

JUN 19 1985

MEMORANDUM FOR: R. D. Walker, Director
 Division of Reactor Projects, Region II

FROM: J. G. Partlow, Director
 Division of Inspection Programs
 Office of Inspection and Enforcement

SUBJECT: ASSESSMENT OF IMPLEMENTATION OF THE NRC INSPECTION PROGRAM
 BY REGION II AT SHEARON HARRIS NUCLEAR POWER PLANT

The Office of Inspection and Enforcement described to the Commission in SECY-82-150A the assessment of the implementation of the NRC inspection program in conjunction with Construction Appraisal Team (CAT) inspections. Accordingly, we have examined Region II's implementation of the construction inspection program based on the October-November 1984 CAT inspection at Shearon Harris. The results of the inspection were documented in Inspection Report 50-400/84-41 dated December 24, 1984. The enclosure to this memorandum documents the results of our assessment of the construction inspection program implementation.

In our review of the region's followup to previous CAT inspection findings it appears that there has been an unnecessary duplication of efforts. Such efforts can be better utilized for direct followup and review of corrective actions.

J. G. Partlow, Director
 Division of Inspection Programs
 Office of Inspection and Enforcement

Enclosure: Assessment

cc: J. Taylor, IE

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REGIONAL CONSTRUCTION INSPECTION PROGRAM ASSESSMENT
SHEARON HARRIS (R-II)

I. SCOPE

A Construction Appraisal Team (CAT) inspection was conducted at the Shearon Harris Nuclear Power Plant of the Carolina Power and Light Company during the period October 1-12 and October 22 - November 2, 1984. While the predominant effort of the inspection team was devoted to the hardware inspection, the team also evaluated the control of design changes and corrective actions. In addition, an examination was made of project construction controls.

The purpose of this assessment is to evaluate the implementation by Region II of the Construction Inspection Program. A further purpose of the assessment is to make recommendations, if necessary, to improve the inspection program so that a comprehensive review of the licensee's construction activities is covered by the Construction Inspection Program.

II. ASSESSMENT ACTIVITIES

A review was made of Region II's inspection reports, SALP reports and enforcement items of the Shearon Harris facility to identify those deficiencies that were previously identified by Region II inspectors. The inspection reports of 1975-1984, 1982 and 1983 SALP reports, open items and violations were reviewed.

The Executive Summary and Potential Enforcement Actions of the Shearon Harris CAT inspection report (50-400/84-41) are provided as Appendix A and Appendix B.

The inspection reports for 1983 and the 766 inspection data were analyzed and it was determined that approximately 3280 man-hours of direct inspection effort were performed by Region II at Shearon Harris in 1983. The analysis of the reports and computer data indicated that the construction inspection program was approximately 85 percent complete at the start of the CAT inspection. The total man-hours and percent completion is comparable to other construction sites and Regional totals for the construction status of the Shearon Harris construction effort.

III. INSPECTION FINDINGS

A. Electrical and Instrumentation Construction

1. CAT Findings

- o It was identified that some documents in the area of electrical separation for raceways deviate from FSAR commitments. As a result, installations exist in which the required separation has not been maintained between non-Class 1E and Class 1E raceway components.

- Numerous deficiencies were identified in non-seismic raceway supports. Their possible failure could adversely affect nearby Class 1E electrical components.

2. Assessment

- The area of electrical separation has been found by the NRC CAT inspection program to be a source of problems for most construction sites. The problems are caused by differing interpretations of codes and standards by the NRC, architect-engineers, and utilities.
- The Region II office had previously identified a generic concern for non-seismic raceway support installations in Inspection Report 50-400/82-24 and updated in Report 50-400/84-17. The CAT findings provided additional details of hardware deficiencies.

3. Recommendation

- The NRC CAT findings at Shearon Harris and other facilities show that utilities and NRC personnel are having problems properly interpreting the requirements for electrical separation. IE has recently issued Information Notice No. 85-11 to summarize the problems identified by the NRC CAT program in this area.
- IE will evaluate the need for additional inspection guidance in the area of non-seismic components which may adversely affect nearby equipment components.

B. Mechanical Construction

1. CAT Findings

- Deficiencies were identified in the applicant's program to effectively identify and resolve hardware clearance problems in the areas of piping and HVAC.
- A programmatic concern was noted in the area of a lack of timely verification of piping and pipe support location to original requirements.
- Discrepancies were identified in the area of mechanical equipment fasteners and connections.
- Deficiencies were identified in the required wall thicknesses for field purchased piping.

2. Assessment

- The area of hardware clearance problems has been found by the NRC CAT program to be one activity often left to be accomplished late in the construction phase. IE inspection procedures do not address this problem.

- IE inspection procedures are considered adequate in the area of the review of procedures to cover pipe and pipe support location verification. Several Region II inspections have been performed in the piping and support area and open items were issued concerning several aspects; however, the timing of the location verification was not addressed.
- IE inspection procedures are considered adequate in the area of mechanical equipment mounting connections. A similar deficiency was identified by Region II inspectors (Inspection Report 83-13) concerning thread engagement of an anchor bolt nut for a pump. However, it appears that additional regional attention is necessary in this area.
- The deficiencies in pipe wall thickness for field purchased piping was brought to the NRC CAT inspectors attention based on findings developed in the IE Vendor Inspection program. The findings identified at Shearon Harris were provided to the Vendor Program Branch.

3. Recommendations

Of The four NRC CAT findings in the mechanical area, two areas are adequately covered in the IE Inspection program, if properly implemented. In the other two areas, IE will evaluate the inclusion of provisions in the IE inspection program to review the utility's program for control of interferences and clearances and the IE Vendor Program Branch is considering the issuance of an Information Notice regarding the pipe wall thickness problem.

C. Welding - NDE

1. CAT Findings

- A number of examples were identified in which nozzle to shell welds did not meet design requirements for vendor supplied tanks.
- Several radiographic film quality deficiencies were identified.

2. Assessment

The deficiencies in tank welds and radiographic film quality are mostly associated with vendor (off-site) supplied components. These vendor problems are recurring ones at nuclear construction sites.

3. Recommendations

The recurring problems in vendor tank welding and vendor film quality will be brought to the attention of the IE Vendor Program Branch for their evaluation. IE has issued an Information Notice regarding nozzle to shell welds in vendor supplied tanks.

D. Civil and Structural Construction

1. CAT Findings

- Three areas were identified where concrete reinforcing steel had not been placed in accordance with design drawings. In two areas there was uncertainty among site personnel as to the actual design requirements.
- An area of improperly consolidated concrete was identified in one beam.
- Concrete expansion anchor bolts for non-seismic electrical system components were found not to have the minimum embedment depth assumed in analyses.

2. Assessment

- Of the three cases of improperly placed reinforcing steel, one case involved missing reinforcing steel and the other two were cases of mispositioned reinforcing steel. The missing reinforcing steel incident is similar to occurrences identified by the applicant in 1979 and 1980 and for which a meeting in the Region II office was held. The applicant's corrective actions, implemented in 1980 to ensure responsible personnel understand the design drawing requirements, do not appear to have been fully effective. In two of the areas, the concrete had been placed after 1980. The current IE inspection procedures are adequate to cover this area if properly implemented.
- The one area of improperly consolidated concrete occurred in a location which is fairly inaccessible. This finding is considered to be of a relatively limited nature. The current IE inspection procedures are adequate to cover this area.
- The finding concerning the concrete expansion anchor bolts is related to the finding regarding non-seismic raceway supports discussed in II.A.

3. Recommendations

Although there is little concrete work remaining to be performed, there should be consideration of additional Regional attention in the area of reinforcing steel placement. Current IE inspections procedures are adequate.

E. Material Traceability and Controls

1. CAT Findings

Problems were identified regarding the traceability of fastener materials.

2. Assessment

This finding had been previously identified by both the Region II office and the applicant.

3. Recommendations

Problems in the traceability of fasteners have been identified by the NRC CAT program at several sites. At the present time, IE inspection procedures address material traceability only in each technical discipline. Current procedures do not exist to cover the programmatic control for material traceability. IE will evaluate the need for additional inspection guidance in this area.

F. Design Change Control

1. CAT Findings

- Some design documents were identified which have a large number of unincorporated design changes.
- For some field design changes, analyses and other backup documentation were not maintained as QA records.

2. Assessment

- Although the high number of unincorporated design changes created few hardware deficiencies, there is a significant potential for problems to occur in installation and inspection activities. There had been previous discussions between the Region II office and applicant in this area. Current IE inspection procedures are adequate in this area.
- The case of background documents to field design changes not being maintained as QA records is an isolated incident and deals with a minor aspect of the overall design change area. The applicant will review their current procedures and make appropriate changes. The IE inspection procedures are adequate in this area.

3. Recommendations

- The Region II office should continue to closely monitor work activities involving large numbers of unincorporated changes to ensure work is being performed to all the latest drawings and revisions.
- The IE inspection procedures are adequate in the design change control area.

G. Corrective Actions Systems

1. CAT Findings

Audits in the welding and nondestructive examination area lacked sufficient scope and quality.

2. Assessment

Current IE inspection procedures cover the general area of QA audits, but do not specifically require a review of welding or nondestructive examination audits. In addition, the review in the audit area was directed by NRC CAT efforts in the welding area. The applicant has stated that improvements are planned in this area.

3. Recommendation

Current IE inspection procedures are adequate. As few actual hardware deficiencies were identified in the welding area, no extra monitoring of the applicant's activities are recommended, except as normal followup to corrective actions planned by the applicant.

IV. OVERALL ASSESSMENT CONCLUSIONS

The implementation of the Construction Program inspection procedures at the Shearon Harris site was satisfactory. Of the 14 CAT findings identified previously, five were similar in substance to items identified previously by Region II inspections. Of these 14 CAT findings, eight are adequately covered in the Construction Inspection program procedures, three are not, and three are considered to be in the area of the Vendor Program. It appears that additional regional attention is required in the areas of mechanical equipment foundation connections and concrete reinforcing steel placement. Areas have been identified for evaluation by the Reactor Construction Programs Branch and Vendor Program Branch for possible inclusion in the current inspection procedures.

APPENDIX A

EXECUTIVE SUMMARY

An announced Construction Appraisal Team (CAT) inspection was conducted at the Shearon Harris site during the period October 1-12 and October 23 - November 2, 1984.

Overall Conclusions

Hardware and documentation for piping, pipe supports/restraints, HVAC, structural steel (including welding and nondestructive examination in these areas) and dams and dikes were generally found to be in accordance with requirements and commitments. However, the team did identify the following construction program weaknesses that require management attention:

1. Conflicts were identified between design inputs and FSAR commitments with regard to electrical cable and raceway separation which resulted in separation deficiencies.
2. Hardware discrepancies were found in non-seismic items installed over Seismic Category I items. Failure of these discrepant non-seismic items could adversely affect Class 1E electrical components.
3. Deficiencies identified in the area of interdisciplinary and pipe to pipe clearances indicated that the identification and resolution of these interferences were not being effectively addressed.

The NRC CAT team considered the direct involvement and control by CP&L in design engineering and the extensive use of field engineers to identify and resolve problems to be positive aspects of the Shearon Harris construction program.

Electrical and Instrumentation

The majority of the electrical and instrumentation samples examined met the appropriate design and construction requirements. The applicant's program for inspection of construction activities and maintenance of Class 1E electrical equipment appears to be effective. Construction and design deficiencies were identified in several areas including some items which will require additional NRC review.

Some design documents, which specify separation criteria for electrical raceway installation, deviate from FSAR commitments. As a result, numerous installations exist where the required separation between Non-Class 1E and Class 1E raceway components have not been maintained.

Because of numerous identified hardware deficiencies in non-seismic raceway supports, their possible failure may adversely affect the ability of nearby Class 1E electrical components to perform intended safety functions.

The corrective actions being taken by the applicant concerning problems associated with instrumentation appear to be adequate although final actions and approvals were not completed at the time of the NRC CAT inspection.

Mechanical Construction

Piping, pipe supports/restraints, concrete expansion anchors and HVAC supports/restraints were generally found to be in accordance with applicable drawings and requirements. Discrepancies were identified with mechanical equipment foundation fasteners and sliding end installations. Noted deficiencies of undersized wall thickness in field purchased piping indicates that the inspection and surveillance effort in this area requires increased management attention.

Programmatic concerns were noted in two areas: (1) lack of verification of piping and pipe support/restraint location to original design requirements and, (2) lack of an ongoing program to effectively identify and resolve hardware clearance problems early in the construction process. Both of these concerns involve practices that could result in extensive inspection, analyses and rework efforts very late in the construction schedule.

Welding and Nondestructive Examination

Welding and nondestructive examination activities were generally found to be conducted in accordance with the governing codes and specifications. Few deficiencies were identified by the NRC CAT inspectors in this area. However, a number of examples were identified where vendor supplied tanks did not meet the design requirements for nozzle to shell weld reinforcement, and some of the tanks support welds were undersized. In the area of NDE, several irregularities involving film quality were identified. However, the finished welds were found to be acceptable.

Civil and Structural Construction

Construction quality and concrete material certification were in general found to be acceptable. However, three areas were identified where the reinforcing steel had not been placed in accordance with the design drawings.

An area of improper concrete consolidation was identified in one of the beams in the Reactor Auxiliary Building. After chipping out the concrete in this area, a void was identified above the embedded plate and one layer of the bottom reinforcement lapped at this location was placed to one side of the beam instead of being distributed across the bottom of the beam.

A number of non-seismic electrical system components located over seismically qualified systems which are supported by unmarked concrete expansion bolts were identified. Subsequent ultrasonic testing indicated that the anchor bolt embedment lengths were as low as 1 1/2 inches. Also, tension and shear tests performed by CP&L personnel indicate that the factors of safety are approximately 50% of recommended values.

Material Traceability and Controls

In general, the project material traceability and control program was found to be acceptable. Problems were identified regarding traceability of fastener materials, including large anchor bolts and equipment mounting bolts and nuts. It was noted that both the applicant and the NRC Region II had previously identified such deficiencies and corrective actions were in progress by the applicant.

Design Change Control

Design change control, including control of changes to design documents, was determined to be generally in conformance with applicable requirements. A number of minor, non-generic discrepancies were identified, none of which are considered significant. In the area of document change control, the most significant finding was the numerous unincorporated changes affecting many documents. The most significant finding in the area of design change control is that some analyses and other backup documentation for field changes have not been designated as quality assurance records.

Corrective Action Systems

In general the applicant's corrective action program was found to be acceptable. However, it was evident that the scope and quality of audit activities regarding nondestructive examination of welding were deficient and should be improved. The applicant stated that improvements were planned in this area.

Project Management

Project Management personnel and organization appear to be adequate to assure that construction and startup activities will meet quality requirements.

APPENDIX B

POTENTIAL ENFORCEMENT ACTIONS

As a result of the NRC CAT inspection of October 1-12 and October 22-November 2, 1984, the following items have been referred to NRC Region II as Potential Enforcement Actions (section references are to the detailed portion of the inspection report):

1. Contrary to 10 CFR 50, Appendix B, Criterion III and the CP&L SHNPP FSAR, Design Control has not been maintained in that the applicant has failed to assure that applicable regulatory requirements for separation of Class 1E and Non-Class 1E electrical raceway components are correctly translated into specifications, drawings, procedures and instructions (Sections II.B.1 and II.B.2).
2. Contrary to 10 CFR 50, Appendix B, Criterion V, the applicant has failed to install reinforcing steel to the tolerances shown on the design drawing and specifications in that:
 - a) The top reinforcing steel in beam 55-L-KZ in the Fuel Handling Building was installed $\frac{1}{4}$ inch lower than shown on the rebar placement drawing and was not identified during the inspection of the reinforcing steel placement (Section V.B.1).
 - b) The bottom steel on beam 38 between column line FZ and the exterior wall in the Reactor Auxiliary Building was placed on one side of the beam instead of being distributed across the bottom of the beam (Section V.B.1).
3. Contrary to 10 CFR 50, Appendix B, Criterion VII and the Shearon Harris Plant FSAR, Chapter 17, the program for the control of purchased materials affecting quality was not effectively implemented to assure that purchased piping was in conformance with specified acceptance criteria and requirements for pipe wall thickness (Section III.B.1).
4. Contrary to 10 CFR 50, Appendix B, Criterion X and the Shearon Harris Plant FSAR, Chapter 17, the program for inspection of activities affecting quality was not effectively implemented in that inspection programs did not assure that equipment foundation connections were installed in accordance with specified acceptance criteria and requirements (Section III.B.5).