UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30303

Report Nos.: 50-413/83-22 and 50-414/83-19

Licensee: Duke Power Company
422 South Church Street
Charlotte, NC 28242

Docket Nos.: 50-413 and 50-414

License Nos.: CPPR-116 and CPPR-117

Facility Name: Catawba 1 and 2

Inspection at Catawba site near Rock Hill, South Carolina

Inspector: W C Liu — 8/30/83
W. C. Liu — Date Signed

Approved by: J J Blake — 8/30/83
J. J. Blake, Section Chief — Date Signed
Engineering Program Branch
Division of Engineering and Operational Programs

SUMMARY

Inspection on August 1-5, 1983

Areas Inspected

This routine, unannounced inspection involved 32 inspector-hours on site and at the licensee's design engineering office (Charlotte, North Carolina) in the areas of safety related pipe support and restraint systems, alternate stress analysis for piping systems, seismic relative displacement or seismic anchor movement, and design considerations for emergency conditions in piping stress analyses.

Results

Of the four areas inspected, no violations or deviations were identified in two areas; two apparent violations were found in two areas (Criterion V - Failure to follow procedure for hanger inspection, paragraph 5; and Criterion III - Inadequate design control for design calculations for problems CN-1492-NB-152A and CN-1492-NB-267A, paragraph 6.e.).

REPORT DETAILS

1. Persons Contacted

   Licensee Employees

   *J. Rogers, Project Manager
   *S. Dressler, Engineering Manager - Construction
   *R. Morgan, Senior QA Engineer
   *T. Barron, QA Engineer - Hangers
   L. Davison, Project QA Manager
   *W. Goodman, QC Inspection Superintendent
   *L. Vincent, Office Engineer
   *M. Childers, Engineer Associate
   *D. Hensley, QA Technician
   C. Ray, Jr., Principal Engineer, Mechanical/Nuclear Division
   R. Dulin, Jr., Senior Engineer, Mechanical/Nuclear Division
   R. Bonsall, Senior Engineer, Mechanical/Nuclear Division

   Other licensee employees contacted included design engineers, QC inspectors, technicians, and office personnel.

   NRC Resident Inspector

   *P. K. VanDoorn

   *Attended exit interview

2. Exit Interview

   The inspection scope and findings were summarized on August 5, 1983, with those persons indicated in paragraph 1 above. The licensee was informed of the inspection findings listed below. The licensee acknowledged the inspection findings in a telephone conference between Mr. S. Dressler (Engineering Manager) and Mr. J. Blake (Section Chief, NRC) on August 11, 1983, with no dissenting comments.

   - (Open) Violation 413/83-22-01, Failure to follow procedure for hanger inspection, paragraph 5.

   - (Open) Violation 413/83-22-02, Inadequate design control for design calculations for problems CN-1492-NB-152A and CN-1492-NB-267A, paragraph 6.e.

   - (Open) Inspector Followup Item 413/83-22-03, Piping analysis for emergency conditions, paragraph 7.

   - (Open) Inspector Followup Item 413/83-22-04, Weld acceptance criteria for hanger inspection, paragraph 8.

3. Licensee Action on Previous Enforcement Matters

   Not inspected.

4. Unresolved Items

   Unresolved items were not identified during this inspection.

5. Safety Related Pipe Support and Restraint Systems (50090)

   At the time of this inspection the licensee indicated that approximately 85% of the Unit 1 and less than 5% of Unit 2 supports and restraints (hereafter referred to as hangers) had been QC inspected and accepted. Prior to inspecting any of the QC accepted hangers, the inspector reviewed portions of the following documents:

   - QA Procedure M-51, Component Supports, Rev. 10
   - QA Procedure M-8, Piping System Installation Inspection, Rev. 12
   - Specification No. CNS-1206.00-04-0003, Procedure Requirements for Fabrication and Erection of Hangers, Supports, and Seismic Controls, Rev. 9.

   The inspector selected the following four hangers (Unit 1) that had been QC inspected and accepted for a reinspection in order to determine the effectiveness of the hanger inspection program.

Hanger Number	Piping System
1-R-KC-0392, Rev. 5	Component Cooling
1-R-KC-0029, Rev. 7	Component Cooling
1-R-TE-0059, Rev. 0	Turbine Exhaust
1-R-SA-0051, Rev. 1	Main Steam to Auxiliary Equipment

   The above hangers were inspected against their detail drawings for configuration, identification, location, fastener/anchor installation, clearances, member size, welds, and damage/protection. In general, the hangers were installed in accordance with design documents with the exception of one (hanger) in the component cooling system.

   Hanger detail drawing 1-R-KC-0392, Rev. 5, in the component cooling system had a note which stated "limit sway angle for snubber to maximum 1°". The hanger QC inspectors measured the as-built configuration twice and it was found that the actual sway angle for the snubber was 2.1°. This discrepancy was not identified during the hanger QC inspection conducted on April 28, 1983. It was noted that the 1° sway angle limit was shown on Form M-51C in the inspection package, dated April 11, 1983, prior to the hanger QC inspection. This is a violation of 10 CFR 50, Appendix B, Criterion V and is identified as Violation 413/83-22-01, Failure to follow procedure for hanger inspection.

Within the areas inspected, no violations, except as noted above, or deviations were identified.

6. Alternate Stress Analysis for Piping Systems (Unit 1)

The inspector performed the inspection in the area of piping stress analysis and pipe support (hanger) design at the licensee's design engineering office (Charlotte, NC). Prior to evaluation of the analyses and design, the inspector reviewed portions of the following documents:

- Specification No. CNS-1206.02-04-0000, Alternate Analysis Criteria for Reactor Building and Auxiliary Building Pipe and Supports, Rev. 5.

- Specification No. CNS-1206.00-04-0001, Design Specification for Nuclear Safety Related (QA Condition 1) and QA Condition 4 Component Supports, Rev. 2.

In addition, the inspector reviewed portions of the following design calculations:

File No.	Problem/Mark No.	Method
CNC-1206.12-21-2032A1	CN-1492-NB-152A, Rev. 1	Alternate Analysis
CNC-1206.12-21-2039A	CN-1492-NB-267A, Rev. 3	Alternate Analysis
CNC-1206.12-21-1004	1-R-NB-0196, Rev. 4	Support (Anchor) Design
CNC-1206.12-21-1005	1-R-NB-0179, Rev. 3	Support (Anchor) Design

The above design calculations in the areas of alternate analysis and support design were reviewed for conformance to design specifications, code and NRC regulatory requirements and to the licensee commitments.

a. Design calculations for supports 1-R-NB-0196, Rev. 4, and 1-R-NB-0179, Rev. 3 were reviewed and evaluated during the inspection for thoroughness, clarity, consistency, and accuracy. They appeared to be adequate in terms of using design input, references, units (dimension, force, and moment), equations, tables, and computer analytical models. In general, design calculations for support 1-R-NB-0196, Rev. 4, were very good.

b. In the area of alternate analysis, design calculations for problems CN-1492-NB-152A, Rev. 1 and CN-1492-NB-267A, Rev. 3 were reviewed. It was noted that calculations for both problems showed a lack of clarity, consistency, and accuracy. Specification No. CNS-1206.02-04-0000, Alternate Analysis Criteria for Reactor Building and Auxiliary Building Pipe and Supports, Rev. 5 provided guidance to design calculations. The specification consisted of 6 sections, 11 appendices, 7 thermal cases, and numerous tables for load calculations.

Paragraph 1.1.8 of Design Engineering Procedure PR101, Rev. 4, states that calculations shall include identification of sources of information, data, equations, etc., employed in the calculation. Paragraph 1.1.9 of the same procedure requires complete presentation of the calculation such that anyone appropriately qualified could review the calculation. Paragraph 2.2.1 of procedure PR101 requires the checker to review data and design method used and to check the calculation step by step. In addition, the checker has the responsibility to check the activity and/or all revisions for completeness, clarity, and accuracy.

A review of the design calculations for the two aforementioned problems revealed that none of the design calculations met the above procedure requirements as described in the Design Engineering Procedure PR101. The design calculations showed a lack of references in terms of using sections, appendices, identification of thermal cases, equations, and applicable tables as specified in design specification CNS-1206.02-04-0000.

c. Thermal load calculations for problem CN-1492-NB-152A were reviewed and evaluated with isometric drawings CN-1492-NB-179A, Rev. 1 and CN-1492-NB-152A. It was found on sheet no. 4 of the design calculations that a dimension of 9.875 feet was used in the bending leg calculation. The bending leg was used to determine the size of the thermal load. The 9.875 ft. dimension was based on the addition of two vertical pipe segments plus one sloped pipe segment (45° from vertical axis). The design engineer treated vertical pipe segments and sloped pipe segments in the same manner when performing thermal load calculation. This is inappropriate because projected length should be used for sloped pipe segments, or the length obtained by multiplying by a cosine angle to the sloped pipe segment. As a result, the revised thermal load was increased by 23% (176 lbs. versus 143 lbs). In addition, isometric drawing CN-1492-NB-179A, Rev. 1 showed a lack of references in terms of using dimensions to column lines for load calculation.

d. Anchor seismic load calculations for problem CN-1492-NB-152A were reviewed and evaluated with isometric drawing CN-1492-NB-152A. It was noted on sheet 6 of the design calculations that the spectra dependent coefficient 0.75 was used for Operating Basis Earthquake (OBE) load calculations and 1.4 was used for Safe Shutdown Earthquake (SSE) load calculations. In accordance with paragraph 5.2.5.c.2 of specification CNS-1206.02-04-0000, Rev. 5, the correct spectra dependent coefficients should be 0.4 for OBE and 0.75 for SSE. In addition, there were no notes on sheet 6 to indicate that the 0.75 and 1.4 spectra dependent coefficients were intentionally used for load calculations.

Anchor seismic load calculations for problem CN-1492-NB-257A, Rev. 3 were reviewed with isometric drawing CN-1492-NB-267, Rev. 2. It was noted on sheet 10 of the design calculations that a pipe length of 24.75 ft. was used for both OBE and SSE load calculations. The correct pipe length (run CD) shown on the corresponding isometric drawing was 22 ft. The discrepancy between the two lengths was 2.75 feet. Furthermore, there were no notes on sheet 10 to indicate that the 24.75 feet was intentionally used for load calculations.

e. Discrepancies described in paragraphs 6.b, 6.c., and 6.d above were discussed with the licensee. These discrepancies are a violation of 10 CFR 50, Appendix B, Criterion III and are identified as Violation 413/83-22-02, Inadequate Design Control for Design Calculations for Problems CN-1492-NB-152A and CN-1492-NB-267A, Rev. 3.

Within the areas inspected, no violations, except as noted above, or deviations were identified.

7. Piping Analysis for Emergency Condition (Unit 1)

Discussions with the licensee indicated that no emergency conditions have been used in the stress analysis nor in the support calculations for safety related piping. It is the understanding of the inspector that the licensee will provide the reasons why emergency conditions were not considered in the analyses. This matter is identified as Inspector Followup Item 413/83-22-03, Piping Analysis for Emergency Condition.

Within the areas inspected, no violations, except as noted above, or deviations were identified.

8. Weld Acceptance Criteria for Hanger Inspection (Unit 1)

Specification CNS-1206.00-04-0003, Procedure Requirements for Fabrication and Erection of Hangers, Supports, and Seismic Controls, Rev. 9, was partially reviewed for conformance to code requirements. It was noted that AWS D1.1 code requirements were not addressed in the above specification. In addition, weld acceptance criteria with respect to oversize welds and location of welds were not described. This matter is identified as Inspector Followup Item 413/83-22-04, Weld acceptance criteria for hanger inspection.

Within the areas inspected, no violations or deviations were identified.

9. Seismic Anchor Movement in Stress Analysis (Unit 1)

Calculations CNC-1206.02-82-2005, Rev. 3, in the residual heat removal system and CNC-1206.02-82-2020, Rev. 6, in the safety injection system were partially reviewed. It was noted that both calculations did evaluate the effect of seismic anchor movement (or seismic relative displacement) in the stress analyses. However, this evaluation was made only in the horizontal direction. Discussions with the licensee revealed that seismic relative displacements in the vertical direction between reactor building and auxiliary building are very small, such that they are considered to be negligible in the stress analysis. Furthermore, the inspector reviewed a document from S. B. Hager, Chief Engineer Civil/Environmental Division to S. K. Blackley, Jr., Chief Engineer, Mechanical/Nuclear Division, dated August 4, 1983, with regards to seismic relative displacements between the buildings.

Based on the above information and the information from paragraph 3.7.2.4, Soil/Structure Interaction, of Catawba FSAR, the stress analyses with respect to seismic anchor movements consideration appeared to be adequate and acceptable.

Within the areas inspected, no violations or deviations were identified.