



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

Report Nos. 50-338/79-22, 50-339/79-30, 50-404/79-03 and 50-405/79-03

Licensee: Virginia Electric and Power Company
Post Office Box 26666
Richmond, Virginia 23261

Facility Name: North Anna Power Station, Units 1, 2, 3 and 4

Docket Nos. 50-338, 50-339, 50-404, and 50-405

License Nos. NPF-4, CPPR-78, CPPR-114, and CPPR-115

Inspection at North Anna Site near Mineral, Virginia

Inspector:

J. C. Bryant for
J. C. Lenahan

5/11/79
Date Signed

Approved by:

J. C. Bryant
J. C. Bryant, Section Chief, RCES Branch

5/11/79
Date Signed

SUMMARY

Inspection on April 23-25, 1979

Areas Inspected

This routine, unannounced inspection involved 24 inspector-hours onsite in the areas of structural concrete QA/QC controls, service water pumphouse settlement data, and containment structural integrity test QA/QC controls, work performance and quality records.

Results

Of the areas inspected, no apparent items of noncompliance or deviations were identified.

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DETAILS

1. Persons Contacted

Licensee Employees

- *#J. E. Wronlewicz, QA Engineer
- #P. A. Slater, Resident QA Engineer
- *E. R. Smith, Jr., Supervisor Technical Services
- *W. R. Cartwright, Station Manager
- *W. R. Madison, NRC Coordinator
- R. C. Sturgill, Assistant Engineer
- *W. F. Diehl, Operations QC Engineer

Stone and Webster Engineering Corporation (S&W)

- J. G. Dyckman, Lead Structural Engineer
- D. Barry, Resident Engineer, Units 1 and 2
- D. Wells, QC Engineer
- #A. Foussekics, Resident Engineer, Units 3 and 4
- R. Belanger, Structural Engineer
- R. Wiesel, Structural Engineer

Wiss, Janney, Elstner and Associates (WJE)

- G. Hedien, Structural Engineer
- K. Krause, Structural Engineer
- D. W. Boggs, Structural Engineer
- P. Linehan, Structural Engineer

Champion, Inc.

- D. A. VanLoon, QC Engineer

NRC Resident Inspector

- M. S. Kidd

*Attended operations staff exit interview.

#Attended construction staff exit interview.

2. Exit Interview

The inspection scope and findings were summarized on April 25, 1979 with those persons indicated in Paragraph 1 above. Separate exit interviews were conducted with the operations staff to discuss findings of the inspection on Units 1 and 2 and with the construction staff to discuss findings of the inspection on Units 3 and 4.

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3. Licensee Action on Previous Inspection Findings

Not inspected.

4. Unresolved Items

Unresolved items are matters about which more information is required to determine whether they are acceptable or may involve noncompliance or deviations. New unresolved items identified during this inspection are discussed in paragraph 5.

5. Independent Inspection Effort

The inspector examined the following areas:

- a. Units 1 and 2 Service Water Pumphouse (SWPH) Settlement Data. The licensee had notified Region II on April 19, 1979, that the results of April 6, 1979 settlement surveys disclosed that the SWPH had settled an additional 1/8 inch since the previous survey of March 7, 1979. The April 6, 1979, data indicate average SWPH settlement of 0.138 feet since December 1, 1975. This amount is 92 percent of the total average SWPH settlement permitted by Technical Specification 3.7.12.1. The licensee has initiated weekly SWPH settlement surveys which will be continued until evaluation of the data indicate that the frequency can be reduced.

In addition to the SWPH settlement data, the inspector also reviewed the April 6, 1979, settlement data collected on the service water piping expansion joints and on settlement monuments located on the service water reservoir embankment, SM-1 through SM-6. The April 6 data for each of those points also indicated approximately 1/8 inch of additional settlement since the March 7 survey.

- b. Data from piezometers located in vicinity of the SWPH and at other locations in the service water reservoir. Review of the data disclosed that the ground water level in the service water reservoir embankment has not changed significantly in the last two months. The inspector concluded from the data that the 1/8 inch of apparent settlement discussed in the above paragraph was not caused by a recent and abrupt drop in the ground water level in the vicinity of the service water reservoir.
- c. Service water piping expansion joints located adjacent to Units 1 and 2 SWPH.
- d. Construction status of Units 3 and 4.

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- e. Concrete batch plant for production of concrete for Units 3 and 4.
- f. Units 3 and 4 concrete mix designs numbers 64A and 77A.
- g. Procedure Numbers NAS-30113, "Mixing and Delivering Structural and Heavy Aggregate Concrete", and draft of Procedure Number POP-804, Revision 2, "Field Procedure for Concrete Placement -Vertical Exterior Walls Reactor Containment". These procedures will be used for placement of reactor containment walls for Units 3 and 4. Examination of the procedures disclosed that procedure number NAS-30113 needs clarification on requirements for calibration of concrete batching equipment as it does not appear to meet the requirements of ACI 304-58, "Recommended Practice for Measuring, Mixing, and Placing Concrete". Paragraph 15.4 of the PSAR states, in part, that concrete materials and workmanship will conform to ACI 304-58.

Discussions with responsible engineers disclosed that in the past the batch plant scales were calibrated and certified by the Commonwealth of Virginia Bureau of Weights and Measures. The state has recently determined that since concrete from the batch plants is not sold to the public, it has no jurisdiction over the plants and will therefore no longer calibrate the batch plant scales. Procedure Number NAS-30113 has not been revised to specify a method for batch plant scale calibration since the state stopped performing this function.

The inspector did not have sufficient time during this inspection to check the currentness of the latest certificate of calibration furnished by the Commonwealth of Virginia and to determine if proportioning and batching of materials for concrete is being properly controlled. This was identified to the licensee as Unresolved Item No. 404-79-03-01 and 405-79-03-01, "Calibration of Concrete Batch Plant Scales".

No deviations or items of noncompliance were identified.

6. Containment Structural Integrity Test (SIT) - Unit 2

- a. Review of Program and Test Procedures - The inspector examined the following procedures to determine if work activities and quality control and quality assurance functions were provided for as specified in FSAR Section 3.8.2.8.1, SER Section 3.8.1, and NRC requirements.

Preoperational test procedure 2-PO-74, "Reactor Containment Structural Acceptance Test"

Specification NAS-395, "Structural Acceptance Test for Concrete Primary Reactor Containments"

Test Procedure TMP-7, "Reactor Containment Structural Acceptance Test (SAT)"

Wiss, Janney and Elstner Drawing Number 9.0-192A, 9.0-193A, 9.0-194A, 9.0-195A and 9.0-196A

These procedures specified type, location and accuracy of instrumentation and the method for application of test loads. The test pressure was specified to be 1.15 times the containment design pressure. Mapping of surface crack patterns was specified at maximum test pressure and at atmospheric pressure before and after the test. The procedures were approved by authorized licensee personnel prior to the test.

- b. Witnessing of Containment Structural Integrity Test - Prior to the start of the test the inspector toured the interior of the containment structure and verified that required instrumentation was installed at specified locations.

The crack pattern map areas and several other locations on the exterior of the containment structure were also examined prior to start of the test. Interviews were conducted with several members of the SIT crew. The crew was knowledgeable of the test program and procedures and the care and operation of the test instrumentation. Initial strains and deflections were recorded. Data output from the instrumentation was recorded and processed on a computer which printed the results in a numerical form.

The inspector witnessed approximately 12 hours of the SIT from test pressures of 14.7 psig to the maximum test pressure, 52.7 psig, and start of depressurization. Crack patterns were mapped at each hold point. The inspector observed mapping of crack patterns at pressures of 27.5 psig and 52.7 psig. The inspector verified dimensions of several cracks and the accuracy of recording the crack locations. Strain data and radial and vertical deflections were recorded at required intervals. Test pressures were held at the specified increments for the required time periods. S&W structural engineers and QC personnel continuously monitored performance of the SIT crew and recording of test data during the SIT. Test data was reviewed by responsible engineers during the test to verify that deflections were within predicted FSAR values. No adverse environmental conditions occurred during the test.

- c. Review of Test Records - The inspector examined the following records relating to the structural integrity test:

Pretest calibration record of Heise pressure guage Serial Number 15197.

Calibration records of Invar wire extensometers, frame numbers 10 through 15, 17 through 19, 21 through 24, 26, 27, 29 through 34, 1002, 1003, 1005 through 1010, and 1012.

Calibration record of Invar 36 wire

Calibration records of voltmeter A904-01 IDVM

Strain and deflection data collected at pressures of 0 psig, 5+2-0 psig, 13+2-0 psig, 26+2-0 psig, 35.0 psig, 39+2-0 psig, and 52+1-0 psig. Measured deflections were less than those predicted in the FSAR.

Crack pattern mapping at pressures of 0 psig, 13+2-0 psig, 26+2-0 psig, 39+2-0 psig and 52+1-0 psig.

Review of the above records, discussions with responsible engineers and inspection of mapped crack areas identified the problem described below:

In Section 3.8.2.8.1 of the FSAR the width of a new crack or increase in an existing crack was predicted to be a maximum of 0.03 inch at maximum test pressure. During the SIT, at application of maximum test pressure, cracks opened in excess of the predicted maximum of .03 inch at the springline of the dome and adjacent to the equipment hatch. At the springline the crack was horizontal and measured a maximum width of .035 inches for a length of approximately 3 feet in the mapped area. In the remaining 4 feet of the mapped area the crack had a width of approximately 0.03 inch. Adjacent to the equipment hatch two cracks in excess of 0.030 inches were measured. One crack extended from approximately twelve o'clock to three o'clock with a maximum width of approximately 0.075, and the other from six o'clock to nine o'clock with a maximum width of 0.090 inches. The cracks adjacent to the equipment hatch were similar to the one which opened at the equipment hatch during the SIT on Unit 1. S&W engineers indicated that these were most likely not cracks, but probably separations of the exterior portion of the concrete from the equipment hatch.

The inspector questioned the meaning of the strain data recorded on strain gauge number 70 during the test. Strain gauge number 70 was located approximately mid height on the structure at an azimuth of 120 degrees. This gauge recorded negative (compressive) strains until a test pressure of 35.0 psig was attained even though radial deflections in the positive (outward) direction had occurred at lower pressures. Above 35.0 psig, gauge 70 recorded small positive strains. All other gauges located at midheight on the structure, including the gauge at an azimuth of 60 degrees, near the equipment

hatch, recorded positive strains during application of the full range of test pressure. The strains recorded on these gauges were much larger at maximum pressure than the strain recorded on gauge 70 at maximum pressure. Comparison of the strains and deflections measured during the Unit 1 SIT with those measured during the Unit 2 SIT indicates that the strains measured by strain gauge number 70 during the Unit 2 SIT were anomalous.

The evaluation of the cracking in excess of predicted values and the explanation of the meaning of the strain data recorded by strain gauge number 70 will be reviewed by NRC in a subsequent inspection. This was identified to the licensee as Inspector Followup Item 339/79-30-01, "Concrete Cracks in Excess of Predicted Size During the SIT".

No deviations or items of noncompliance were identified.

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