1

Location: 5413 Shearon Harris Road
New Hill, NC 27562

Dates: November 15 - 19, 1999

Team Leader: J. Lenahan, Senior Reactor Inspector
Engineering Branch
Division of Reactor Safety

Inspectors: B. Crowley, Senior Reactor Inspector
K. Heck, Quality Assurance Engineer, NRR
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Approved By: Kerry D. Landis, Chief
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Division of Reactor Safety

SUMMARY OF FINDINGS

Shearon Harris Nuclear Power Plant
NRC Inspection Report 50-400/99-12

The fuel pool cooling systems are described in Section 9.1.3 of the licensee's Updated Final Safety Analysis Report (UFSAR). The design basis for pools A and B, which support the operation of Unit 1, is identical to that for pools C and D. Because these pools are located in a single building and major system components needed to be installed during the early phase of construction, procurement and installation of the major system components for all four spent fuel pools was performed concurrently, in the late 1970s and early 1980s. In a letter dated December 23, 1998, the licensee requested an amendment to the Shearon Harris facility operating licensee to place spent fuel pools (SFP) C and D in service to increase the onsite spent fuel storage capacity. The licensee is currently operating and storing fuel in the A and B SFP. The majority of the C and D SFP were completed prior to 1982 during plant construction.

During preparation of the plans for completion of the C and D SPF, the licensee discovered that documentation for 52 welds on ASME Class III piping had been inadvertently destroyed. The 52 welds were 40 piping welds and 12 welded attachments for pipe hangers (lugs). The 40 piping welds included 15 spent fuel system welds which are embedded in concrete, 22 accessible spent fuel system welds, and 3 accessible component cooling system welds. Three of the accessible spent fuel system welds were subsequently removed and replaced with new welds, resulting in 37 piping welds with missing records. The most significant missing documents were the weld data reports (WDRs) for each of the welds. In order to demonstrate the weld quality for the welds with missing documentation, the licensee developed and implemented an alternative inspection program.

This special inspection included a review of the construction quality assurance (QA) and quality control (QC) program; the original construction QA/QC records; the licensee's alternative inspection program for welds with missing QA/QC records; the engineering service requests prepared to complete the C and D SFP; a walkdown inspection of the accessible C and D SPF components; and the licensee's program for commissioning of the C and D SFP. The inspectors used Temporary Instruction (TI) 2515/143 for guidance during this inspection.

The inspection found that the licensee had a comprehensive program to control, inspect, and document welding at the time of original construction in accordance with Section III of the ASME Boiler and Pressure Vessel Code, and NRC requirements. The inspection also found that the licensee's alternative weld inspection program was adequate to provide assurance that the welds for which documentation was missing, met design requirements. The licensee's program for commissioning of the C and D SFP equipment should ensure that existing equipment meets design requirements and will perform its design function. An Inspector Followup Item (IFI) was opened to inspect implementation of the equipment commissioning process. No violations were identified.

REPORT DETAILS

1. REVIEW OF THE LICENSEE'S CONSTRUCTION QUALITY ASSURANCE PROGRAM

1.1 Review of Quality Assurance and Quality Control Procedures

Inspection Scope

The inspectors reviewed Quality Assurance (QA) and Quality Control (QC) procedures that implemented the QA program requirements during construction.

Observations and Findings

The inspectors reviewed the licensee's ASME Quality Assurance Manual for the Construction of the Shearon Harris Nuclear Power Plant transmitted to NRC by letter dated dated April 30, 1999. This Manual described the quality assurance program that implemented the quality assurance requirements of ASME Boiler and Pressure Vessel Code, Section III, Division 1, Nuclear Power Plant Components, and applicable Federal, State and local regulations and codes. The Manual was applicable to fabrication and construction of ASME components which include the A, B, C and D spent fuel pools.

The inspectors reviewed the implementing QA and QC procedures listed below which controlled activities relating to weld quality. The procedures revisions were applicable to the time during 1979-1981 when the major weld activity for construction of the spent fuel pools occurred. Procedures reviewed were as follows:

Number, Revision	Title
CQA-1, Rev. 5	Personnel Training and Qualification
CQA-2, Rev. 0	QA Document Control
CQA-4, Rev. 5	QA Records
CQA-8, Rev. 3	Material Issue Surveillance
CQA-12, Rev. 0	Mechanical Equipment Installation Monitoring
CQA-14, Rev. 0	Application and Control of "N" Type Symbol Stamps
CQA-15, Rev. 0	Assignment and Control of National Board Serial Numbers
CQA-16, Rev. 0	Preparation and Submittal of ASME Code Data Reports
CQA-18, Rev. 0	Control of Site Fabrication/Modification of Piping Subassemblies
CQA-20, Rev. 0	Surveillance of Contractor Welding and Related Activities
CQA-22, Rev. 0	Welding Activity Monitoring
CQA-24, Rev. 0	Procurement Control
CQA-28, Rev. 0	QA Surveillance
CQA Appendix A	Quality Assurance Forms
CQC-2, Rev. 3	Nonconformance Control
CQC-4, Rev. 3	Procurement Control
CQC-6, Rev. 0	Receiving Inspection

CQC-8, Rev. 3	Storage Control
CQC-10, Rev. 0	Cleanness Control
CQC-12, Rev. 0	Mechanical Equipment Installation Control
CQC-13, Rev. 0	Concrete Control
CQC-19, Rev. 0	Weld Control
CQC-20, Rev. 0	Post-Weld Heat Treatment Control
CQC-22, Rev. 3	Hydrostatic Test Inspection
CQC-23, Rev. 0	Systems Turnover

The procedures were consistent with the CP&L QA program, established by the ASME QA Manual and NRC requirements, and defined specific process requirements in sufficient detail to provide for QA/QC control of welding activities.

A detailed review was performed for procedures CQC-19, Weld Control; CQC-22, Hydrostatic Test Requirements; and CQC-13, Concrete Control. This review was directed toward determining an alternate method to ascertain the quality of the field welds for which certain records were missing. These procedures are described below.

Weld Control

CQC-19 assigned the Welding QA/QC Specialist the responsibility for: review and verification of data and designated hold points in the Weld Data Reports (WDRs); ensuring completed WDRs for code welds were forwarded to the Authorized Nuclear Inspector (ANI) for review; supervising the QC Inspectors in the performance of weld inspections; and monitoring activities related to welding. QC inspection personnel were trained and qualified in accordance with CQA-1. The SFP field welds, which were ASME Code Class 3 welds, were documented on a WDR , reviewed and approved by the Welding QA/QC Specialist, and reviewed for acceptance by the ANI. The ANI performed an independent third party review. The responsibilities of the Welding QA/QC Specialist and QA inspection personnel were sufficiently defined to provide reasonable assurance that the quality of the completed field welds were in compliance with applicable ASME Code requirements. After the documentation of a field weld was determined to be acceptable, pertinent documents were assembled and the package was transmitted to QA Records in accordance with CQA-4.

Hydrostatic Test Inspection

CQC-22 established the requirements for performing hydrostatic test inspections to ensure that hydrostatic tests were performed in accordance with approved procedures and specifications. The Mechanical QA Specialist was responsible for verifying that the documentation for the piping was completed prior to performance of the hydrostatic test. This included verification that field welds within the scope of a hydrostatic test had been satisfactorily completed, inspected, and accepted. The Mechanical QA Specialist was also responsible for performance of the leak inspection during hydrostatic testing. QC inspection personnel also witnessed the test. The responsibilities of the Mechanical QA Specialist and QC inspection personnel were sufficiently defined to provide assurance that the quality of hydrostatic testing was in compliance with applicable procedures and specifications. After the documentation for a hydrostatic test had been accepted by the ANI, the pertinent documents were assembled and reviewed by the Mechanical QA Specialist, who verified that manufacturing/fabrication records for components within the boundaries of the test had been received and accepted and that there were no open nonconformances on any of the components.

Concrete Placement

CQC-13 and Construction Procedure WP-05, Concrete Placement, established the requirements for assuring all work activities in the area affected by a concrete pour were completed prior to placement of concrete. A prerequisite to placement of concrete was the completion of a Concrete Placement Report, which signified that all activities in the affected area had been satisfactorily completed such that access to the area to be covered with concrete was no longer required. When specific crafts completed their work, the appropriate Craft Superintendent signed off the Concrete Placement Report, signifying that a particular activity, such as mechanical, electrical, cadwelds, nondestructive examination, or cleanup, was complete and ready for the concrete pour. This sign-off was required by all Craft Superintendents, whether or not they had work in the particular placement, as a safeguard against omissions. After sign-off by the Craft Superintendents, Field Engineering signed the Concrete Placement Report, verifying that required design attributes, such as the correct location and anchoring of embedded conduit, grounding, inserts, sleeves, piping, and plumbing, were complete and correct. When all the crafts had completed their work, the Construction Inspector signed the report, signifying that all work had been inspected and approved. Subsequently, Quality Control and Quality Assurance signed the report signifying that all of their oversight activities were completed and that the items to be embedded in the concrete were in compliance with applicable requirements. Finally, after all required disciplines, QA, Construction Inspector and design approval sign-offs were completed, the Area Superintendent authorized concrete placement activities to proceed. The completed Concrete Placement Report was transmitted to QA Records in accordance with CQA-4.

Conclusions

The QA/QC procedures in effect at the time of construction of the SFP provided comprehensive control of welding and other construction activities. The procedures provided holdpoints to assure welding was completed in accordance with ASME and NRC requirements prior to proceeding beyond a point wherein any nonconformances could be resolved. These included a detailed review of weld documentation to assure the welds were completed in accordance with technical requirements, and that the welds were inspected and tested prior to being subjected to a hydostatic pressure test. For welds which were to be embedded in concrete, completion of the Concrete Placement Report provided an additional holdpoint to assure the welds were satisfactory prior to placement of concrete. The ANI provided an independent third party review of the ASME welding program.

1.2 Review of Welding Process Control Procedures

Inspection Scope

The inspectors reviewed original construction welding process control procedures, which were in effect at the time the existing Fuel Pools “C” and “D” equipment and piping were installed, as detailed below.

Observations and Findings

The welding control procedures listed below were reviewed to verify that a quality assurance program was in place at the time of installation of Fuel Pools “C” and “D” piping to ensure that pipe welding was accomplished in accordance with applicable Code requirements. The procedure revisions were those applicable when the welding activities for the fuel pools were in progress. Procedures reviewed were as follows:

MP-01, Revisions 3, 5, 6, and 7, Qualifying of Welding Procedures

MP-02, Revision 4, Procedure for Qualifying Welders and Welding Operators

MP-03, Revisions 1, 3, and 4, Welding Material Control

MP-06, Revisions 3, 4, and 5, General Welding Procedure for Carbon Steel Weldments

MP-07, Revisions 3 and 4, General Welding Procedure for Stainless Steel Nickel Base and Nonferrous Weldments

MP-09, Revisions 1, 9, and 10, Welding Equipment Control

MP-10, Revisions 2 and 3, Repair of Base Materials and Weldments

MP-11, Revisions 3, 4, and 5, Training and Qualification of Metallurgical/Welding Engineering and Support Personnel

MP-12, Revisions 1, 2, and 3, Control of Special Welding Materials for BOP and Welding Material for Non-Permanent Plant

MP-13, Revisions 1 and 2, Welder Qualification for Areas of Limited Accessibility

The procedures provided detailed control for all aspects of the welding process, including qualification of procedures and welders, control of welding materials, control of welding variables, and quality documentation for each weld.

Conclusions

At the time of original construction of the existing fuel pool cooling system piping, a comprehensive welding program was in place to control and document pipe welding in accordance with Section III of the ASME Boiler and Pressure Vessel Code.

2. REVIEW OF CONSTRUCTION QA/QC RECORDS

2.1 Review of Hydrostatic Test Reports

Inspection Scope

The inspectors reviewed the records documenting the results of hydrostatic testing performed on the piping welds embedded in the C and D fuel pool concrete.

Observations and Findings

The inspectors reviewed the records which documented completion of hydrostatic testing in accordance with WP-115 and the licensee's quality assurance program. Records examined were for the following C and D fuel pool embedded piping welds numbers : 2-SF-1-FW-1, -2, -4, & -5; 2-SF-149-408; 2-SF-143-512, 513, & -514; 2-SF-144-FW-515, -516, & -517; and 2-SF-159-FW-518 & -519. These records were documented on CP&L form QA-26, pages one and two of two, Hydrostatic Test Records. Information on the data sheets included the hydrostatic test boundaries (welds tested), the piping design pressure, test pressure, the test medium and test temperature, test data, and the test results. The test prerequisites required that the mechanical QA specialist verify that all required piping documentation was completed, and that all required weld documentation was completed. The inspectors verified that the hydrostatic test records specified that all weld records were completed, and that the welds were accepted by the quality assurance group prior to start of the hydrostatic test. The inspectors also verified that the records had been signed by the ANI. The hydrostatic test records for the above welds showed that all welds were tested to a minimum of 25 percent above design pressure and that all welds met the test acceptance criteria. The licensee did not retain copies of the form QA-26 for embedded weld numbers 2-SF-8-FW-65 & -66. However, in response to questions during construction regarding hydrostatic testing of the welds attaching the liner plate to the piping spool pieces, the licensee initiated Deficiency and Disposition Report (DDR) 794. Resolution of this DDR included documentation of the dates various welds were hydrostatically tested. The dates the welds for piping spool pieces were hydrostatically tested (July 19, 1979 and July 24, 1979) were listed in the DDR response. These included weld numbers 2-SF-8-FW-65 & 66. The inspectors concluded that the documentation for DDR-794 provided evidence that weld numbers 2-SF-8-FW-65 & 66 were subjected to hydrostatic testing in accordance with WP-115 and the licensee's quality assurance program.

Conclusions

The hydrostatic test records documented that the embedded welds were subjected to hydrostatic testing, and met the test acceptance criteria. The records also provided evidence that the welds were completed, inspected and documented in accordance with the licensee's quality assurance program. The hydrostatic test records provide evidence that the WDRs were reviewed prior to performance of the hydrostatic tests.

2.2 Review of Concrete Placement Reports

Inspection Scope

The inspectors reviewed the concrete placement records for spent fuel pools C and D which documented that all work and preparations for the concrete placements were completed and that all required inspections had been completed prior to placement of concrete.

Observation and Findings

Prior to placement of concrete, a concrete placement report was completed to document that all work activities have been completed in a particular area (slab, column, wall, etc) and that the concrete placement could proceed. The inspectors reviewed drawing numbers SK A-G-0126, South Fuel Pool Area of FHB Isometric, and SK A-G-0125, FHB Isometric North Fuel Pool Units 2 & 3, to determine the concrete placement numbers which contained the embedded piping for the C and D fuel pool cooling system. This review showed that the piping had been installed in the following C & D fuel pool placement numbers: wall placements W-255-7, W-261-7, -7A, -9, -10, and -11, W-281-10, -16, -17, and -18, and slab placements SL-246-3 and SL-246-4. The inspectors reviewed the placement report for the above listed placement numbers and verified that the placement reports had been properly completed and signed prior to placement of concrete. The inspectors verified that the mechanical embed/piping had been signed in accordance with CP&L procedure WP-05. The acceptance criteria noted on the placement reports for mechanical embed/piping was CP&L procedure WP-102, Installation of Piping. Procedure WP-102 required that a verification be performed to assure that all piping was installed as per the design drawings. Additional requirements referenced by procedure WP-102 were that hydrostatic testing of piping to be embedded in concrete was to be completed in accordance with CP&L procedure WP-115, Hydrostatic Testing of Buried or Embedded Piping.

Conclusions

The concrete placement reports provide evidence that the piping embedded in the concrete was inspected and tested in accordance with the requirements of the licensee's construction quality assurance program prior to concrete placement. These requirements included verification that the welding was completed in accordance with applicable procedures, and that documentation such as WDRs were completed and reviewed prior to the concrete placement.

2.3 Review of ASME Documentation

Inspection Scope

The inspectors reviewed completed documentation required by the ASME Boiler and Pressure Vessel Code for the fuel pool cooling systems.

Observation and Findings

10 CFR 50.55, “Codes and standards,” requires that systems and components of pressurized water-cooled nuclear reactors meet certain requirements of the ASME Boiler and Pressure Vessel Code. The fuel pool cooling systems for for SFP A, B, C, and D are classified as ASME Code Section III, Division 1, Class 3 systems. The applicable edition of the ASME code is Section III, 1974, Winter 1976 Addenda.

Subsection NA of Section III addresses “General Requirements”; Subsection ND addresses requirements for “Class 3 Components”. Subsection NA-8420, “Report Form for Field Installation,” required that installation welds be verified on Data Form N-5, which includes attestation of the quality of the weld process and specification data for the weld filler material. The weld process was witnessed at several specified check points by a Quality Assurance inspector; the Authorized Nuclear Inspector had the option to witness any check point and verified the completed weld data report prior to closure.

The licensee’s amendment request, submitted by letter dated December 23, 1998, states that certain records, notably piping isometric packages for field installation of the completion portion of SFP C and D, were inadvertently discarded. Subsection NA-8416, “Piping Systems” of the Code requires completion of N-5 forms for each piping system, which includes weld data records attesting to the quality of the weld process and weld material certification. Because these records have been lost, the SPF C and D cannot be certified as an N-stamp system.

Since piping welds for SFP A and B were completed during the same time frame as those for SFP C and D, and by the same group of welders, it is reasonable to expect similar quality of the N-5 data packages for both units. Therefore, the N-5 package for Pools A and B were examined. The N-5 forms were included as part of the N-3 package, which was submitted upon completion of Unit 1 to the ASME National Board, the enforcement authority having jurisdiction. The N-3 form listed the components including interconnecting welds and the data reports for a facility. The summary N-3 package for Unit 1 was examined by the inspectors.

Subsection NA-8400 identifies the reporting requirements for various components, including valves and pumps, parts and appurtenances, pipe subassemblies, and piping systems. Only the reporting requirements for 49 field welds cannot be met. The inspectors randomly selected data packages for two C and D SFP components: a pump (2B-SB) and a strainer (3-SF-53-5A-2). The data package for the pump included a Certificate of Compliance, a Manufacturer’s Data Report (NPV-1), material certification, hydrostatic test reports, performance test reports, welding ticket records, dimensional inspection records, a cross-sectional drawing, and an as-built drawing. The data package for the strainer included an ASME Code data report, a Certificate of Conformance, liquid penetrate reports, a product quality control check list, material test reports, an inspection and test report, dimensional inspection records, and sequence traveler.

Conclusions

The ASME N-3 and N-5 data packages for Unit 1 and the ASME data packages for two SPF C and D components reviewed by the inspectors were determined to be complete and satisfactory and provided an indication that the licensee documented construction of the SFP in accordance with ASME requirements.

2.4 Review of Audits of ASME QA Program Implementation

Inspection Scope

The inspectors randomly selected an audit of ASME QA program implementation for review.

Observations and Findings

CP&L corporate audits were conducted of the ASME QA Program implemented at Shearon Harris. The inspectors retrieved a listing of these audits from the licensee's data base and noted that eight such audits had been conducted during the period from March 19, 1979 through February 19, 1982. From these audits, the inspectors randomly selected audit QAA/170-6 for review. QAA/170-6 was conducted at the Shearon Harris site on September 21-29, 1981. The inspectors reviewed the audit checklist, the audit report containing the findings and concerns, the memoranda describing the corrective actions for each identified deficiency, and the QA closure documentation. The audit report concluded that the Shearon Harris Construction, Nuclear Plant Engineering, and QA Program adequately met ASME code requirements except for eleven findings and sixteen concerns. The identified deficiencies were typically associated with procedural and training requirements and indicative of careful review by the auditors. The inspectors reviewed the corrective actions and found them reasonable and appropriate. All corrective actions were implemented and determined to be satisfactory by the licensee'sQuality Assurance organization within four months following the audit.

Conclusions

The audit report showed that the licensee's QA program implemented the ASME program and NRC requirements during construction.

2.5 Review of Vendor ASME QA Program Implementation

Inspection Scope

The inspectors reviewed an audit of a vendor supplying Code equipment for compliance with ASME requirements.

Observations and Findings

The inspectors reviewed CP&L corporate audit QAA/702-1, conducted at the fabrication facility of Southwest Fabricating & Welding Company, Inc., a supplier of piping spool pieces for the four spent fuel pools at Shearon Harris. The audit was conducted on May 22-23, 1974, in order to appraise the the manufacturing facility and quality assurance program to adherence to purchase order requirements, including applicable Articles of Section III of the ASME Boiler and Pressure Vessel Code and the requirements of 10 CFR 50, Appendix B, "Quality Assurance for Nuclear Power Plants." The audit report concluded that the vendor's quality system, as defined in its QA Manual was adequate to meet the intent of the requirements imposed by the purchase order. The audit report identified six findings requiring corrective action. The inspectors reviewed the audit checklist and the audit report containing the findings. The inspector also reviewed the corrective actions taken by the vendor and the QA closure documentation. Based on this review, the inspectors determined that the deficiencies were relatively minor and administrative in nature and that the corrective actions were appropriate. All actions were determined to be satisfactory by the CP&L Quality Assurance organization within three months of the audit with exception of an issue related to training and qualification of audit personnel. This issue was held open pending resolution of a related draft ANSI standard and closed satisfactorily in December, 1974.

Conclusions

The vendor audit report showed that the licensee's QA program implemented the ASME program and NRC requirements for performance of vendors during construction.

2.6 Review of QA/QC Related Reports

Inspection Scope

The inspectors reviewed a random sample of QA/QC related reports to assess the effectiveness of the site QA/QC program in identifying and resolving problems associated with SFP welding activities.

Observations and Findings

Reports documenting results of QA/QC activities were reviewed by the inspectors to assess the effectiveness of the QA/QC program. The reports selected for review covered the period when welding activities were in progress on the piping from 1979 to 1982. The records reviewed include Deficiency and Disposition Reports (DDRs), Nonconformance Reports (NCRs), and QA/QC monitoring and surveillance reports. DDRs for ASME Code components required the ANI to review, approve and sign the final disposition as acceptable. The following DDRs, which are listed in general categories assigned by the inspectors, were reviewed:

Category	DDR
Arc Strike	869, 877, 895, 945

Stamping	888, 889, 914, 945
Holdpoint	829, 1009
Hydrostatic Test	783, 794

The identified deficiencies were clearly identified on the DDR and disposition of the deficiencies were appropriate. Concurrence with the disposition by the ANI and report closure by Quality Assurance was completed for all DDRs reviewed.

Nonconformances (NCRs) were less significant infractions of the QA program requirements (i.e., were less serious than DDRs). The following NCRs were reviewed and listed in general categories assigned by the inspectors.

Category	NCR
Arc Strike	WP-206
Stamping	W-027, W-096, W-103
Holdpoint	W-207
Welder Requirement	WP-111, W-028
Weld Status Report	WP-278

Documentation of the nonconforming condition was clear and corrective actions were appropriate. The final disposition for each NCR was verified by the responsible QA Specialist.

For completeness of review, the inspectors arbitrarily selected a sample of QA/QC reports which documented monitoring and surveillance of weld activities. These covered areas which included material control, welding equipment, welder training and qualification, review of WDRs for accuracy and completeness, and compliance with weld procedures. The following QA/QC activity reports were reviewed and determined to be typical and expected for oversight of welding activities.

WP62, WS79, WP56, W29, W86, W116, W124, W143, W199, W200, W285, W297, W322, W361, W365, W402, W429, W434, W456, W461, W462, W469, W475, QA8, QA81, WS80, QA146, QA150, QA169, QA215, QA294, QA359, QA424, QA368, QA376, QA509, QA548, QASRC83116, QA550, QA551, QA586, QA587, QA588, QA703, QA777, W509, W507, W506, W503, W767, W756, W750, QA16, QA254, QASRC187, QASRC822660, QA199, W630, W560, W554, W544, W519, W518, QA385, W8257, W225.

Conclusions

Based on review of the above DDRs, NCRs, and reports documenting QC/QA activities, the inspectors concluded that inspection personnel actively monitored welding activities and processes for compliance with ASME Code and QA Program requirements. Deficiencies were accurately reported, corrective actions promptly taken, and appropriately resolved. All corrective action documents reviewed were in compliance with the licensee’s QA program and NRC requirements.

3. SFP C AND D DESIGN CHANGES

Inspection Scope

The inspectors reviewed the design changes prepared by licensee engineers to complete the C and D spent fuel pools.

Observations and Findings

The licensee implements design changes in accordance with CP&L procedure EGR-NGGC-0005, Engineering Service Requests (ESR). This procedure implements the design control program required by 10 CFR 50, Appendix B. The licensee prepared the following ESRs to complete the C and D spent fuel pools:

- ESR 95-00425, Study Effort to Support Fuel Pool in Service Date.

- ESR 99-00218, CCW Tie In to Heat Exchangers for North Pools

The inspectors reviewed the ESRs. ESR 99-00218 was prepared for connecting the C and D spent fuel pool heat exchangers to the Unit 1 component cooling water system. During the inspection, the licensee was in the process of installing piping and pipe supports required for the tie-in of the CCW system to the SFP C and D heat exchangers. The final tie in will not be completed unless NRC approval is received for the fuel pool expansion. ESR 95-00425 was prepared to complete the C and D SFP piping, complete installation of equipment (pump motors, strainers, etc.), perform system pre-operational and startup testing, and revise existing plant procedures to incorporate the C and D SFP into the Unit 1 operating plant.

The inspectors reviewed the 10 CFR 50.59 safety evaluation, design inputs, design evaluations, assumptions, and references, design verification documentation, and installation drawings and instructions. The inspectors noted that the details for commissioning of the existing equipment were incomplete. The licensee initiated ESR 99-00416 to control the commissioning process. This is discussed in the Section below. The requirements and procedures for preoperational and startup testing were also incomplete. Discussions with licensee engineers disclosed that these procedures will be developed following those used for startup of Unit 1 (SFP A and B). The 10 CFR 50.59 evaluation concluded that this project involved an unreviewed safety question which required NRC approval prior to completion and startup.

Conclusions

The ESRs were technically adequate and generally met regulatory requirements.

4. EQUIPMENT COMMISSIONING

Inspection Scope

The inspectors examined the licensee’s maintenance and lay-up actions for the installed Fuel Pool “C” and “D” piping and equipment. In addition, plans for additional activities to ensure that equipment will meet all applicable requirements and be capable of performing its intended function were reviewed.

Observations and Findings

A significant portion of the Fuel Pool Cooling System and Component Cooling Water System piping and components for Fuel Pools “C” and “D” were installed during original construction in the late 1970s and early 1980s. As documented in section 26.5.0 of Engineering Service Request (ESR) Design Specification 95-00425, Revision 0, the equipment was never incorporated into the operating unit and has not been formally maintained under controlled storage since that time. The equipment was procured and installed to applicable quality assurance requirements. However, since the installed equipment has been stored in-place without a formal storage and lay-up program, the licensee plans to implement an equipment commissioning or dedication process to ensure that the equipment will meet the applicable requirements and is capable of performing its intended function in the completed design. In accordance with ESR 95-00425, which had not been approved and issued at the time of the inspection, a Matrix of Commissioning Requirements is to be developed, which will define the requirements, including any additional inspections and testing, for each component. At the time of the inspection, a preliminary matrix had been developed as part of ESR 95-00425 and ESR 99-00416 had been initiated to further detail and manage the commissioning process. Although plans and some of the details for the process were included in ESR 95-00425, most of the details for each individual component were still being developed to be included in ESR 99-00416. Based on discussions with responsible licensee personnel and review of ESR 95-00425, the commissioning process will consist of the following activities:

Scope Development

To develop the scope for the commissioning process, a field walkdown of the installed equipment (mechanical, civil, instrumentation and control, and electrical) will be performed to compare the installed equipment with the completed modification design and each item in scope will be identified and individually dispositioned as part of ESR 99-00416.

Document Review

Quality documentation will be retrieved and reviewed to ensure that required quality assurance information is available, complete and acceptable. The verified records will include original procurement and field installation records. The equipment installation records will be compared with field conditions to ensure that the installation as accepted has not been altered. If records are missing or deficient, an assessment will be performed to determine what can be accepted by virtue of retest or re-inspection, or by use of alternate methods of verification.

Test and Acceptance Criteria

The Equipment Commissioning Matrix will specify additional activities needed to ensure the required level of quality assurance because of the lack of formal storage and lay-up program since original equipment installation. These activities will include:

Field verification of equipment identification against procurement documentation with establishment of traceability to Code Data Reports for code related equipment.

Physical inspections and testing as required to verify that lack of controlled storage conditions and regular maintenance has not caused any condition (corrosion, aging, etc.) adverse to quality.

Physical inspections and considerations necessary to ensure that plant activities since construction have not resulted in any conditions adverse to quality (scavenging of parts, introduction of foreign material, damage from personnel and equipment traffic, etc.).

Although the equipment commissioning details for individual equipment had not been finalized, some work had already been accomplished. The inspectors reviewed the following work requests (WRs) that had been issued:

WR 98-AGAR1 - Disassemble and Inspect Valve 1CC-512
WR 98-AFJA1 - Inspect Train A Spent Fuel Cooling Heat Exchanger
WR 98-AFJE1 - Inspect Train B Spent Fuel Cooling Heat Exchanger
WR 98-AFJF1- Disassemble and Inspect Train A Spent Fuel Cooling System Strainer
WR 98-AFJH1- Disassemble and Inspect Train B Spent Fuel Cooling System Strainer
WR 98-AFIY1- Disassemble and Inspect Spent Fuel Pool Cooling Pump 2A
WR 98-AFIZ1- Disassemble and Inspect Spent Fuel Pool Cooling Pump 2B

Disassembly and inspection had been completed for WRs 98-AGAR1, 98-AFJA1, 98-AFJE1, 98-AFJH1. The other 3 WRs had not yet been worked. For inspection of the Heat Exchangers, the WRs only covered removing the end covers and inspecting the tube side of the Heat Exchangers. The WRs indicated that a nitrogen purge had been maintained on the shell side of the heat exchangers. However, further investigation revealed that the use of the nitrogen purge had not been implemented until late 1991. In May of 1988, WRs 88-AMYH1 (Train A) and 88-AMYI1 (Train B) were issued to provide a nitrogen purge on the shell side of the Heat Exchangers. The WRs documented that the shell side of the Heat Exchangers had been open to the Fuel Building atmosphere. There was no indication how long the heat exchangers had been open. The 1988 WRs installing the purge were not worked until December 1991. Also, additional WRs documented a number of problems with low nitrogen purge on Train B Heat Exchanger in 1993. Based on the documented history of lack of control of the atmosphere on the shell side of the Heat Exchangers, the inspectors questioned whether additional evaluations of the Heat Exchangers were needed. In response, the licensee indicated that further evaluations of the shell side of the Heat Exchangers will be performed as part of the commissioning process under ESR 99-00416.

The inspectors walked down and observed the general condition of the installed piping and equipment. Even though the equipment had not been maintained under a formal program, the equipment and piping appeared to be well preserved. The inspectors also examined spent fuel pool cooling pump motors “A” and “B”, which have been stored and maintained in the warehouse since procurement at the time of construction. These were found to be in good condition with the motor space heaters energized. Evidence of control of storage of the pumps, including records of periodic pump shaft rotation, maintenance of heat on motors, and megger testing, were reviewed. Preventative maintenance of these parameters had been maintained in accordance with licensee Material Evaluation Procedure ME 000261.03.

The inspectors inspected three welds, weld numbers 2-CC-3-FW-207, 2-CC-3-FW-208, and 2-CC-3-FW-209 for misalignment and concluded that there was no noticeable misalignment.

The inspectors reviewed the re-inspection records for installed welds and piping as discussed below.

Based on the above reviews, the inspectors concluded that the planned equipment commissioning process should ensure that existing equipment will meet requirements and will perform its design function. However, since the details of tests and inspections to be performed for individual equipment items had not been completed, Inspector Followup Item (IFI) 50-400/99-12-01, Review of Final Equipment Commissioning Details, was opened to track further inspection after more details are available.

Conclusions

Although details of the commissioning inspections had not been finalized for each individual piece of equipment, a detailed plan had been drafted and if properly implemented should ensure that existing equipment meets requirements and will perform its intended function. An IFI was opened to track further inspection of the equipment commissioning process after more details of the tests and inspections to be performed for individual equipment items are available. The equipment commissioning WRs reviewed were considered appropriate to ensure that equipment is acceptable to place in service. Based on the documented history of lack of control of the atmosphere on the shell side of the Spent Fuel Pool Cooling Heat Exchangers, the inspectors concluded that additional evaluations of the heat exchangers were needed.

5. ALTERNATE INSPECTION PROGRAM

5.1 Review of Weld Records

Inspection Scope

The inspectors reviewed the Spent Fuel Cooling System and Component Cooling System weld and weld inspection records as detailed below.

Observations and Conclusions

The licensee re-inspected all existing accessible Fuel Pool “C” and “D” Spent Fuel Pool Cooling System (SFPCS) and supporting Component Cooling Water System (CCWS) pipe and pipe attachment field welds. The welds were visually (VT) and liquid penetrant (PT) inspected. In addition, vibro-tooled welder symbol identifications were taken from each weld surface and welder qualification verified by review of records. The re-inspections and the welder symbols were documented on new Weld Data Reports (WDRs). The inspectors reviewed the new WDRs, the NDE qualification records for the current re-inspections and the original construction welder qualification records for these welds. All records were retrievable and found to be in order.

In addition to review of the re-inspection records for the accessible welds, records consisting of WDRs, welder qualification records, weld QC inspector records, NDE examiner qualification records, welding procedure specifications (WPSs), and procedure qualification records (PQRs) were reviewed for the below listed Unit 1 SFPCS piping welds. These Unit 1 (SFP A and B) welds were constructed using the same welding QC program at approximately the some time period as that used for the cooling system piping welds for Fuel Pools “C” and “D”.

F1-236-1-SF-10-FW-60
F1-236-1-SF-2-FW-9
F1-236-1-SF-10-FW-58
F1-236-1-SF-2-FW-8
F1-236-1-SF-10-FW-59
F1-236-1-SF-2-FW-6
F1-236-1-SF-2-FW-7

These original Unit 1 (SFP A and B) construction records were retrievable, legible, and complete. The records provided objective evidence that a detailed welding quality control program was in place and followed during original construction.

Conclusions

All records reviewed were retrievable and in order. The original Unit 1 construction records provided good assurance that the SFP C and D welding was accomplished and documented in accordance with the approved welding quality assurance program in effect at that time.

5.2 Welding Material

Inspection Scope

The inspectors reviewed the welding procedure specifications and the records for the filler metal (materials) used for welding the SFPCS and CCWS piping.

Observations and Findings

SFP A & B Filler Metal

The inspectors randomly selected embedded SFPCS welds from isometrics drawings, 1-SF-2 and 1-SF-10 from SFP A and B for review. The WDRs for these welds were reviewed by the inspectors. From the WDRs, the inspectors randomly selected the certified material test reports (CMTRs) for filler and insert metals and reviewed the chemical test records. Based on the records reviewed, the inspectors concluded that the materials used for the embedded welds were type 308 filler metal, type 308 consumable inserts, and type 304 base material (piping materials).

The inspectors reviewed Weld Procedure Specification (WPS)1BA3 for the material used for welding the pipes in the component cooling water system. The WPS listed the pipe material as P-1, Grade 1 (Appendix D to Section XI of the ASME Code) and weld filler metals as E70S-6 and E7018. For procedure qualification, WPS 1BA3 referenced Procedure Qualification Report (PQR) 15. The inspectors reviewed PQR 15 and CMTRs of the material used for the qualifications.

Product Check Chemistries

The inspectors compared the chemistries from CMTRs with the stainless steel product check chemistries submitted to NRC in a letter dated April 30, 1999, Subject: Response to NRC Request for Additional Information Regarding The Alternative Plan for SFPCS Piping, and the chemical analyses from PQR 15 that were used for qualifying the carbon steel weld procedure specification 1BA3 with product check chemistries submitted to NRC in a letter dated June 14, 1999. The comparisons showed carbon analyses for the product checked consistently above the filler metal values for SFP A & B and values recorded in the PQR. The inspectors questioned the licensee regarding possible carbon contamination with the product check chemistries.

In search of the contamination, the inspectors examined the sampled surface on weld 2-CC-3-209. The sample had been removed from the center of the weld crown. The weld and surrounding pipe were clean and free of foreign matter. Next, the inspectors reviewed the technique used for sampling. The sampling technique is in Appendix A to Procedure NW-16, Revision 1, "Identification of Base Metals for Welding Applications," dated January 6, 1998. The sampling technique uses a rotary carbide deburring tool which removes material with a grinding action. Licensee engineers suspected that the deburring tool was a possible source of the carbon contamination. The licensee made test samples by taking known material and seeding it with metal flakes broken from the teeth of the deburring tool. The tests showed that for samples seeded with 5 and 10 weight percent from the deburring tool, the carbon analyses increased by .03 and .08 weigh percent, respectively. The tests showed that the carbide deburring tool was a possible source of carbon contamination.

Alloy Comparator

During the inspection, the inspectors witnessed a demonstration of the test method used to develop the acceptance criteria for the test data submitted to NRC in the April 30, 1999 letter. For the testing, the licensee utilized the Metorex X-Met 880 electronic unit, CP&L Control No. MLCE-132 which was operated by CP&L's plant metallurgist. The inspectors reviewed the following: Operating Instruction Manual 3881 432-4VE; and operating procedure: MCP-NGGC-0101, Revision 1, Test Method 4, dated March 26, 1999. For developing an acceptance criteria, the metallurgist setup the X-Met using the same calibration and reference standards that were used for the previous testing. For calibration, pure standards for Fe, Cr, Ni, Cu, Mo, and a backscatter sample were run and stored in the X-Met. For reference alloys, stainless steel standards for type 304, 309, 310, 316, and NIST C1154a were run and stored in the X-Met reference library.

For the development of the acceptance criteria, 12 different standards were used. Each standard was run 10 times producing an average set of chemical values. In the comparison mode, the X-Met compared each test against the standards stored in the reference library. If the test matched or was close to a match with a reference standard, the X-Met displayed the reference standard followed by the term: good, possible, or good/possible. If a test did not come close to any reference standard, the X-Met displayed "no good match." The reference standards, test standards, type of match displayed for that standard, and the Cr, Ni, Mo, Mn, and Cu from the certified analysis reports for the standards are shown in Table 1 in the Appendix. The data showed that the X-Met comparison mode can discriminate stainless steel types and chemical extremes within a stainless steel type. Based on the testing performed on the accessible field welds and Table 1, the licensee’s metallurgist tentatively established the acceptance criteria for field welds as two test displays showing a good or possible match and no test displays showing no good match.

Conclusions

The SFPCS piping and CCW piping was welded using the correct materials. The X-Met and chemical analysis provided identification of stainless steel and carbon steel materials.

5.3 Water Quality

Inspection scope

The inspectors reviewed the C & D SFP pipe welds exposed internally to hydrostatic pressure test water and/or the spent fuel pool water.

Observations and Findings

The inspectors reviewed drawings and hydrostatic test records to identify the C & D SFP welds that were exposed internally to hydrostatic pressure test water or spent fuel pool water, to determine the length of time that these welds were exposed to that water. Of the 52 welds identified in CP&L's letter dated April 30, 1999, pipe welds 2-SF-1-FW-3, 2-SF-1-FW-6, and 2-SF-36-FW-448 were replaced by new welds, and 12 are hanger-to-pipe welds. Of the remaining 37 pipe welds with missing documentation, the inspectors identified 15 welds exposed to hydrostatic test water, 22 welds exposed to the fuel pool liner leak test water, and the same 22 welds exposed to the current fuel pool water conditions.

Hydrostatic test water quality was specified in CP&L Procedure WP-115, Revision 0, "Hydrostatic Testing of Buried or Embedded Pressure Piping," dated September 19, 1979. WP-115 specified that potable or lake water was to be used for hydrostatic testing. After testing, the procedure required that the pipes must be drained. However, the procedure did not specify a time limit for draining of the piping/system. The inspectors were unable to determine from documentation when the piping was drained. However, logic dictates that the pipes were drained before the licensee performed the fuel pool liner leak testing (hydrostatic test).

Hydrostatic test water quality for fuel pool liners was identified in CP&L Procedure TP-57, "Hydrostatic Test of Fuel Pool Liners," dated May 17, 1983. TP-57 required that that the fuel pool be leak tested for a 24 hour period using unchlorinated site water. The procedure defined unchlorinated water as site water with a chloride content not exceeding 100 parts per million (ppm). After the test, the procedure required that the test water was pumped out of the SFP and that the pool was rinsed with demineralized or distilled water. Attachment A to TP-57 for SFP D showed that the pool was filled June 11, 1985 with water containing less than 1 ppm chlorides and that the rinse was completed on November 1, 1985. For SFP C, the records showed that the pool was filled May 7, 1985 with water containing less than 1.5 ppm chlorides and that the rinse was completed on November 4, 1985.

Discussions with licensee engineers disclosed that SFPs C & D were filled with SFP quality water around 1989 and have been full ever since. The gates between SPF A and B and C and D were opened at various times which resulted in the water mixing between the pools. During April 1999, the licensee obtained water samples from the low points in seven of eight pipe lines connected to SFP C & D. These samples were analyzed for impurities. The results are tabulated in Table 2 in the Appendix. The inspectors compared the sample results to the administrative limits for A & B SFP and data for a primary system cold shut down that is published in NUREG CR-5116, Survey of PWR Water Chemistry, February 1989. Based on the data reviewed, the water quality in SFP C & D was similar to the water quality in SFP A and B.

The pipe welds exposed to the potentially poorest water quality were the embedded welds. If corrosion or fouling were to occur, they would occur in the embedded welds first. The presence of corrosion or fouling would be visible from the interior of the piping. The visual inspection of the embedded welds performed by the licensee to examine the interior of the embedded piping is discussed below.

<u>Conclusions</u>

The pipe welds exposed to the potentially poorest water quality were the 15 embedded welds. The pipe welds remaining were exposed to treated water with very low impurities and similar to the water quality in SFP A and B. If corrosion or fouling were present in the SFP C and D piping, they would occur in the embedded welds first because of the type of water the embedded piping was exposed to.

5.4 Review of the Procedure for Remote Visual Inspection of Welds and Piping

Inspection Scope

The procedure used for remote visual inspection of embedded welds was examined for compliance with the CP&L Quality Assurance Program and NRC requirements.

Observations and Findings

The inspectors reviewed Temporary Procedure SPP-0312T, Temporary Procedure For Remote Visual Examination of Interior Welds and Surfaces of Embedded Unit 2 Spent Fuel Pool Cooling Piping for C and D Pools. The procedure provided instructions for performing remote visual examinations of interior welds and surfaces of embedded piping for the SFP C and D piping. The results of these examinations were used to determine whether the weld quality and interior surface conditions meet the acceptance criteria established in Paragraph 6.0 of the procedure. The acceptance criteria specified that welds were to be free of the following defects: cracks, lack of fusion, lack of penetration, oxidation (“sugaring”), undercut greater than 1/32 inch, reinforcement (“push through”) exceeding 1/16 inch, concavity (“suck back”) exceeding 1/32 inch, porosity greater than 1/16 inch, or inclusions. Any recordable indications of these defects were recorded on Attachment 1 of the procedure. Other indications such as arc strikes, foreign material, mishandling, pipe mismatch, pitting and microbiologically induced corrosion were also recorded on the attachment and were required to be evaluated by licensee engineers.

In addition to reviewing SPP-0312T, the following referenced documents were examined by the inspectors with respect to applicable requirements: (1) ASME Section III, 1974, Subsection ND-4424, Surfaces of Welds; NDEP-0606, Rev. 4, Remote Visual Examination; NDEP-601,Rev. 13, VT Visual Examination of Piping System and Component Welds at Nuclear Power Plants; and NDEP-A, Rev. 13, Nuclear NDE Procedures and Personnel Processes.

Both Revision 0 (approved 5/17/99) and Revision 1 (approved 9/9/99) of procedure SPP-0312T were reviewed. Revision 1 contained no change in the technical content or scope of work, but was made to reflect a new vendor and contract number. Based on review of the procedure and applicable references, the inspectors determined that the procedure prescribed prerequisites, precautions and limitations, and detail on special tools and equipment to adequately control the scope of the visual inspection activities. Technical, process-related, and administrative references were adequate and complete. The acceptance criteria were appropriately detailed such that conclusions as to the weld quality and interior surface conditions could be made by qualified inspection personnel. The remote inspection procedure was reviewed for adequacy prior to its use by a licensee NDE Level III inspector. The licensee’s Level III NDE inspector was interviewed by the inspectors. The Level III certification records and training for this individual were also reviewed.

Conclusions

The procedure which specified the method for visual inspection of the embedded welds provided detailed instructions and acceptance criteria for inspecting and evaluating the embedded welds. The procedure complied with the licensee’s QA program and NRC requirements.

5.5 Remote Visual Examination

Inspection Scope

The inspectors reviewed the videotape that recorded the remote visual examination and the analysis of the remote visual examination of embedded welds. The review included piping and other welds captured on videotape. The inspectors also reviewed the licensee’s evaluations of the welds documented on Attachment 1 to SPP-0312T.

Observation and Findings

The licensee performed a remote enhanced visual examination of 15 embedded field welds from inside the stainless steel SFP C and D piping. Prior to performance of the remote video examinations of the embedded piping, three Level II NDE personnel were trained in the use of procedure SPP-0312T. These individuals demonstrated their proficiency with the use of this procedure to the ANI and the Level III NDE inspector. Attestations to the satisfactory completion of these activities were reviewed by the inspectors and determined to be satisfactory.

The visual examination was performed by sending a mobile video camera with focusing and magnifying capabilities through the piping to examine each embedded field weld. The video camera sent images of the weld to a television monitor and video recorder. The images on the monitor were viewed by the licensee’s Level II qualified remote visual inspectors. The Level II’s observations were documented on Attachment 1 to SPP-0312T, ”Remote Visual Examination Data Sheets.” Attachment 1 contained a check list for recordable condition of the weld. These recordable conditions are described in the acceptance criteria of SPP-0312T. Weld acceptability was determined by the qualified Level II visual examiner in accordance with the acceptance criteria specified in procedure SPP-0312T and approved by a qualified Level III NDE inspector and the ANI.

The inspectors reviewed eight videotapes recorded during the remote visual inspection and the completed SPP-0312T Attachment 1 for each embedded field weld. The videotapes reviewed were as follows: weld 2-SF-8-FW-65 prior to cleaning; the in-process cleaning of 2-SF-144-FW-516; and the 15 embedded field welds after cleaning. The videotapes also captured images of accessible welds 2-SF-150-412 and 2-SF-148-FW-382.

In the videotape made prior to cleaning, the inspectors observed laced material particles inside the pipes and on the field welds. These particles looked like a dusting of snow flakes. They were flat, very thin, interconnected, and conformed to the contour of the pipes, pipe seams, and field welds. The inspectors viewed the videotape showing removal of the particles from welds 2-SF-

144-FW-516. The particles were removed with a pressurized water flow directed toward the pipes, interior surfaces. When the particles were hit by the water stream, they were readily dispersed. After dispersing, the particles appeared to be suspended in the water.

Based on the videotapes of the cleaned field welds, the inspectors concurred with the observations of the licensee's NDE inspectors recorded on the Attachment 1 to SPP-0321T for each weld. The inspectors observed the images of vendor fabricated welds, pipe seam welds, and the piping itself as the video camera traveled to the different embedded field weld locations. These images showed no misalignment, unusual protrusions, blockages, or indentations in the pipe walls, pipe seams, vendor fabricated welds, and the two accessible field welds examined. In the videotapes made of the cleaned welds, the inspectors identified conditions in three welds that require further evaluations. These conditions were: (1) an insert segment with the letters 308L still visible on weld 2-SF-144-FW-516; (2) brown spots that were out of focus with the surface of the pipe on weld 2-SF-144-FW-517, and (3) heavy stains, oxides, and deposits on weld 2-SF-159-FW-519. Although not part of the weld inspection, the inspectors also observed and requested an evaluation of a condition adjacent to the longitudinal seam in the pipe just beyond weld 2-SF-144-FW-515. The condition appears to be a fine saw tooth line located parallel to the pipe seam and about half the seam thickness away. The length of the line was not determined. The licensee stated that they were evaluating these conditions which were identified on the SPP-0312T, Attachment 1.

The inspectors reviewed and found satisfactory work requests associated with preparation for remote video inspection, and the system closure following completion of the visual inspection. These were WR/JO 99-ADUN2, ADUP1, AEHH2, and AFEY1. Results of the visual examinations were recorded on a data sheet, marked as a QA Record, which was included in SSP-0312T as Attachment 1. The data sheet was reviewed by the inspectors and determined to provide adequate detail of the examination to determine whether the acceptance criteria had been met and to record any recordable conditions noted by the licensee's NDE inspector. Completed data sheets documenting examination of 15 interior welds and piping surfaces were examined and determined to contain sufficient detail as to the results of the inspection. The signature of the NDE Level II examiner on Attachment 1 was determined to be one of the three personnel who were trained and qualified in the use of this procedure.

The recordable conditions documented on the data sheet are required to be reviewed and approved by licensee engineers and subsequently be approved by an ANI. The licensee initiated ESR 99-00266 to evaluate the recordable conditions. The evaluations were being performed by an independent engineering consultant. At the time of the inspection, evaluation of the recordable conditions had not been completed.

The inspectors reviewed and discussed the videotape examination of weld 2-SF-144-FW-516 with a CP&L welding supervisor that worked as a welding engineer during the construction of the SFP. The videotape showed the section of a consumable insert in the weld with the lettering 308L still visible on the consumable insert. The welding supervisor stated that the type of consumable insert for this application is shaped like the cross section of an inverted mushroom. The stem of the insert forms the base of the joint between the pipes. The joint is hand welded using a gas shielded tungsten arc welding process. The process should consume the insert and adjacent pipe during the first weld pass. The supervisor stated that insufficient heat input may fuse the insert (mushroom) head to the weld puddle instead of melting the insert completely. After the first pass, subsequent passes were made with filler metal to form weld layers. The supervisor estimated that 5 layers of filler metal were necessary to weld 3/8-inch thick piping.

The inspectors requested that the licensee provide chemical analysis on the particulate that were dispersed during the pipe/weld cleaning process. This particulate appeared reddish brown in color, is easily disturbed, and is believed by the licensee to be the source of the pipe stain. The inspectors questioned the ANI regarding the particulate. The ANI stated that there he observed abundant amounts of reddish brown color on the video equipment, piping interior, and at the video equipment entry point during the inspection. The licensee radiologically analyzed by chemical elements the particulate in 1990 and again in 1996. They provided the analyses to the inspectors for review. The particulate is radioactive with the most abundant element by two orders of magnitude being iron, followed by one order of magnitude cobalt, and zero order of magnitude nickel.

Conclusions

The condition of the embedded welds and associated piping inside the C and D SFP piping are free of abnormal obstructions and deposits. However, the inspectors identified four conditions requiring further evaluations. The licensee is in the process of evaluating the data shown on SSP-312T, Attachment 1 that include these four conditions.

5.6 QA Programs for Special Inspections Associated with the Alternate Inspection Program

Inspection Scope

The inspectors reviewed the alternate inspection activities for compliance with quality assurance requirements.

Observations and Findings

Ongoing activities associated with the alternate inspection program for resolution of issues concerning activation of Pools “C” and “D” were reviewed. These activities include remote inspection of the inner surfaces and field welds for embedded piping, determination of water chemistry during the period of layup, and examination of weld material taken from accessible field welds.

Oversight and examination of the embedded piping was performed by qualified NDE Level II examiners, who demonstrated proficiency in the use of the procedure used for the inspection (SPP-0312T) to the satisfaction of a NDE Level III examiner. The demonstration was witnessed and an Authorized Nuclear Inspector concurred with the demonstration of this proficiency.

Water chemistry analysis was performed by the CP&L chemistry organization, in accordance with site and corporate quality assurance program requirements. Material analysis of the weld samples was performed by NSL Analytic Services, identified on the CP&L Approved Supplier List with Supplier Control No. 16; manual dated 6/30/99; reviewed by CP&L 11/4/99. The supplier was audited for compliance under the CP&L Commercial Grade Survey program on February 1-2, 1999.

Conclusions

Activities associated with special inspections related to activation of fuel pools C and D were performed in compliance with applicable quality assurance requirements.

6. AUTHORIZED NUCLEAR INSPECTOR

Inspection Scope

The inspectors interviewed the authorized nuclear inspector (ANI) to determine the involvement of the ANI with the WDR, hydrostatic tests, and remote visual examinations.

Observations and Findings

The inspectors interviewed the recently retired ANI (July 1, 1999) and current ANI. The retired ANI was involved in plant construction and reviewed WDRs during plant construction. The verification was performed in two stages. The first stage was the verification of field weld fabrication at randomly selected predetermined hold points and ASME Code required inspection points. When satisfied that ASME requirements were met, the ANI initialed the associated line entry on the WDR. The second stage was verification of the entire WDR. When satisfied that all the necessary entries for the specified field weld were complete, the ANI signed off the WDR.

When questioned by the Inspectors regarding the significance of the ANI signature on the hydrostatic test document, both ANIs stated that the signature meant that the hydrostatic test satisfied ASME Code requirements, and the signature on the hydrostatic test was independent of any ANI signatures on the WDRs.

The ANIs were questioned regarding the extent of their involvement with the remote visual examinations of the 15 embedded welds in the C & D SFPs. They stated they both observed the equipment demonstration and qualifications of the remote visual examiners. For the equipment demonstration, a video camera was mounted on a transporting device that moved through a mockup of the SFP piping. The mockup contained flaws similar to those described in the acceptance criteria of Procedure SSP-0312T. In the mockup demonstration, the video camera transmitted images to a television monitor as it was moved. By viewing the monitor, the licensee’s remote visual examiner directed the equipment operator to the areas of interest. These images were analyzed by the examiner. The examiner had to determine if the images of interest were a flaw, the type of flaw, and the acceptability of the flaw. The successful detection of flaws in the mockup demonstrated the equipment and remote visual examiner's skills. Upon a successful demonstration, the remote visual examiner qualification was certified by the licensee and verified by the ANI. On June 30, 1999, both ANIs signed off on the qualifications of the three remote visual examiners.

The inspectors questioned the current ANI regarding his involvement with the reinspection of the accessible welds and remote video examination of the embedded welds. The ANI stated that he observed the reinspection of accessible welds, 2-SF-36-FW-450 and 2-SF-38-FW-451, and that he observed the remote video inspections of at least two of the embedded welds. The actual examinations of the other embedded welds were less extensively viewed. At the time of the inspection, the ANI was in the process of reviewing the videotapes and verifying the data recorded on the remote visual examination data sheets.

Conclusions

The ANIs performed an independent verification of ASME Code requirements on the WDR and hydrostatic test documentation. The verification is part of their duties that are required by the 1974 Edition (and later) of ANSI/ASME Code N626.0, "Qualifications and Duties for Authorized Nuclear Inspection," and the referenced edition and addenda of Section III of the ASME Code. The ANIs were actively involved with the demonstration of the remote visual examination equipment and the qualification of the personnel. The current ANI was actively involved with examination and videotaping of the embedded welds

7. NRC INSPECTIONS DURING THE CONSTRUCTION PHASE

The inspectors reviewed NRC Inspection Reports which documented inspection of construction activities by NRC Region II Inspectors between 1978 and 1983. This was the period when the A, B, C, and D spent fuel pools were under construction. The inspection reports document more than 50 separate inspections for this period for items related to the welding program and/or piping installation. The majority of these inspections were performed by eight Region II Welding Specialist inspectors. Several violations dealing with the general subject of welding were identified in these reports. Most of these violations were relatively minor (Severity Level V and VI) and would not be cited under the current NRC reactor inspection program. These violations would typically be resolved through the licensee's corrective action program. The violations were typical of what one would expect for oversight of a large construction project and are not indicative of any programmatic weakness in the licensee's welding program.

MANAGEMENT MEETINGS

The Team Leader discussed the progress of the inspection with licensee representatives on a daily basis and presented the results to members of licensee management and staff at the conclusion of the inspection on November 19, 1999. The licensee acknowledged the findings presented.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

D. Alexander, Manager, Regulatory Affairs
B. Altman, Manager, Major Projects Section
E. Black, Level III NDE Examiner

G. Brovette, ANI
B. Clark, General Manager, Harris Plant
E. Dayton, ANI (Retired)
J. Eads, Supervisor, Licensing and Regulatory Programs
S. Edwards, SFP Activation Project Manager
G. Kline, Manager, Harris Engineering Support Services
J. Scarola, Vice President, Harris Plant
K. Shaw, Licensing Engineer, Major Projects Section
M. Wallace, Senior Analyst, Licensing
Daniel W. Brinkey III, CP&L Metallurgist
Charlie Griffith, CP&L Welding Supervisor

Other licensee employees contacted included engineering, maintenance and administrative personnel.

NRC:

R. Hagar, Resident Inspector
K. Landis, Chief, Engineering Branch, Division of Reactor Safety

INSPECTION PROCEDURE USED

TI 2515/143, Shearon Harris Spent Fuel Pool (“C” and “D”) Expansion

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-400/99-12-01	IFI	Review of Final Equipment Commissioning Details

Closed

None

Discussed

None

APPENDIX 1

TABLES

Table 1

X-Met 880 Alloy Analyzer Data for Developing an Acceptance Criteria

Standard	Cr	Ni	Mo	Mn	Cu	Good/Possible Match: Alloy	No Good Match	Overall Rating
Type 304	18.28	8.13	0.17	1.48	0.19	7 / 3: Type304	- - - -	Good
Type 309	22.60	13.81	- - -	1.63	- - -	9 / 1: Type309	- - - -	Good
Type310	24.87	19.72	0.16	1.94	0.11	5 / 5: Type310	- - - -	Good
Type 316	16.74	10.07	2.06	1.44	0.11	Not Analyzed	- - - -	- - - -
NIST C1154a	19.31	13.08	0.068	1.44	0.44	10 / 0: C1154a	- - - -	Good
Standards Used to Check the Alloy Analyzer								
NIST 1267	24.14	0.29	- - -	0.315	- - -	0 / 0	10	No Match
NBS 1219	15.64	2.16	0.164	0.42	0.162	0 / 0	10	No Match
NBS C1289	12.12	4.13	0.82	0.35	0.205	0 / 0	10	No Match
BCS 331	15.20	6.26	- - -	0.78	- - -	0 / 0	10	No Match
NIST C1151a	22.59	7.25	0.79	2.37	0.385	0 / 0	10	No Match
NIST C1153a	16.70	8.76	0.24	0.544	0.226	0 / 9: Type304	1	Possible
NIST C1152a	17.76	10.86	0.44	0.95	0.097	0 / 4: Type304	6	No Match

NIST 1155	18.45	12.18	2.38	1.63	0.169	0 / 8: Type316	2	Possible
NIST C1287	23.98	21.16	0.46	1.66	0.58	0 / 8: Type310	2	Possible
NBS 1230	14.80	24.20	1.18	0.64	0.14	0 / 0	10	No Match
NBS C1288	19.55	29.30	2.83	0.83	3.72	0 / 0	10	No Match
NBS 1246	20.10	30.80	0.36	0.91	0.49	0 / 0	10	No Match

Table 2

Current Water Assay for C & D SFP Piping Systems, Administrative limits for A & B SFP, and NUREG CR-5116 Data for Primary Water in Cold Shut Down (ppb = parts per billion)

Identification	F (ppb)	Cl (ppb)	SO_4 (ppb)	pH
2-SF-75	57	29.5	1027	6.33
2-SF-74	29.3	62.7	682	5.82
2-SF-49	166	48	632	5.60
2-SF-215	11.7	26	321	5.55
2-SF-214	14.2	31.5	430	5.40
2-SF-212	120	70.5	676	6.74
2-SF-213	13.1	28.2	424	5.33
A & B SFP Admin. Limits (1)	<150	<150	- - - -	- - - -
Primary Water(2) Shut Down	<150	<150	- - - -	- - - -

(1) HNP Plant operating manual, Volume 5, Part 3, “SHNPP Environmental and Chemistry Sampling and Analysis Program,” January 20, 1999.
(2) Shut down values above those indicated should be corrected before reaching full power operations.