



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

Report Nos.: 50-413/84-49 and 50-414/84-23

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: *T. E. Conlon for*
J. R. Harris

5/16/84
Date Signed

Approved by: *T. E. Conlon*
T. E. Conlon, Section Chief
Engineering Branch
Division of Reactor Safety

5/16/84
Date Signed

SUMMARY

Inspection on May 1 - 4, 1984

Areas Inspected:

This routine, unannounced inspection involved 26 inspector-hours onsite in the areas of structural concrete, an unresolved item and a previously identified licensee item.

Results:

Of the three areas inspected, no violations or deviations were identified in two areas; one apparent violation was found in one area (Failure to Identify Concrete Honeycomb - paragraph 3).

8407180165 840706
PDR ADOCK 05000413
PDR
Q

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *R. L. Dick, Construction Vice President
- *E. M. Couch, Project Administrator
- *L. R. Davidson, Project QA Manager
- *R. W. Ballard, Chief, Construction Technical Support
- *T. H. Robertson, Civil Construction Technical Support Supervisor
- *R. A. Morgan, Senior QA Engineer
- *K. W. Schmidt, QA Engineer
- *D. V. Ethington, Assistant QA Engineer
- *D. P. Hensley, QA Technician
- J. Warren, QC Engineer Civil
- C. Arnold, Civil Field Engineer
- D. Allison, Civil QC Inspector

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on May 4, 1984, with those persons indicated in paragraph 1 above. The licensee acknowledged the inspection findings. The following item was opened:

Violation 413/84-49-01, 414/84-23-01, Failure to Identify Concrete Honeycomb.

3. Licensee Action on Previous Enforcement Matters

(Closed) Unresolved Item (414/80-33-01) Identification of Concrete Honeycomb. The inspector observed several honeycomb areas in concrete pour numbers 2W72 and 2W74 made on August 25, 1977, which had not been repaired and which did not appear to have been identified, as required by procedure M-2 Revision 8, Inspection of Design Concrete. Procedure M-2 Revision 8, requires the structural inspector to document honeycomb and void areas after the forms are removed. Review of documentation for wall pours 2W72 and 2W74 in the Unit 2 Containment and for several wall pours in the Unit 1 containment showed that honeycomb was not being documented by structural inspectors at the time of form removal. This unresolved item is closed and is upgraded to a violation. The violation was identified to the licensee as violation 413/84-49-01, 414/84-23-01, Failure to Identify Concrete Honeycomb.

In response to the unresolved item the licensee has been performing a 100 percent reinspection of concrete surfaces on all structures in Unit 1 and Unit 2 and is repairing all identified defects. Work on Unit 1 is scheduled to be completed by June 1, 1984. Work on Unit 2 is scheduled to be completed by November 1984. During this inspection, the NRC inspector examined documentation on the repairs and did a walkdown inspection of

honeycomb repairs made on all structures in the Unit 1 powerblock and the annulus of the Unit 2 containment building. Examination of repairs and documentation showed that honeycomb is now being identified and repaired in accordance with procedures.

4. Unresolved Item

Unresolved items were not identified during this inspection.

5. Independent Inspection

The inspector examined ongoing work activities in the concrete and soils testing laboratory, calibration controls on testing equipment and preparation for a concrete placement around the Unit 2 pressurizer.

6. Licensee Identified Items (92700)

(Closed) Item CDR 413-414/82-23, Abandoned Drill Hole Repairs. This item was reported to NRC on November 8, 1982. The licensee submitted an interim report on December 8, 1982, a final report on May 6, 1983 and an amended final report on April 18, 1984.

During drilling of a hole for an anchor in the Auxiliary Building it was necessary to partially drill into an abandoned drill hole which had been repaired with SikaTop 122. The repair material was found to be weak and could not support torquing of the anchor to the required load. QA personnel investigated this problem and found that construction craft personnel were not following the approved construction procedure for mixing the two components for SikaTop 122. Anchor capacity could be adversely affected if the anchor is located partially in or near weak repairs made with SikaTop 122.

Investigations showed that craft personnel were mixing and placing the SikaTop 122 at a "dry pack" consistency instead of the wet mortar or grout consistency obtained when following the manufacturers mixing directions. The licensee performed tests in which SikaTop 122 was mixed to a "dry pack" consistency and then used to repair 5/8 inch, 1 inch, and 2 inch diameter holes drilled in a test slab. After curing, 5/8 inch diameter holes were drilled at locations from completely within a repair to tangent to a repair. Expansion anchors were then installed into the repairs and axially loaded to failure. Test results showed that the anchor capacities in the dry pack were equivalent to capacities of anchors set in sound concrete. The licensee also made test cube specimens with the dry pack and the specified wet grout mix and made compressive strength tests on the test cubes after the specified curing time. Test results showed that the SikaTop 122 will have an acceptable strength when properly mixed as both a dry pack and as a wet grout mix. However, the investigation also showed that in mixing SikaTop 122 to a dry pack consistency, the material tended to dry quickly once mixed. The dried material would have been weak and would not have allowed torquing of the anchor. Thus additional tests were initiated to

determine the likelihood of other weak repairs that could affect anchor performance.

A list of hangers whose anchors were installed during the affected time frame was compiled. A statistical sampling approach using random numbers was used to determine a 95% confidence level that less than 5% of anchors installed could be significantly affected by a repair made with the SikaTop 122. Anchors from the selected sample were loaded to 125 percent of their design capacity. A total of 119 anchors on 74 hangers were tested and found to hold the imposed load. In addition to the above, Swiss hammer tests were made on 125 repair areas in walls and 78 repair areas located in ceilings that were judged to be typical of repairs made during the affected time frame. The sample size was made in accordance with guidance in Military Standard 105D. The Swiss hammer was calibrated to the SikaTop 122 material for horizontal and overhead hammer positions and all Swiss hammer tests were performed by a single operator using one hammer. Analysis of the Swiss hammer data showed that there is a 99% probability that the repairs will exceed 3300 psi and an 82% probability that the repair will exceed 5000 psi. The capacity values for anchors found in Specification CNS-1206.00-04-0001, "Design Specification for Nuclear Safety-Related Pipe Supports" are based on 3000 psi concrete strength.

Based on the above investigations and testing the following conclusions were drawn:

- a. When SikaTop 122 is properly blended and placed as a dry pack, the repair will have acceptable strength and will not affect the ultimate capacity of anchors.
- b. The root cause of the weak repair that was discovered was either the use of dry material which was not sufficiently combined with the liquid component or the use of mixed material which was allowed to dry out before using.
- c. The weak repair which initiated concerns was an isolated case. The probable occurrence of poor repairs is low.
- d. Tests on in-place anchors indicate to a 95% confidence level that anchors are properly installed into sound material and that design requirements will be met.
- e. Test of field repairs indicate a 96% probability that repairs are sufficiently sound such that no reduction in pullout capacity will take place.

A new procedure had been developed with guidance for use of SikaTop materials for concrete repairs. Craft personnel have been retrained in the proper method for mixing and placing SikaTop materials. This item is closed.