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

Report Nos.: 50-325/92-20 and 50-324/92-20

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: June 22-24, July 6-8, and July 27-31, 1992

Inspector: J. J. Lenahan — Date Signed: 8/25/92

Accompanying Personnel: H. Ashar, Senior Civil Engineer, Structural and Geosciences Branch, NRR
D. Jeng, Section Chief, Structural and Geosciences Branch, NRR
R. Lo, Senior Project Manager, NRR

Approved by: J. J. Blake, Chief — Date Signed: 9/26/92
Material Processes Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope:

This special announced inspection was conducted in the areas of structural steel platform evaluations, inspection and testing of concrete expansion anchors, and results of cold side and hot side walkdown inspections.

Results:

In the areas inspected, violations or deviations were not identified. A weakness was identified in the licensee's program for inspecting and testing concrete expansion anchors regarding performance of work using a draft procedure - paragraph 4.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*J. Brown, Manager, Engineering Support, Nuclear Engineering Department (NED)
***S. Callis, Licensing Engineer
***S. Floyd, Manager, Regulatory Compliance
***R. Godley, Manager, Regulatory Compliance
***J. Holden, Manager, Outage Management and Modifications
T. Jones, Senior Specialist, Regulatory Compliance
R. Knott, Civil Engineer, NED
***D. Moore, Manager, Maintenance
***R. Richey, Vice-President, Brunswick Nuclear Plant
**T. Spencer, Plant General Manager
***S. Vann, Misc. Steel Project Manager, NED
***H. Williams, Chief Civil Engineer, NED
**K. Williamson, Manager, Onsite NED

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

Other Organizations

O. Gurbuz, Technical Advisory Board, Bechtel
R. Kosiba, Project Manager, Bechtel
E. Thomas, Senior Engineer, Bechtel

NRC Resident Inspector

**R. Prevatte, Senior Resident Inspector
***P. Byron, Resident Inspector
**D. Nelson, Resident Inspector

*Attended July 8 exit interview
**Attended July 31 exit interview
***Attended July 8 and 31 exit interviews

2. Miscellaneous Structural Steel Evaluations Program - Unit 2 (37701)

a. Background

Miscellaneous structural steel consists of platforms and other beams/columns which provide support for piping, electrical raceways and conduits, HVAC ducts, instrumentation and other equipment not supported from the main building structures. The licensee and NRC have identified numerous deficiencies in miscellaneous

structural steel construction at the Brunswick plant. These problems, which were summarized in NRC Inspection Report number 50-325/92-14 and 50-324/92-14, include lack of design calculations, lack of as-built drawings, incorrect member sizes, missing members, missing bolts and welds, undersized welds, and numerous other construction deficiencies. To resolve the questions regarding the qualification of the structural steel, the licensee retained Bechtel Power Corporation to perform walkdown inspections, prepare as-built drawings, and perform design calculations to qualify the miscellaneous structural steel. During their review, Bechtel will identify any modifications required to correct construction and design deficiencies and restore the design margin for the miscellaneous structural steel.

b. Structural Steel Verification Program

The structural steel verification program is a two phase project with the purpose of establishing a high confidence that miscellaneous steel is adequate for plant operation and to document the current design basis of the plant. The Phase 1 portion of the program consists of walkdown inspections of the steel by two man teams of experienced structural engineers. The purpose of the Phase I inspections is to identify construction irregularities which could affect load capacity of members to identify any non-standard types of connections and to identify any potential overloaded portions of structural steel. The phase II portion of the program consists of obtaining detailed field measurements to update design documents, preparation of as-built drawings, performance of a detailed structural analysis, and preparation of a load tracking program. After completion of the structural analysis, areas requiring modification to meet design criteria will be identified and the modifications will be completed by the licensee. The load tracking program will identify the location and magnitude of loads from piping, equipment and other components carried by the structural steel, and will be used to control future modification work.

The inspector examined the following Bechtel procedures which control the walkdown inspection program:

- Procedure No. WDP-001, Phase I Engineering Walkdown Procedure for Reactor Building Miscellaneous Steel.

- Procedure No. WDP-002, Phase II Walkdown Procedure for Reactor Building Miscellaneous Steel and Drywell Platform Steel.

The Phase I procedure controls the scope of the Phase I walkdown project, walkdown personnel qualification and training requirements, precautions and limitations, requirements for documentation of walkdown results, requirements for performance of the walkdowns, and evaluation and modification criteria. The Phase II procedure controls the scope of the Phase II walkdown project, personnel training and qualification requirements, precautions and limitations, the walkdown process including data collection, weld verification, tracking of irregularities, and measurement accuracy, and walkdown documentation. The dry well platforms will be walked down prior to restart under the Phase II program only.

A meeting was held onsite on July 7, and 8, 1992, between licensee engineers, Bechtel engineers, and NRC (NRR and Region II) personnel to discuss the structural steel verification program and to review the Phase I and Phase II projects. During the meeting NRC personnel questioned the scope of the walkdown programs, including inaccessible inspection areas, and inspection of structural steel, if any, in others areas, e.g., the diesel generator building. NRR structural engineers requested that the licensee formally submit the following information for technical review and approval:

- The short term (intermin) design criteria. The licensee provided a copy of Design Guide II.20, Civil/Structural Operability Reviews to NRR on July 24, 1992

- Comparison of long-term structural acceptance criteria with UFSAR criteria and justification for deviations

- Basis for addressing thermal loads

- Justification for not considering tornado loads

- Methodology for addressing interface loads from piping, HVAC, cable tray, conduits, etc.,

- Use of dynamic load future

c. Field Walkdown and Review of Walkdown Packages

The inspector walked down structural steel platforms between elevation -17 and 20 in the north west and south west quadrants of the Unit 2 reactor building, Column lines 18-19R, K to L, and 22 to 24R, K to L. The inspector reviewed the results of the Bechtel Phase I walkdowns documented in the Bechtel walkdown packages with the field as found conditions. No discrepancies were noted between the findings of the Bechtel walkdowns and the inspectors walkdowns. The inspector examined selected connections, noted any physical irregularities and verified that the Bechtel engineers had evaluated and properly classified the irregularities during their walkdown, as documented in the Bechtel records. In accordance with Procedure number WDP-001, Irregularities are classified in accordance with the following table:

Table

Structural Steel Physical Irregularities

CODE	ACTION
A.	No Irregularities Noted
B.	Irregularities Noted: No Modification Necessary
C.	Irregularities Noted: Modification Recommended
D.	Further Evaluation Required
E.	Inaccessible: Observation Not Possible (Note Areas Not Viewed In Remarks)

The inspector concurred with the classification of the irregularities determined by the Bechtel engineers. The procedure also specifies a numerical codes, which identifies the type of irregularity, e.g., weld missing, number 1, bolt missing, number 4, connection member missing, number 12, etc.

Conclusions

Based on review of the Bechtel field walkdown procedures, the inspector concluded that the Phase I and Phase II walkdown program will be adequate to identify and evaluate physical irregularities associated with miscellaneous steel in the Unit 1 and 2 reactor buildings, and to obtain the necessary data to perform design calculations to qualify the structural steel. The licensee's design evaluation criteria are currently under review by the NRR Structural and

Geosciencies Branch. Based on review of a limited sample of the completed Bechtel walkdown, the inspector did not identify any discrepancies in the Bechtel Walkdown Program.

Violations or deviations were not identified.

3. Walkdown Inspection Programs (Units 1 and 2) 62700

In February 1992, while the plant was at 80 percent power, an auxiliary operator noticed that the Unit 1 3B Feedwater heater was moving excessively and the extraction steam line was vibrating more than usual. Licensee engineers performed walkdown inspections and found damaged bolts and pipe supports, and identified some pipe supports which appeared to be missing. After the Units were shut down in April, 1992 due to the structural deficiencies identified with the diesel generator building masonry walls, the licensee conducted an inspection of areas which are inaccessible (due to high radiation levels) when the units are at power. This effort was designated the Hotside Walkdown. The results of these inspections were reviewed by regional inspectors during an inspection conducted June 8-12 and 15-19, 1992, documented in NRC inspection report numbers 50-325/92-18 and 50-324/92-18. The inspectors questioned the thoroughness of the hotside walkdown inspection efforts based on additional discrepancies and undersized welds discovered by these inspectors. An inspector followup item, number 325,324/92-18-02 was identified by the inspectors to perform further evaluation of the feedwater lines.

During the current inspection, the inspector discussed the Hotside Walkdown Program with licensee engineers, including the scope and purpose of the program, and the results of the walkdown inspection. These discussions disclosed that the inspection methodology and criteria was to identify damaged components, e.g., bent or broken pipe hanger, conduit supports, HVAC supports, corrosion, oil leaks, missing junction box covers, indication of excessive vibration/movement. The program did not include verification of weld sizes, or comparison of as installed equipment to the original construction drawings. The licensee did not have a written procedure to use for the walkdown inspections, although inspection personnel were furnished written inspection criteria which listed examples of the type of problem they were to identify. Discussion with responsible licensee engineers disclosed that the individuals performing the hotside walkdown inspections received training as the program expectations and on the inspection criteria. The inspector reviewed the findings from the hotside walkdowns. The discrepancies have been documented on trouble tickets and are currently being

reviewed by the licensee to determine the affect on operability of safety-related systems/equipment prior to startup.

After completion of the hotside walkdowns, the licensee undertook a similar walkdown inspection program in the areas of the plant accessible during operation. This program was designated the cold side walkdown inspection. Similar types of inspection attributes were recorded as check lists for use by the licensee's inspection personnel. A larger number of deficiencies (more than 2000) were identified during the cold side walkdowns. These were also documented on trouble tickets and are being evaluated for effects on operability of safety related equipment prior to startup. Review of the results of the cold side and hot side walkdowns disclosed that the drywell and torus area were not included in either program. Considering the large number of deficiencies identified during the hot side and cold side walkdown inspections, the inspector discussed the need for performing similar type walkdown inspections of drywell and torus areas with licensee management personnel. The inspector will examine these programs in a future inspection to determine the adequacy of the scope of the inspection.

Violations or deviations were not identified.

4. Sampling and Inspection Program for Drilled-In Anchors - Units 1 and 2 (37702)

The licensee committed to NRC to extend the program for inspection and testing drilled-in anchors originally installed by Brown and Root to all areas of the plant because of the counterfeit concrete expansion anchors discovered in the diesel generator building. The licensee prepared Design Guide III.17, Sampling Plan for Drilled-In Anchors Installed in Systems/Structures at BNP. The inspector reviewed the design guide which contains the scope of the inspections, inspection methodology, precautions and limitations, sample size and documentation requirements. The licensee's inspection program included measuring bolt length using ultrasonic testing (UT) equipment, and physically loosening 100 percent of the bolts installed as drilled in anchors in structural steel applications, and 25 percent in other equipment. When the bolt was removed, the bolt length was measured and compared to the UT results, and the presence of the anchor sleeve embedded in the concrete was verified. All drilled-in anchors/bolts installed in structural steel installations were tested, while the sample size for anchors supporting other equipment were based on MIL-STD-105 E statistical methods. The inspector noted that the licensee started testing and sampling the drilled-in anchors prior to the date when the procedure was approved.

The work was performed using a draft copy of the design guide. The performance of this work using a copy of a draft procedure, and not a controlled approved procedure is contrary to good practices. This was identified to the licensee as a weakness in their documentation control program. The procedure was approved on June 20, 1992, approximately two weeks after the inspection work had commenced.

The inspector observed inspection of 12 anchors installed in surface mounted plates supporting structural steel in the Unit 1 north RHR room, elevation -6, and 0, and 10 anchors in the Unit 2 reactor building, elevation 20 platforms for TIP equipment. These inspections consisted of removal of the bolts, measurement of the bolts, and verification sleeves had been installed in the drilled in holes. Three of the anchors could not be removed, i.e., they were frozen, most likely due to corrosion, and three were inaccessible. The remaining 16 installations were found to be acceptable. The inspector will perform an indepth review of the results of the licensee's drilled in anchor inspection program in a future inspection.

Violations or deviations were not identified.

5. Exit Interview

The inspection scope and results were summarized on July 8 and July 31, 1992, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.