



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

Report Nos.: 50-424/85-19 and 50-425/85-19

Licensee: Georgia Power Company
P. O. Box 4545
Atlanta, GA 30302

Docket Nos.: 50-424 and 50-425

License Nos.: CPPR-108 and CPPR-109

Facility Name: Vogtle 1 and 2

Inspection Conducted: May 6-10, 1985 and May 20-24, 1985

Inspectors: J. R. Harris

6/12/85

Date Signed

J. J. Lenahan for

6-12-85

Date Signed

R. W. Wright for

6-12-85

Date Signed

Accompanying Personnel: W. H. Rankin
T. F. McElhinney

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

6/12/85

Date Signed

SUMMARY

Scope: This special inspection, consisting of an unannounced inspection of May 6-10, 1985, and an announced inspection of May 20-24, 1985, entailed 251 inspector-hours on site in the areas of Module one, Reinforced Concrete Structures, of the Readiness Review Program.

Results: No violations or deviations were identified.

8507110086 850617
PDR ADOCK 05000424
G PDR

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- ***D. O. Foster, Vice President, Project Manager
- **P. D. Rice, Vice President & General Manager, Quality Assurance
- *W. T. Nickerson, Deputy Project General Manager
- ***H. H. Gregory, General Manager, Construction Department
- ***C. W. Hayes, Vogtle Quality Assurance Manager
- *E. D. Groover, Quality Assurance Site Manager
- *M. H. Googe, Project Construction Manager
- ***W. C. Ramsey, Readiness Review Project Manager
- *B. C. Harbin, Manager of Construction QC
- **G. F. Trudeau, Readiness Review Team Member
- ***R. W. McManus, Readiness Review Team Member
- **W. M. Wright, Readiness Review Team Member
- **M. R. Thikar, Readiness Review Team Member
- **J. E. Seagraves, Readiness Review Team Member

Other licensee employees contacted included construction craftsmen, engineers, technicians, and office personnel.

Other Organizations

- *S. Pietrzyk, Assistant Project Engineer, Bechtel
- *D. W. Strohman, Project QA Engineer, Bechtel
- **D. Niehoff, Project Field Engineer, Bechtel
- **S. Thomas, Project Field Engineer, Bechtel
- **W. Gardel, Readiness Review Team, Stone & Webster

NRC Resident Inspectors

- ***W. F. Sanders
- *J. Rogge
- *R. J. Schepens

- *Attended exit interview May 10, 1985
- **Attended exit interview May 24, 1985
- ***Attended exit interview May 10 and May 24, 1985

2. Exit Interview

The inspection scope and findings were summarized on May 10 and 24, 1985, with those persons indicated in paragraph 1 above. The inspectors described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

Unresolved Item 424-425/85-19-01, Review of Results of Testing Performed on Concrete Materials by the Independent Testing Laboratory - paragraphs 8a(4)(d), 8a(13)(c), 8a(14), 8a(29), 8a(30), 8a(32)(a-d), 8a(35)

Unresolved Item 424-425/85-19-02, Review of Civil Open Item Reports - Paragraph 8a(32) (last subparagraph)

Unresolved Item 424-425/85-19-03, Maximum Allowable Water on Batch Tickets - Paragraph 8.b(1)(b)

Unresolved Item 424-425/85-19-04 Certification of QC Inspectors on Concrete Pour A-11B-004 and 008 - Paragraph 8.b(1)(b).

The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection.

3. Licensee Action on Previous Enforcement Matters

This subject was not addressed in the inspection.

4. Unresolved Item

Unresolved items are matters about which more information is required to determine whether they are acceptable or may involve violations or deviations.

Four new unresolved items identified during this inspection are discussed in paragraphs 8a(4)(d), 8a(13)(c), 8a(14), 8a(29), 8a(30), 8a(32)(a)(b)(c)(d), 8a(32), 8b(1)(b), 8a(35).

5. Independent Inspection Effort

The inspectors observed the following ongoing work activities and records:

- a. Standard penetration testing (SPT) performed at depths of 40 to 50 feet and 75 to 78.5 feet in test boring number SPT-107. This test boring and a number of others are being drilled to provide additional information for response to FSAR review questions of the NRC Office of Nuclear Reactor Regulation (NRR). The onsite drilling work is being controlled by guidelines specified in a Bechtel Letter dated April 19, 1985, Subject: Work Plan for Geotechnical Verification. The SPT testing was performed in accordance with the requirements of ASTM D 1506. The results of the SPT (an average resistance to penetration of 100 blows per six inches) indicates the backfill materials are very dense.
- b. Preplacement and placement of concrete pour number 2-051-002-02A in the Unit 2 Nuclear Service Water Tower. The inspector examined the placement prior to placing of concrete for proper cleanout and placement of reinforcing steel and during placement for proper consolidation of the concrete and testing of the concrete for slump, air and temperature.

- c. The inspector examined purchase order documents for receipt of melment (water reducing superplasticizer). Examination of purchase order documents disclosed that the licensee was deficient in not requiring this material to be purchased as a Q material. However, examination of receipt documents showed that the material did meet the standard specification for chemical admixtures for concrete as specified by ASTM-494. This minor deficiency has no safety significance.

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

6. Readiness Review, Module 1, Reinforced Concrete Structures

The inspectors performed a detailed review of sections 3.0, 6.0, and 7.0 of Module 1 as part of a continuing assessment of the effectiveness of the licensee's verification program for reinforced concrete. This verification program is being conducted by the licensee to assure that design, construction, and operational requirements and commitments have been properly implemented. In addition to reviewing the details presented in these sections of the module, the inspectors verified that the correct FSAR commitments were referenced, randomly sampled the commitments and verified that the commitments were being implemented in the specifications and procedures, examined findings identified by the licensee to verify that the resolutions were accurate and examined records documenting results of the construction inspection program. Results of the inspectors review are discussed in the following paragraphs.

7. Module 1, Section 3 Commitments

This section of the module has a commitment matrix which contains a listing of the source and subject of licensee commitments and an implementation matrix with a listing of the commitments and corresponding implementing documents.

The inspectors reviewed the FSAR and verified that the commitments referenced in the FSAR have been identified in the commitment matrix. The inspectors also reviewed the implementation matrix to verify that construction commitments have been correctly implemented in construction specifications and procedures. Construction commitments and implementing specifications and procedures reviewed by the inspectors are as follows:

<u>Commitment Source</u>	<u>Implementing Specifications and Procedures</u>
ACI-211.1	X2AP01
ACI-214	X2AP01
ACI-304	X2AP01, CD-T-02
ACI-305	X2AP01, CD-T-02
ACI-306	X2AP01, CD-T-02

ACI-308	X2AP01, CD-T-02
ACI-309	X2AP01, CD-T-02
ACI-318	X2AP01, CD-T-02
ACI-347	X2AP01, CD-T-02
ANSI-N45.2.5	X2AE03, X2AE01, X2AE02
ASTM-C150	X2AE01, CD-T-02
ASTM-C123	X2AE02, CD-T-02
ASTM-C125	CD-T-02
ASTM-C127	X2AE03, CD-T-02
ASTM-C128	X2AE02, CD-T-02
ASTM-C131	X2AE03, CD-T-02
ASTM-C136	X2AE03, X2AP01, CD-T-02
ASTM-C142	X2AE02, X2AP01, CD-T-02
ASTM-C235	X2AE03, CD-T-02
ASTM-C260	X2AE07, CD-T-02
ASTM-C295	X2AE02, X2AE03
ASTM-C40	X2AE02, CD-T-02
ASTM-C494	X2AE07, CD-T-02
ASTM-618	X2AE06, CD-T-02
ASTM-C88	X2AE01, CD-T-02
ASTM-D1411	X2AE02, X2AP01
ASTM-D1888	CD-T-02
Reg Guide 1.10	CD-T-06
Reg Guide 1.15	X2AF01, X2AP01

Review of the above listed commitments to concrete codes and practices, regulatory guides and industry standards referenced in the FSAR and review of specifications and procedures, indicated that the commitments were being properly implemented in site specifications and procedures.

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

8. Section 6.2 - Construction Program Verification

The Construction Program Verification was performed in two phases. Phase I was verification of implementation of 43 construction and 23 procurement commitments. Phase II was a technical review of construction records to verify acceptability of the construction materials and to verify that the work was performed in accordance with the project specifications, procedures, and drawings. The NRC inspectors reviewed findings identified by the licensee during their review and also reviewed a sample of the construction records. Review of these items are discussed in the following paragraphs.

a. Review of Findings

During the Phase I verification process, five findings were identified. These are described in Section 6.2.4 of the Module. Fifty findings which were identified during the Phase II verification process are described in Section 6.2.5 of the Module. The inspectors examined the corrective actions associated with resolution of the findings. Details of this review are discussed below.

Findings identified during the Phase I program verification are listed as Finding number (Phase I). All other findings were identified during the Phase II verification.

- (1) Finding 1 (Phase I) - The FSAR requires compliance with Regulatory Guide (RG) 1.15 for reinforcing steel. RG 1.15 states that reinforcing steel shall conform to ASTM A 615-1972. The procurement specification for reinforcing steel (Specification X2AF01) states that reinforcing steel is required to conform to the edition of ASTM A 615 in effect at the time of award of the steel procurement contract (1976 edition). The specification has subsequently been updated to various later editions. The licensee evaluated the later edition of ASTM A615 against the 1972 edition and concluded that the physical requirements (tensile strength, bend test requirement, nominal weight, dimensions, deformation requirements, etc.) were identical and chemical changes were insignificant. The inspector evaluated the 1976 and 1978 editions of ASTM A615 against the 1972 edition and concurred with the licensee's evaluation of this problem. It is a general practice in construction to procure materials to the latest edition of the ASTM standard. The licensee will amend the FSAR to clarify that reinforcing steel was purchased to the later editions of ASTM 615. In addition, RG 1.15 has been replaced by RG 1.136. This finding was minor in nature and has no safety significance.
- (2) Finding 2 (Phase I) - ACI 318-71 requires vertical construction joints to be wetted and coated with neat cement grout immediately prior to placing new concrete. The construction procedure and project specification required a 4 hour wet down with water prior to concrete placement. The inspector reviewed the licensee's evaluation of this finding. As a result of the evaluation, the licensee concluded that the method for treatment of construction joints specified in ACI 318-71 was the minimum requirement and that the design engineer had the option of establishing more specific requirements. The method specified in the construction specification (four hour wet down) is equal or better than treatment with cement grout. The inspector concurs with the licensee's evaluation. The requirement for treating vertical construction joints with neat cement was found to be impractical and was deleted from the 1983 edition of ACI 318.
- (3) Finding 3 (Phase I) states that Section 6.2.1 of ACI 318-71 requires field cured cylinders to support evidence of strength to remove form work shoring. The finding also states there is a conflict between section 6.2.2 of ACI 318-71 and specification X2AP01 C3.2 regarding minimum time after concrete placement for removal of forms.

The inspector reviewed Section 6.2.2 of ACI 318-71 and Section C3.2 of Specification X2AP01. This review disclosed that ACI 318-71 requires that the concrete gain sufficient strength to

support its weight and any construction loads prior to removal of the forms. ACI 318 states that this strength may be demonstrated by use of field cured cylinders. The minimum time (24 hours) quoted in ACI 318 after concrete placement refers to forms supporting vertical loads. Specification X2AP01 requires that shoring/ forms supporting vertical loads be left in place until the concrete has reached 80 percent of its design strength, or a minimum of 28 days during cold weather. This requirement exceeds the minimum ACI 318 requirements quoted above. The inspector considers this finding resolved.

- (4) Finding 4 (Phase I) - The FSAR states that air entraining admixtures (AEA) will conform to ASTM C-260. Table I, In-Process Test Schedule of procedure CD-T-02 lists ASTM C-494 as the test method and acceptance criteria for AEA. Review by the licensee of this finding resulted in writing of a field procedure change notice to add test requirements of ASTM C-260 to Table I of CD-T-02. Section III.E of procedure CD-T-02 requires AEA to comply with ASTM C-260. The procedure requires that the supplier provide test results demonstrating compliance with ASTM C-260 with each batch of AEA delivered. The procedure also requires that the licensee obtain composite grab samples from each shipment of AEA and send the samples to an independent laboratory for testing. The licensee concluded that the AEA delivered to the site complied with ASTM C-260.

The inspector reviewed Specification X2AE07, Furnishing Admixtures for Concrete and procedure CD-T-02. Review of the specification and procedure disclosed that AEA was required to conform to ASTM C-260. The inspector examined results of testing performed on AEA composite grab samples by the independent laboratory, Law Engineering Test Company, and examined test data submitted by the AEA manufacturer to demonstrate compliance with ASTM C-260. The test data covered 26 batches delivered to the project site between September 21, 1977 and March 6, 1985. Review of the test data disclosed the following problems:

- (a) Review of records of Law Engineering test results for batch numbers 9037, 1005, 1007, 1019, 1056, and batch 20005/20006 disclosed that testing was performed in accordance with ASTM C-494, not ASTM C-260 as required by the procedure and specification. In addition, pH values were not reported for batches 1005, 1007, and 1019, as required by the specification and ASTM C-260.
- (b) The specific gravity values reported by Law Engineering for batch number 30001 was incorrect. The value reported was 109.1, whereas the correct values should be approximately 1.050.
- (c) Law Engineering test data for Batch number 0016 was missing.

- (d) There are numerous differences greater than 1.0 between pH values reported by Law Engineering and those reported by the supplier. ASTM C-260 specifies that differences should not deviate by more than 1.0.

None of the discrepancies listed above had been detected by the Georgia Power Level II inspectors who reviewed, signed, and approved the Law Engineering test data. Pending further review by NRC, this problem was identified to the licensee as unresolved item 424, 425/85-19-01, Review of Results of Testing performed on Concrete Material by the Independent Laboratory (Law Engineering).

- (5) Finding 5 (Phase I) - The FSAR states that sand used in production of concrete would have a fineness module (FM) between 2.5 and 3.0. The procurement specification for sand (X2AE02) was revised on October 1, 1982, to permit the FM of the sand to range between 2.3 and 3.1.

The licensee revised the specification to permit a wider range for the FM. The specification still complies with ASTM C-33 requirements. The licensee will amend the FSAR to correct the discrepancy.

- (6) Finding 6 states that the procurement specification for cement (X2AE01, Furnishing Cement for Concrete) requires the licensee to obtain samples of cement for testing by an independent laboratory at 1200 ton intervals. The finding indicates that cement was sampled on several occasions at intervals exceeding 1200 tons. Review of specification X2AE01 by the inspector disclosed that this specification does not require the purchaser to sample cement at 1200 ton intervals. The requirement for the purchaser (the licensee) to obtain the samples at 1200 ton intervals is contained in specification X2AP01, Section C3.6, and procedure CD-T-02. When this problem was identified, the licensee reviewed sampling records which covered shipments received between April 21, 1981 and January 1985. Thirty-seven samples were obtained at intervals exceeding 1200 tons. Thirty-one samples were sampled at a frequency not exceeding 1400 tons, four samples were sampled at a frequency not exceeding 1500 tons and the remaining two samples were sampled at 1558 and 1910 tons.

As a result of these problems, two deviation reports CD-7233 and CD-7314, were written to address the improper sampling intervals. The inspector reviewed the deviation reports which had been dispositioned Use-As-Is. The test samples were for user tests to validate the vendor test results. The inspectors reviewed the results of compressive strengths test performed on concrete test cylinders. This review disclosed that the concrete strength exceeds design strength requirements. Occasionally exceeding the specified user test frequency has no effect on concrete quality. This finding is resolved.

- (8) Finding 8 - Records for 23 cement bin releases were reviewed. One bin was found not entered in the bin release schedule. Review of this problem disclosed that the vendors certified material test report (CMTR) for this bin was on file in the vault. The CMTR had been reviewed by a Level II QC inspector. Therefore, the quality of the concrete was not effected. The inspector considers this finding resolved.
- (9) Finding 9 - This finding states that the procurement specification (X2AE06, Furnishing Pozzolan for Concrete) requires the purchaser to obtain samples of fly ash at 200 ton intervals. The finding is based on sampling at intervals exceeding 200 tons. Review of specification X2AE06 by the inspector disclosed that this specification does not require the purchaser to sample fly ash at 200 ton intervals. The requirement for the licensee to obtain the fly ash samples at 200 ton intervals is contained in specification X2AP01, Section C3.6, and procedure CD-T-02. When this problem was identified, the licensee reviewed delivery records for all fly ash shipment. This review disclosed that the sampling interval was exceeded 25 times out of 245 cycles. Nineteen samples were taken at intervals not exceeding 300 tons, four samples at intervals not exceeding 400 tons and two samples were taken at 507 and 2037 tons, respectively. As a result of the improper sampling intervals, deviation report numbers CD 7235, 7240, and 7315 were written. The inspector reviewed the deviation reports which had been dispositioned Use-As-Is. The test samples are for user tests to validate vendor test results. Concrete quality was not affected. This finding is resolved.
- (10) Finding 10 - One of 23 flyash receipt logs reviewed by the Readiness Review team were not signed by a Level II inspector.
- The inspector reviewed deviation report CD-7234 which was written to address this problem. As a result of this finding, the licensee reviewed 100 percent of the flyash receipt logs (124 total) and found an additional four receipt logs without signatures of a Level II inspector. The five receipt logs have been reviewed and found acceptable. The quality of the concrete was not affected. The inspector considers this finding resolved.
- (11) Finding 11 - ASTM C-33 requires concrete sand to have two to ten percent passing the number 100 sieve. Two of 26 gradation reports reviewed by the Readiness Review team only had one percent passing the number 100 sieve.

The inspector reviewed deviation report 7226 which was written to address this finding. The gradation reports in question were those provided by the supplier for the fine aggregate. Final acceptance of the sand gradation is based on those tests performed by the licensee on sand sampled once or twice daily from the batch plant. The licensee reviewed 131 additional vendor gradation test

reports. Eight additional minor discrepancies identified in review of these reports were dispositioned as deviation report (DRs) numbers CD-7332 and CD-7323. The inspector reviewed the DRs which had been dispositioned Use-As-Is. Minor variations in aggregate gradations do not effect concrete quality. This finding is resolved.

- (12) Finding 12 - ASTM C-33 requires concrete sand to have 100 percent passing a 3/8 inch sieve. Vendor gradation test reports did not contain 3/8 inch sieve results.

The inspector reviewed Deviation Report CD-7225 which was written to disposition this finding. As stated above, final acceptance of the concrete sand was based on results of gradation tests performed by the licensee daily on sand samples obtained at the batch plant. The inspector reviewed selected daily gradation reports for daily fine aggregate samples. These results contained the 3/8 inch sieve results. Concrete quality was not affected. This finding is resolved.

- (13) Finding 13 - Specification X2AE02 requires a certificate of conformance (C of C) to accompany or preceded each lot of sand delivered. Records for a period of 26 months were reviewed. Five C of Cs were found to be missing.

The inspector reviewed Deviation Report CD-7224 which was written to address this finding. Final acceptance of the fine aggregate was based on results of user tests performed for the licensee at an Independent Laboratory (Law Engineering) and, as stated above, on gradation tests performed daily on samples obtained at the batch plant. The inspector reviewed the results of testing performed by Law Engineering on samples of fine aggregate taken monthly at the site between May 1979 and January 1985. Specification X2AP01, Section C3.6, and procedure CD-T-02 required the fine aggregate to be tested in accordance with ASTM C-123 and C-142 on a monthly interval and on a six month interval in accordance with ASTM C-88 and C-289. Review of the Law Engineering test data disclosed the following problems:

- (a) Tests for C-88 and C-289 were not performed on fine aggregate material sampled between April 1980 and July 1981, a period of 15 months. Specification X2AP01 and procedure CD-T-02 requires this test to be performed at 6 month intervals.
- (b) No test data was available for ASTM C-123 and C-142 for the month of April 1982.
- (c) Law Engineering test report dated November 23, 1982, states Test for Lightweight Pieces was performed in accordance with ASTM C-142. This is an error, the test should have been performed in accordance with ASTM C-123.

Resolution of these problems by NRC will be covered under Unresolved Item 424, 425/85-19-01, discussed in paragraph 8.a.(4), above.

- (14) Finding 14 - Procedure CD-T-02 requires each shipment of concrete admixtures to be sampled for testing by an independent laboratory. Documentation for testing could not be found in the records vault for 1 of 23 shipments reviewed. This finding is related to problems identified by the inspector in review of admixture test results discussed in paragraph 8.a(4) above. This problem will be reviewed further by NRC in resolution of Unresolved Item 414, 425/85-19-01.

- (15) Finding 15 - Procedure CD-T-02 requires miscellaneous concrete ingredients to be logged in at receipt on the concrete material Part IV form. These forms were not retrievable for the period March 1979 through March 1982. The licensee was able to generate missing Part IV forms from Part V reports.

This form was required only for months admixture were received. All manufacturer certificate of conformance (C of C) for admixtures were on file in the vault. Concrete quality was not affected. This finding is resolved.

- (16) Finding 16 - This finding is a result of a conflict between the pour card and the post-placement inspection report with regards to curing of concrete placement number A-110-003 placed on November 11, 1978. The post-placement inspection report indicates curing was satisfactory, while the pour card indicated curing was stopped a day early, resulting in issuance of deviation report (DR) CD-232.

The inspector reviewed DR CD-232 which was written in November 1978 to extend curing of the pour for 48 hours. Since the problem with the curing was identified and properly resolved when it occurred, this finding is resolved.

- (17) Finding 17 - Two reinforcing steel check lists were missing from 23 packages reviewed by the Readiness Review team. The checklists are required by procedure CD-T-06. As a result of this finding, 288 additional pour packages were reviewed. Twenty-two were missing the required checklists. Thirteen of the missing records were from pours made in one month.

The inspector review DR number CD-7216 which was written to address this problem. The checklists are secondary records and were not intended to serve as inspector tools. The reinforcing steel inspections were performed in accordance with procedure CD-T-06 and the construction drawings. Final acceptance of the reinforcing steel is indicated by the inspectors signature on the pour card, not the checklists. This finding is resolved.

- (18) Finding 18 - Tensile test records for cadweld number 2531-19 could not be located. However, the record was later located. This finding has no safety significance.
- (19) Finding 19 - Cadweld splice number 5501-11 was noted on the Cadweld Inspection Report as acceptable. However, a later inspection report indicated that another cadweld was shot as a replacement for cadweld 5501-11 which was rejected.

Review of the later inspection report and other records indicated that splice number 5502-11 was rejected. Therefore this finding was a result of writing one incorrect digit on an inspection report. Splice 5501-11 was acceptable. Splice 5502-11 was rejected and replaced with a new cadweld. This finding was resolved.

- (20) Finding 20 - Cadweld splice 18TVZD255 was identified on the cadweld inspection report as a test splice, but no tensile test results could be located for this number.

Review of the cadweld records disclosed that cadweld number 18TVZD225 was tested. This finding is similar to Finding 19 in that it was of writing one incorrect digit on an inspection report. This finding is resolved.

- (21) Finding 21 - Cadweld test splice 11TVZF9 is indicated as a test splice on the Tensile Test Report for November 1980 but was not indicated on the Cadweld Inspection Report as a test splice.

Review of this finding disclosed that this information was deleted from the Cadweld Inspection Report. The report was corrected, based on information obtained from the inspectors field book. This finding is resolved.

- (22) Finding 22 - Three cadweld splices, numbers 18TVCL72, 18TVBZ174, and 18THCBZ378 were not noted on inspection reports as test splices but appear on the Tensile Test Evaluation Reports.

This finding is similar to finding 21. The Cadweld Inspection Reports have been corrected to indicate these splices were test splices. During examination of observation 14 of Readiness Review Module 1 Section 7.5.2, a Region II inspector reviewed all cadweld tensile test results. The project Cadweld failure rate is approximately 0.3 percent. These failure were identified, evaluated and resolved by the licensee. Finding 22 is resolved.

- (23) Finding 23 - Five Cadweld Inspection Reports were missing from the vaults. However, these reports were later located in field files and transmitted to the vault. This finding has no safety significance.

- (24) Finding 24 - Copies of approved mix designs were not stored in the QA records vault. Subsequently, the mix design documents were retrieved from project files and placed in the vault. This finding has no safety significance.
- (25) Finding 25 - Specification X2AP01, Section C3.6 and procedure CD-T-02 require inprocess tests for slump, air, and temperature be performed every 50 cubic yards during concrete placement. Contrary to this requirement, during placement of pour number A-11C-013, 65 cubic yards of concrete were placed without slump air and temperature being recorded.

The inspector reviewed DR number CD 7218 which was written to disposition this item. The inspector also reviewed the results of air, slump and temperature tests performed on concrete placed in pour number A-11C-013. This review disclosed that 381 cubic yards of concrete were in the placement and that 9 tests were performed for slump, air and temperature, for an average of one test per 42 cubic yards of concrete placed. This finding is resolved.

- (26) Finding 26 - Procedure CD-T-02 requires that a gradation test be performed on aggregate each day concrete is produced. No records could be found in the vault for a gradation test on No. 67 aggregate on March 2, 1981. A concrete pour was made on this date.

The inspector reviewed DR number CD 7238 which was written to resolve this finding. Since concrete quality was not affected, i.e., slump, unit weight, and compressive strength tests were acceptable, the DR was dispositioned Use-As-Is. The inspector concurs with this disposition. This finding is resolved.

- (27) Finding 27 - A unit weight test was not performed on concrete placed in pour number A-080-068B which was placed on May 13, 1981.

The inspector reviewed DR number CD-7236 which was written to disposition this finding. As a result of this problem, the licensee reviewed records for the period of April 1, 1981 through June 30, 1981, for unit weight tests. Twenty-three of 171 unit weight reports were missing. Based on the fact that all 148 unit weight reports reviewed exceeded the minimum required unit weight of 137 pounds per cubic feet, and the fact that the batch plant has satisfactorily passed concrete uniformity tests (ASTM C94) every 6 months (Note: ASTM C-94 test the batch plant to verify it produces uniform concrete, i.e., concrete with consistent slump, air unit weight, strength, etc.), this DR was dispositioned Use-As-Is. The inspector concurs with this disposition. This finding is resolved.

- (28) Finding 28 - Results of test reports could not be located in the vault for samples of concrete materials tested by the outside

testing agency (Law Engineering) for the period September 1984 through December 1984. Subsequently, the testing was completed by Law Engineering and the test results (records) were received from Law Engineering. This finding has no safety significance.

- (29) Finding 29 - Results of the friable particle test (ASTM C-142) could not be located in the vault for number 67 aggregate sampled on February 1, 1984. Subsequently, Law Engineering was contacted and the test results were provided. Further review of this finding will be conducted in resolution of Unresolved Item 424, 425/85-19-01.
- (30) Finding 30 - Results of LA Abrasion Tests, ASTM C-131, for number 67 aggregate sampled in January and June 1984 were not in the vault. Subsequently, Law Engineering was contacted and test results were provided. Further review of this finding will be conducted in resolution of Unresolved Item 424, 425/85-19-01.
- (31) Finding 31 - Procedure CD-T-02 requires LA Abrasion testing (ASTM C-131) to be performed every 6 months. No results could be located in the vault for LA Abrasion testing performed prior to November 7, 1980. Subsequent investigations resulted in locating in the vault LA Abrasion tests performed on aggregate sampled on December 29, 1978 and May 13, 1980. The licensee wrote DR number CD-7254 to address the missing results for the year 1979. This DR was subsequently disposition Use-As-Is based on concrete quality. During this inspection the licensee located the L. A. Abrasion test results performed on number 67 aggregate sampled on May 18, 1979 and November 5, 1979. The inspector reviewed the May 18, 1979 test data during an inspection performed July 24-26, 1979 (See Inspection Report 50-424, 425/79-13). The inspector reviewed results of L. A. Abrasion testing performed on number 67 aggregate sampled between February 17, 1978 and January 2, 1985. The test results were acceptable and samples were obtained and tested at the proper frequency. This finding is resolved.
- (32) Finding 32 - Documentation could not be retrieved for Potential Reactivity tests (ASTM C-289) performed on number 67 aggregate between July 13, 1979 and April 7, 1980.

The inspector reviewed Dr number CD 7239 which was written to disposition this finding. This DR was dispositioned Use-As-Is. As a result of this finding the inspector made a detailed review of results of selected tests performed on number 67 and number 8 coarse aggregates by the outside testing firm (Law Engineering). The data reviewed were results of test performed on monthly samples of number 67 aggregate sampled between April 1979 and March 1985, and number 8 aggregate sampled between August 1981 and March 1985. Results of the test review are summarized in the Table below. The required frequency of testing, as specified in

Procedure CD-T-02, and Section C3.6 of Specification X2AP01 are also indicated in the table.

TABLE

<u>Test Required</u>			
<u>Test Method</u>	<u>No 67</u>	<u>No. 8</u>	<u>Test Frequency</u>
Friable Particle (ASTM C 142)	Yes	Yes	Monthly
Lightweight Pieces (ASTM C 123)	Yes	Yes	Monthly
Soft Fragments (ASTM C 235)	Yes	No*	Monthly
Flat and Elongated Particle (CRD C-119)	Yes	No*	Monthly
Potential Reactivity (ASTM C-289)	Yes	Yes	Six months
Soundness (ASTM C-88)	Yes	Yes	Six months

*No 8 aggregate is too fine to be tested in accordance with ASTM C 235 and CRD C-119.

Review of the test results disclosed the following problems with test results reported for the No. 67 aggregate. No problems were noted with No. 8 aggregate test results.

- (a) Missing test results for C-88, C-123, and C-142 for aggregate sample numbers 80-3 and 84-2
- (b) Test method ASTM C-851 is indicated as the test method used for scratch hardness test for sample numbers 80-10, 81-10, 81-11 and 81-12. Although this test is almost equivalent to ASTM C-235, the Level II inspector signing and approving the test results should have questioned use of this test method when the procedure specified the test was to be performed in accordance with ASTM C-235.
- (c) Results for aggregate sampled on March 5, 1984, have an incorrect sample number. The sample number should be 84-3, not 83-3.
- (d) For sample number 84-9, the test method indicated for flat and elongated particles should be CRD-C-119, not ASTM C-119 as shown on test results.

As a result of the problems identified with review of Law Engineering test results disclosed by several of the licensee's findings and by the inspector's review of Law Engineering results for tests performed on the air-entraining admixture, the fine aggregate, and the coarse aggregate, the inspector made a detailed review of results of testing performed by Law Engineering on water used in mixes. The requirements for testing water are stated in Section C3.6 of Specification X2AP01 and in procedure CD-T-02. The inspector reviewed results of monthly tests performed on water samples obtained between May 1979 and March

1985. Review of these results disclosed one instance where the 28 day compressive strength of the mix batched with the site water was more than 10 percent below the control mix (Specifications permit a maximum of a 10 percent decrease) and 4 instances when time of initial set for mixes with site water exceeded the 30 minute maximum time difference permitted by the specification. These problems were not identified by the Level II inspectors signing and approving the test results. Finding 32 and other problems disclosed in review of results of tests, performed on No. 67 aggregate and water discussed above will be further reviewed during resolution of Unresolved Item 424, 425/85-19-01.

Review of the water tests also disclosed another problem. Level II inspectors identified instance during their review of the water test data when the results did not comply with the specification requirements. The deviations were noted by the Level II inspector on the reports and were referenced for resolution as Civil QC open items. The NRC inspector reviewed the civil QC open item reports on file in the vault. This review disclosed that the dispositions and final corrective actions for resolving the problems were not indicated on the open item reports. The inspector could not determine from review of the open item reports whether or not the corrective actions had been completed, and whether or not the reports had been reviewed and accepted by engineering. Pending further review of the civil open item reports by NRC, this problem was identified to the licensee as Unresolved Item 424, 425/85-19-02, Review of Civil Open Item Reports.

(33) Finding 33 - For the period July 13, 1979 through April 17, 1980 two sulfate soundness (ASTM C-88) test results were missing. Subsequent to identification of this finding, copies of the test results were obtained from Law Engineering. The inspector reviewed the results which were performed on fine aggregate sampled on October 1, 1979. This finding is resolved.

(34) Finding 34 - Documentation could not be located in the vault for organic impurities (ASTM C-40) testing performed on aggregate during the week of August 18, 1978.

Records were subsequently located. This finding has no safety significance.

(35) Finding 35 - ASTM C-35 permits a maximum of 1.0 percent of lightweight pieces (ASTM C-123) in aggregates. The fine aggregate sampled on April 6, 1979, had 1.1 percent which exceed the maximum by 0.1 percent. This report had been reviewed and approved by a Level II inspector.

The inspector reviewed DR number CD 7232 which was written to address this finding. The licensee concluded that based on review of all other test results for lightweight pieces performed on the fine aggregate, and the fact that the maximum permissible value was exceed only by 0.1 percent that the durability of the concrete

would not be affected. The inspector concurs. However, the problem indicated by this finding of inadequate review of the Law Engineering test results will be reviewed further during resolution of Unresolved Item 424, 425/85-19-01.

- (36) Finding 36 - Three of twenty-six reports documenting inspections of concrete curing could not be found in the vault. These records were eventually located. However, review of 246 additional concrete placements disclosed that curing inspection records could not be located for 8 placements.

The inspector reviewed DR number CD 7414 which was written to resolve this finding. In order to resolve the problem, a detailed walkdown inspection was conducted to examine the concrete structures for evidence of inadequate curing. No problems were identified. This finding is resolved.

- (37) Finding 37 Procedure CD-T-02 requires that compressive strength tests be taken a minimum of once per mix per day or every 100 cubic yards placed. Compressive strength test results could not be located for two placements.

The inspector reviewed DR numbers CD-7227 and CD-7228 which were written to disposition this finding. Review of the DRs disclosed that the compressive test results from one of the placements were included in the monthly statistical analysis report for compressive strength testing. Therefore, test cylinders were made and tested. The compressive strength test results were reviewed for 246 additional placements. No results were missing. Based on the fact that the compressive strength test results indicate that the concrete strength is well above design requirements for all mixes placed on the project, and on review of batch tickets for placements representing missing test records, the licensee concluded concrete was acceptable. The inspector concurs with the licensee. This finding is resolved.

- (38) Finding 38 - A grout placement pour card was found to be missing from one of sixteen grout placement packages reviewed. Subsequently, the missing pour card was found in the vault. This finding has no safety significance.

- (39) Finding 39 - Three of sixteen grout placement package were missing post placement inspection reports. Two of the missing reports were subsequently found.

The inspector reviewed DR number CD-7219 which was written and dispositioned Use-As-Is. Their disposition was justified by the results of a walkdown inspection that indicated that the curing of the grout placements were satisfactory. Sixty-eight additional grout placements were examined. Seven had missing post placement

inspection reports. DR number CD 7419 was written and dispositioned Use-As-Is based on the results of a walkdown inspection. This finding is resolved.

- (40) Finding 40 - Three of sixteen packages had missing daily inspection reports. These reports were subsequently found in the vault. However, additional review of grout placement records involving 208 grout placements identified 12 placements where compressive strength results were not available for grout placed on horizontal construction joints.

The inspector reviewed DR number CD 7429 which was written to disposition this finding. Based on review of grout batch tickets and the fact that compressive strength of grout for the project exceeds design strength requirements, DR CD 7427 was dispositioned Use-As-Is. The inspector concurs with this disposition. This finding is resolved.

- (41) Finding 41 - The grout compressive strength report for April 27, 1981 was not signed by a Level II inspector. The report was reviewed and signed by a Level II inspector on January 31, 1985. This finding is resolved.
- (42) Finding 42 - During review of civil QC inspector training and certification records, records of five inspectors were found to be missing from the vault. The records were subsequently located and placed in the vault. This finding has no safety significance.
- (43) Finding 43 - During review of QC inspector certification records of QC inspectors who had signed inspection records, 26 instances involving 15 different inspectors were identified where inspectors were not certified on the date they inspected and accepted work. Further review of this problem disclosed that the individuals involved had completed their training and were fully qualified prior to performing any inspections.

However, they were not certified in accordance with ANSI N45.2.6. as the licensee was not committed to the standard prior to 1983, the time period involved in this problem. The licensee is currently making a detailed review of inspector training records for inspectors in all disciplines. Since the inspectors were fully qualified when they performed their inspector duties, this finding has only minor significance.

- (44) Finding 44 - Deviation Report CD-1147 references an incorrect civil open item report pertaining to improper rebar placement in a doorway. As a result, DR number CD-7326 was issued to resolve this finding. This DR required chipping of the concrete in the doorway to determine if the proper rebar was installed. The proper header bars were found to have been installed; however, four No. 5 trim bars used for crack control at the corner of the

doorway were found to be missing. Engineering evaluated the problem and examined the doorway to verify that diagonal cracking was not occurring. Based on this evaluation, DR CD-7326 was dispositioned Use-As-Is. This finding is resolved.

- (45) Finding 45 - Nonconformance report (NCR) CD-212 was missing its attachments. The attachments were subsequently located in the vault and attached to the NCR. This finding has no safety significance.
- (46) Finding 46 - NCR CD-511 did not have any indication of the approved disposition of rework except in Recommended Action Areas. Since the rework was approved by the responsible agency (Georgia Power) as required by site procedure GD-T-01, the NCR had been correctly approved. This finding was the result of a misunderstanding of procedure GD-T-01 requirements by the Readiness Reviewer. This finding has no significance.
- (47) Finding 47 - Review of selected DRs disclosed improper approval of Use-As-Is dispositions on DR CD-145, 147, 148, 307, and 308. The specific problem involved failure of the design engineer, Bechtel to approve the Use-As-Is disposition.

As a result of this finding, all DRs (1500) written prior to January 1982 were reviewed by Bechtel. The final dispositions were found to be acceptable. This finding is resolved.

- (48) Finding 48 - The wording of DR CD-5917 involving out of tolerance batch plant scales was not clear. The inspector reviewed DR-CD-5917. This review showed that the disposition of the DR was amended to clearly state the corrective action taken (Concrete was rejected). This finding is resolved.
- (49) Finding 49 - Disposition on DR CD 4903 was not clear since it did not address all problems addressed by the cited deviation report. Review of this item showed that the disposition of DR CD 4903 was clarified. This finding is resolved.
- (50) Finding 50- Justification for repair disposition was not indicated on DR CD-1832. This DR involved non-safety-related work. However, the DR was reviewed. The review disclosed that the items affected were repaired in accordance with design specification requirements. This finding is resolved.
- (51) Finding 51 - Core drill request number C-CDR-382 did not reference the field change request (FCR) used to approve core drilling and did not reference the affected drawing. This finding is administrative in nature. This information was added to the core drill request. This finding is resolved.

- (52) Finding 52 - The applicable FCR was not attached to core drill request number C-CDR-542. This finding is administrative in nature. The proper FCR was attached to the original core drill request in the vault. This finding is resolved.
- (53) Finding 53 - Core drill request C-CDR-695 referenced the wrong design drawing number. The correct drawing number was added to the core drill request. This finding is resolved.
- (54) Finding 54 - Core drill request C-CDR 536 requires holes to be drilled $3\frac{1}{2}$ inches from a 4 inch conduit sleeve, which is a violation of the 6 inch minimum clearance referenced by the applicable FCR.

The inspector reviewed DR number CD-7342 which was written to disposition this finding. Disposition of this DR disclosed that project design criteria had not been violated. This disposition was Use-As-Is. This finding is resolved.

- (55) Finding 55 - Core Drill Request C-CDR-683 incorrectly locates actual location of the core drill hole. This problem was resolved by DR 7204 which required drilling of the hole in its proper location. This finding is resolved.

b. Review of Quality Records

The inspectors examined pertinent records for 2 of the 26 vertical slices of concrete operations which were previously analyzed by the licensee's readiness review group and for three randomly selected independent vertical slices of concrete operations. The licensee's vertical slices centered around concrete placements numbers A-08B-020A and A-084-004. The randomly selected vertical slices were centered around concrete placements A-11B-004, 008, 1-01C-125 and A-083-006A. The inspectors also examined quality records for the critical elements of a horizontal slice of concrete placements made in the unit one containment building. Results of the review of the vertical and horizontal slices are discussed in the following paragraphs.

(1) Vertical Slices

The above mentioned concrete placement records were examined to ascertain whether the records are in conformance with established procedures and specifications and that the records reflect work accomplishment consistent with applicable requirements in the following areas:

- ° Materials acceptability - cement, flyash, fine and coarse aggregates, admixtures, reinforcing steel and cadweld materials
- ° Rebar installation, cadweld splicing and testing activities

- ° Preplacement, batch plant, delivery, and placement operations
- ° Inprocess testing of fresh concrete
- ° Calibration of equipment
- ° Curing and post-placement activities
- ° Core drill and grouting operations
- ° Qualification of inspection (QC) personnel
- ° Handling of deviation reports/non-conformance control

The following deficiencies associated with the below listed concrete placements were identified to the licensee.

(a) Pour A-08B-20A (GPC Slice 13)

Page 6 of the licensee's verification plan checklist states under Section III 1.C. Cadwelds, "No cadweld documentation associated with this pour." Subsequent GPC and NRC inspector review of applicable reinforcing steel drawings for this placement revealed some No. 18 vertical reinforcing steel required cadweld splicing. Further search at the document control center resulted in these cadweld inspection records being found filed in folders bearing the cadweld QC inspector codes ZA and ZP rather than in the subject pour package. These records revealed operator BR and AG shot the cadwelds associated with this pour. No sister or production splices were taken for tensile testing from this placement since there were not enough splices shot in the pour to warrant a test. Review of cadweld tensile test report results (for each test and average of each 15 consecutive tests) for operators BR and AG on No. 18 bar, type T, vertical position for cadwelds shot just prior to the subject placement were found satisfactory.

This deficiency is another indication of an overall problem concerning the filing and retrieveability of quality records which was identified by the licensee in Section 6.2...3.2 of the Readiness Review Module No. 1.

(b) Pour A-11B-004 & 008 (randomly selected vertical slice) Batch tickets for the subject pour which was placed January 30, 1981, depict a maximum allowable water content for each 10 CU. yds. of concrete batched to be 380 gallons or 3,169 pounds. This quantity of water if used exceeds the applicable design mix (411-5) allowable water content of 3,100 lbs. + 1% or 3,131 pounds of water. Review of all batch tickets associated with the subject placement and those placements

listed below (conducted prior to and after the subject placement date) utilizing the same design mix revealed no instance where the design mix allowable water content was exceeded.

<u>Pour No.</u>	<u>Date</u>	<u>Yardage (CY)</u>	<u>Max. Water (LBS)</u>
A-11B-009B	1/29/81	185	380
A-51A-203 & 209	1/28/81	416	380
A-51A-205 & 211	2/2/81	99	380
A-11B-002 & 006	2/2/81	1111	380
A-11B-015	2/27/81	204	380
A-51B-218 & 224	2/20/81	232	380
2-05D-007	2/27/81	—	380

Review of the concrete batching operations revealed the probability of design mix water content (or any other concrete ingredient) being exceeded is highly unlikely. Mixes are conservatively batched holding back considerable amounts of allowable water and the batched concrete is transported in open bed agitating trucks which do not permit the adding of extra water and remixing. Additionally, the batch plant QC inspector is required by procedure to check each batch ticket ingredient against the design mix quantity and allowable tolerance for that ingredient. The inspector examined the 411-5 design mix card (adjusted for allowable tolerance) utilized by the batch plant QC inspector for checking batch ticket ingredient weights and found it satisfactory. However, it is felt that the licensee should investigate this matter further by determining the cause of the deficiency and by examining further this and other design mixes placed to date to assure no violation of water content occurred. This deficiency was identified as Unresolved Item 424/85-19-03, Maximum allowable water on batch tickets.

Review of records concerning the qualification and certification of QC inspectors involved with the subject concrete placement resulted in two additional findings. Records indicate that James E. Sursson, a Level I fresh tester of concrete, failed his requalification test on February 26, 1980, and consequently had his card revoked March 18, 1980, by R. H. Reynolds, Jr. There are no records to support that later Mr. Sursson was ever recertified in this area in his file; however, approximately one year later he conducted inprocess testing of fresh concrete for the subject concrete placement. Secondly, Stanley Lambert, the batch plant QC inspector who evaluated and verified the acceptability of the concrete batch tickets for the subject placement was only certified to Level I. ANSI N45.2.6 requires persons evaluating inspection and test results to be certified as a Level II

or higher. This deficiency was identified as Unresolved Item 424/85-19-04, Certification of concrete QC inspectors.

(c) Pour 1-01C-125 (randomly selected vertical slice)

The procurement specification for cement requires the purchaser to obtain samples of cement shipments for testing by an independent laboratory at 1200 ton intervals. The subject concrete placement was poured on November 24, 1982. Cement receiving inspection reports examined for the interim of November 20-29, 1982, revealed the required 1200 ton sampling frequency was exceeded by 48.45 tons for that period. The readiness review team identified similar findings on many of the vertical slices they reviewed and identified the deficiency as RRDR 21, Item 1. The subsequent project response, and the readiness review team's conclusion satisfactorily resolve this issue.

(2) Horizontal Slice

The inspectors examined the critical elements of concrete records for concrete placements made in the Unit 1 containment from August 1981 through September 1984. Critical elements selected for review included slump, air, temperature and strength. Records of data on these elements were examined for the following concrete placements:

<u>Pour Number</u>	<u>Date of Placement</u>
1-010-001/002-23	8/31/81
1-010-001/002-21	9/10/81
1-010-003	10/7/81
1-010-004	11/3/81
1-010-006	12/9/81
1-01C-010-028	1/28/82
1-010-029	2/22/82
1-01C-050/065	3/11/82
1-010-009	4/3/82
1-01C-042	5/5/82
1-01C-058B, 058C	5/5/82
1-01C-064A & 065A	5/5/82
1-010-014	6/13/82
1-010-016	7/16/82
1-010-017	8/21/82
1-01C-125	11/24/82
1-01C-154	2/27/83
1-01C-151	5/23/83
1-010-018	9/18/83

1-010-031	2/20/84
1-010-038	4/25/84
1-010-039	5/22/84
1-010-040	6/21/84
1-010-041	7/22/84
1-010-042	8/18/84
1-010-043A	9/24/84

Examination of the slump, air temperature and strength data for these placements indicated that specification and design requirements were being met. Examination of the strength data showed that concrete strengths were meeting or exceeding design requirements.

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

9. Section 7.0, Independent Design Review

The inspectors examined observation number 14 identified by the independent design reviewer in section 7.52. Observations were identified as items for which a determination of technical adequacy required a review of additional documents or further documentation clarification. Identification and evaluation of observation 14 is as follows:

a. Observation Number 14, Cadweld Deficiency Evaluation

The independent design reviewer indicated that cadweld deficiencies were evaluated and dispositioned on the basis of job wide low visual and tensile test rates. He stated that a stronger basis for disposition and one more consistent with the intent of Regulatory Guide 1.10 would have been to consider additional tensile testing and/or an evaluation of existing performance records of cadwelders. The reviewer indicated this item was resolved when review of cadweld test results showed that visual acceptance of splices will result in adequate cadwelds with only isolated splices not meeting the minimum requirements of 125 percent of minimum specified bar strength.

The NRC inspectors examined Regulatory Guide (RG) 1.10 and all tensile test results for number 11, 14 and number 18 splices in the vertical and horizontal position and deficiency reports for all test results less than 125 percent of the minimum specified bar strength. The inspectors also interviewed cadweld QC inspectors and reviewed the cadweld training program given to QC inspectors.

Examination of RG 1.10 showed that additional tensile testing is only required when the tensile test failure exceeds 1 for each 15 consecutive test samples. When the tensile test result is less than 125 percent of yield for 1 of each 15 consecutive test samples, the sampling procedure is to be started anew.

Examination of all tensile test data for cadwelds showed that the rate of tensile failures has been very low at the Vogtle project (approximately 0.3 percent). Examination of Deficiency Reports (DR's) showed that tensile test failures were being identified and addressed by the licensee. Review of one Deficiency Report, DR CD-2276 did show that the licensee was deficient in addressing four tensile test failures in a timely manner. This DR was written in July 1982 to address four tensile failures that had taken place in June and September of 1981. Further review of records did show that a stop work order was written in September 1981 because two of the tensile failures exceeded 1 for each 15 consecutive test samples. As a result of this stop work order, additional tensile testing was done.

Examination of the above listed items indicated that cadweld operations are being performed in an acceptable manner.

Within the areas examined no violations or deviations were identified.