



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA ST., N.W., SUITE 3100
ATLANTA, GEORGIA 30303

Report Nos: 50-438/83-03 and 50-439/83-03

Licensee: Tennessee Valley Authority
500A Chestnut Street
Chattanooga, TN 37401

Docket Nos: 50-438 and 50-439

License Nos: CPPR-122 and CPPR-123

Facility Name: Bellefonte 1 and 2

Inspection at Bellefonte site near Scottsboro, Alabama

Inspector: J. R. Harris 3/23/83
J. R. Harris Date Signed

Approved by: T. E. Conlon 3-25-83
T. E. Conlon, Section Chief Date Signed
Engineering Programs Branch
Division of Engineering and Operational Programs

SUMMARY

Inspection on February 7-18, 1983

Areas Inspected

This special, unannounced inspection involved seventy-two inspector-hours on site evaluating potential enforcement matters identified by the OIE Construction Appraisal Team in the areas of structural concrete and structural steel.

Results

Of the two areas inspected, two violations were identified in two areas (Failure to properly cure concrete repair patch, Paragraph 5.d; and failure to train electrical craft foremen in applicable procedure requirements for structural steel installations, Paragraph 5.f).

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REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *L. S. Cox, Project Manager
- *F. Gilbert, Construction Engineer
- *B. F. Painter, General Construction Superintendent
- *B. J. Thomas, Construction Quality Manager
- *J. T. Barnes, Quality Assurance Section Supervisor
- *J. Olyniec, Assistant Construction Engineer
- *W. R. Norris, Civil Engineering Unit Supervisor
- T. Brothers, Hanger/Civil Engineering Supervisor
- *D. Nixon, Civil Quality Control Supervisor
- *A. L. Richards, Electrical Quality Control Supervisor
- C. Hatmaker, Civil Engineer, ENDES
- A. Soderberg, Geologist, Geological Service Branch
- F. Best, Civil Engineer, SMEL
- R. Hale, Geologist, Geological Service Branch

Other licensee employees contacted included eight technicians and three office personnel.

NRC Resident Inspector

- *J. D. Wilcox

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on February 18, 1983, with those persons indicated in Paragraph 1 above. The licensee acknowledged the inspection findings. The following items were opened:

- a. Violation 438, 439/83-03-01, Failure to properly cure concrete repair patch
- b. Violation 438, 439/83-03-02, Failure to train electrical craft foremen in applicable procedure requirements for structural steel installation
- c. Inspector Followup Item 438, 439/83-03-03, Clarification of procedure QCP-2.15, Structural Steel Installation

3. Licensee Action on Previous Enforcement Matters

Not inspected.

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. The following unresolved items were identified by the OIE Construction Appraisal Inspection Team (CAT) as potential enforcement items. Evaluation and resolution of these items are as follows:

- a. Unresolved Item 438, 439/83-02-13 - Concrete Pour Adequacy. Three potential problems were identified in this area. Identification and resolution of the potential problems are as follows:

(1) Density of Concrete for Shield Walls (CAT Report Paragraph IVB3g(1))

Potential Problem: Section 12.3.2.2 of the FSAR states that the poured concrete shield walls throughout the plant are ordinary concrete with a minimum density of 144 lb/ft³. Site procedures do not incorporate adequate criteria to ensure that the minimum density for shield walls satisfies the 144 lb/ft³ specified in the FSAR.

Resolution: The dry density value specified in the FSAR is a nominal value used for calculating shielding requirements and where structural strength is the controlling criteria, the radiation shielding provided is in excess of shielding requirements. Discussion with responsible design engineers and examination of records showed that the density variations for the design mixes were minimal and would have no significant effect on the shielding calculations. Inprocess density testing of ordinary concrete is performed mainly for economic considerations. The results are used for production control and to determine the yield of batches.

Development of acceptance/reject criteria for concrete density testing has no safety significance. This item is closed.

(2) Conformance of Cement to ASTM C-150 Requirements (CAT Report Paragraph IV B3g(2))

Potential Problem: Contractor tests for chemical properties of cement are not being performed as prescribed in FSAR Section 3.8.1.6.1. No on site verification tests to ascertain conformance to ASTM C-150 were performed by the constructor.

Resolution: Section 3.8.1.6.1 of the FSAR states that cement conforms to ASTM C150-72. Section CC5221.1 of the referenced ACI-ASME 359 Code (1973) states that quality control testing shall be performed by the constructor to ascertain conformance with the applicable requirements of ASTM C150. ASTM C-150 requires the cement to conform to the chemical requirements listed in Table 1 and to the physical requirements listed in Table 2. Discussions with responsible engineers and examination of records showed that TVA has delegated responsibility for conformance testing to the supplier and that the supplier is performing tests to assure conformance with the chemical and physical requirements of ASTM C-150. TVA is also performing verification tests at their testing laboratories on the physical tests listed in Table 2 of ASTM C-150 and on selected chemical tests.

Delegation of testing responsibility to the contractor for compliance with ASTM C-150 requirements is permissible under Criterion I of 10 CFR Appendix B. Verification testing being done at TVA laboratories in Knoxville is considered an extension of the site. There is no requirement for the licensee to perform the testing at the site.

It is considered that the licensee's present system of testing meets the intent of the FSAR and ASTM C-150. This item is closed.

- (3) Qualification of Aggregates to ASTM C-33 Requirements (CAT Report Paragraph IV3g(3))

Potential Problems: Aggregates have not been properly qualified to the requirements for potential reactivity as required by ASTM C-33 and Section 3.8.1.6.1 of the FSAR.

Resolution: Section 3.8.1.6.1 of the FSAR states that aggregates conform to ASTM specification C-33-71, Standard Specification for Concrete Aggregates. Testing for potential alkali reactivity of carbonate rocks is one of 19 tests recommended by ASTM C-33. ASTM C-33 states that all the tests are not necessary and that the need for reactivity testing is based on the judgement of the geologist or materials engineer evaluating the aggregate. Section 3.8.1 of the FSAR states that aggregate testing may or may not comply with referenced requirements depending on past experience of TVA with the aggregate in question. Each source of aggregate supply is inspected by TVA geologists prior to construction and their recommendations on potential variations in the aggregate are considered in establishing the project testing frequency for wear, potential reactivity, and soundness.

Examination of the geological quarry report showed that the aggregate was considered to be nonreactive. This was based on the fact that geologic profiles, cores, and chemical analysis of representative materials showed that only 1.25 percent of the strata penetrated consisted of questionable argillaceous, dolomitic limestone and that the remaining 98.75 percent was limestone of unquestionable quality. It was considered that the minor amounts of argillaceous, dolomitic limestone would be diluted during quarrying and crushing operations and would not affect the quality of the concrete. Discussions with responsible TVA geologists disclosed that the quarry is located geologically in the Bangor formation and that concrete made with aggregates from this formation have not shown any evidence of alkali carbonate reactivity. Also examination of design mixes showed that the low alkali cement and fly ash being used in the mixes would offset any deleterious reaction that would result if the aggregates should be reactive. Experience has shown that limitation of the alkali content of the cement and use of pozzolanic materials is the most satisfactory method of controlling deleterious expansion that could result from reactive aggregates. Examination of concrete structures at the site showed no evidence of alkali carbonate reactivity.

It is considered that the licensee met the intent of the FSAR and ASTM C-33 even though they elected not to test the aggregates for alkali carbonate reactivity. However, to satisfy the concern expressed by the CAT inspector, the licensee is presently conducting reactivity tests on the aggregates. This item is closed.

- b. Unresolved Item 438,439/83-02-24, Containment Tendon Grease Leakage (CAT Report Paragraph VIII B.1.a))

Potential Problem: Observations showed that grease was leaking through valve stem fittings in the grease cans for the rock anchor tendons. Grease has been leaking around the valve stems and through the valve stems when caps have been removed without authorization. TVA has not established adequate corrective actions to prevent or monitor grease leakage.

Resolution: Examinations of records and discussions with responsible engineers disclosed that grease leakage has been an ongoing problem since greasing of tendons began. Leakage has been due to numerous causes and numerous Quality Control Investigation Reports (QCIRs) and several Nonconformance Reports (NCR) have been written to address the problems and emphasize the need for ongoing surveillance. The problems have also been documented and discussed in the Daily Diary for Reactor Building Prestressing System, INRYCO, Inc., Contract No. 75C53-85380. A repair for leakage around the valve stems is still being determined.

Present thinking is to use an epoxy material to seal the threaded portion of the valve stem. Leakage as a result of caps being left off was a recent problem that was first identified by QCIR 24899 on August 31, 1982, which was upgraded to NCR 2020 on October 11, 1982. This problem appears to have been a result of vandalism and the licensee has taken steps to limit access to the tendon gallery. No more incidences of caps being removed has occurred since the end of September 1982. The licensee is continuing to monitor the problems of tendon grease leakage and to evaluate and repair the problems as they occur. Present thinking is to include examination of vertical tendon voids for loss of grease during the inservice inspection program.

It is considered that the licensee's present system of monitoring, identifying, and correcting problems associated with grease leakage is adequate. This item is closed.

- c. Unresolved Item 438,439/83-02-25, Concrete Chipping Operations (CAT Report Paragraph VIII B.3.c))

Potential Problem: Reinforcing steel has been damaged, cut, or nicked during the concrete chipping/drilling operations. QC inspection procedures do not call for the identification of reinforcing steel damaged or cut during concrete chipping operations.

Resolution: Discussions with responsible engineers, examination of drawings, procedures, and records disclosed the following methods are being used to control cutting and damage of rebar. Rebar can be cut or damaged by core drilling for penetrations or chipping operations conducted for repairs or modifications. Drilling and chipping operations are controlled by procedure or notes on drawings. Notes on applicable drawings normally give instructions for cutting of rebar. If drawings do not give permission for cutting rebar, permission to cut rebar is obtained from TVA Design, and a Field Change Request (FCR) is issued to identify cut rebar. Before chipping or drilling of concrete can begin, a work release must be obtained in accordance with procedure BNP-QCP-10.6, Work Release. Any rebar cut during the drilling is documented on Attachment A to the procedure. Paragraph 5.4 of the procedure requires the Quality Control Records Unit to prepare a monthly report for TVA Design documenting each issuance of cutting rebar. After chipping operations, the area is examined and approved by a rebar inspector in accordance with procedure QCP-5.3.R.3 before the chipped concrete can be repaired. If any rebar is damaged, a Quality Control Investigation Report (QCIR) documenting the damaged area is issued in accordance with procedure BNP-QCP-10.26. The QCIR is sent to the Civil Engineering Unit for disposition. If the rebar requires repair, a Nonconformance Report (NCR) is issued in accordance with procedure QCP-10.4. The QCIR and NCR are sent to TVA Design for disposition. After evaluating the damage, TVA Design issues instructions to the site detailing methods of repair.

To expedite repairs resulting from increased chipping operations, TVA Design issued detailed instructions to the site for repairing damaged rebar. The instructions were issued in a memorandum dated November 15, 1982, from R. M. Hodges, Project Manager, Bellefonte Design to L. S. Cox, Project Manager, Bellefonte Design. These instructions permit the site to make repairs to damaged rebar without first obtaining permission from TVA Design. However, a copy of all QCIRs on reinforcing bar damage by chipping are still transmitted monthly to TVA Design.

Discussions with responsible engineers and examination of procedures, drawings, QCIRs, and NCRs pertaining to rebar damaged during drilling or chipping showed that the licensee has adequate controls for the identification of cut rebar and identification, evaluation, and repair of damaged rebar. This item is closed.

- d. Unresolved Item 438,439/83-02-26, Post-Placement Concrete Inspection (CAT Report Paragraph VIII B.3.d))

Potential Problem: An aluminum can was observed in a repaired concrete area and embedded reinforcing steel was exposed in a dry-pack mortar area. This was the result of TVA not having formal provisions for post-placement inspection of newly placed or repaired concrete areas to ensure adequate workmanship.

Resolution: Discussions with responsible engineers, examination of procedures and records, and inspection experience of this inspector at Bellefonte showed the following methods are being used to control post-placement inspections. Following placement and removal of forms the concrete surface is inspected for curing in accordance with QCP-5.4, R3, Concrete Curing and Repairing. Acceptance of curing is documented on Attachment B to QCP-5.4, R3. During inspection for curing, any observed defective areas are evaluated and repaired in accordance with Paragraphs 6.2, 6.3, 6.4, 6.5, 6.6, 7.0, and 7.2 of Procedure QCP-5.4, R3. Methods of repair are shown on Table II and documentation of repairs is recorded on Attachment D, Concrete Repair Inspection, of Procedure QCP-5.4, R3. If concrete removal is required, a work release is issued in accordance with BNP-QCP-10.6, Work Release. Chipping operations necessary for the repair are documented on Attachment A to QCP-10.6. Replacement concrete or mortar and location of the repair is documented on Attachment A of Procedure QCP-5.3, R3. In addition to the above, the Civil QC Section B supervisor has been maintaining a log since April 1982 showing a recheck of completed structures and documented location of incomplete repairs. The recheck is incomplete and will be tracked and finished through a computerized printout and checkoff.

Discussions with responsible engineers and QC inspectors indicated that the aluminum can had been cut and flattened to cover a hole in the form of an area being repaired to prevent concrete from leaking through the forms. When the forms were removed the can stuck to the surface of the concrete. The adherence of the can to the surface of the concrete is considered to be cosmetic and to have no safety significance.

Examination of the exposed rebar in the dry pack area disclosed the following violation. Procedure QCP-5.4, R3, Concrete Curing and Repairing, requires that concrete be wet cured or sprayed with a membrane curing compound and acceptance of curing be documented. Contrary to this requirement, no documentation was available to verify that the dry pack area located in the Auxiliary Building at elevation 622 on the backside of the wall in a pipe chase area between column lines A6, A7, T, and U had been cured. This was identified to the licensee as Violation 438,439/83-03-01, Failure to properly cure concrete repair patch.

Discussions with responsible engineers and examination of procedures and records showed that the licensee has adequate controls for inspecting and repairing completed concrete placements. The exposed rebar in a concrete patch was a result of failure to follow existing procedures and controls. Had the curing been checked by the QC inspector as required by QCP 5.4, R3, the improper patch would have been identified and repaired in accordance with the applicable sections of QCP 5.4, R3. As a result of the concerns expressed by the construction appraisal team inspector, the licensee is in the process of revising attachments to procedure OCP-5.4, Concrete Curing and Repairing, to clarify inspection requirements. These clarifications will enhance the existing program. Unresolved item 438, 439/83-02-26 is closed.

- e. Unresolved Item 438,439/83-02-27, Batch Plant Operation (CAT Report Paragraph VIII B.4.c)

Potential Problem: The QC inspector was observed to be operating batch plant controls. The QC inspector's seated location and familiarity with controls indicated this was a routine practice. This is contrary to 10 CFR 50, Appendix B, Criterion X which requires inspections be performed by individuals other than those who perform the activity being inspected.

Resolution: Discussions with responsible QC inspectors and observations by this inspector disclosed the following operation mode for the batch plant. The batch plant console containing the operating controls extends nearly the whole width of the control room. The scales showing the weights of the cement, water, aggregates, fly ash, and admixtures face the console and are located at one end of the console. The QC inspector sits at the end of the console opposite the scales and the

batch plant operator sits at the other end of the console where the main controls are located. Weights of the ingredients for design mixes are preset into the system. The current mix being used is controlled by a selector dial with numbers. Each number on the selected dial represents a specific mix. Cards for each mix design with specified weights are located opposite the console and adjacent to the scales so they are visible to the QC inspector and batch plant operator. The batch plant operator presses the automatic control button in front of him and the batch plant automatically weighs out the ingredients for the design mix shown by the selector dial. By design and for control purposes, the weights usually are slightly under the specified weight. The QC inspector checks the weights shown on the scale against the weights specified on the cards. There are jogging switches located near the QC inspectors end of the console and he frequently jogs these switches when necessary to ensure the proper weights are in the design mix. This has been observed by several Region II inspectors in the past and the resident inspector and has never been construed as operating the batch plant or as inspecting ones own work. It was considered as part of the QC inspectors function to ensure that quality mixes are being batched. To avoid future concerns, the licensee has informed QC inspectors not to touch jogging switches.

Based on the above observations and past inspections of Bellefonte batch plant operations, it is considered that there is no safety significance to the concern that the QC inspector was operating the batch plant. This item is closed.

- f. Unresolved Item 438,439/83-02-28, Structural Steel Dimension Tolerance (CAT Report Paragraph VIII B.5.b.(1)(2) and c)

Potential Problem: Procedure QCP-2.15, R0, Structural Steel Installation does not adequately define the dimensional tolerances to be met nor ensure as part of the final inspection that the fabrication inspection has been performed. Examples are:

- (1) The electrical craft foremen did not know the torque values for bolting of a structural steel support
- (2) Dimensional tolerance for a cable tray support were in a Standard Operating Procedure (SOP), which may be considered a non-quality related document.
- (3) Paragraph 6.2.5.3 of QCP-2.15, R0, allows the QC inspector to verify that the correct structural steel item has been installed on the basis of markings or physical dimensions. Using this provision there would be no provision to ensure that welds have been accepted.

Resolution: Resolution of these concerns is as follows:

- (1) Procedure QCP 2.15, R0, requires the Civil Engineering Unit to determine the torque values from the tension values listed in Table I of Appendix A and to record these values on Attachment B. Records of these values are available from either the vault or the Civil Engineering Unit. Craft foremen are required by QCP 10.3, R2, Craft Training, to be knowledgeable in quality control procedures related to their area of responsibility. Those working in structural steel installation are directed by QCP 2.15, R0 to the Civil Engineering Unit for torque values. Examination of training records disclosed that the electricians craft foremen were not trained in QCP 2.15. This was identified to the licensee as Violation 438, 439/83-03-02, Failure to train electrical craft foremen in applicable requirements of QCP 2.15, R0, Structural Steel Installations.
- (2) Addendum No. 1 to QCP 2.15, R0, states that structural steel members shall be located to a tolerance of plus or minus one inch in plan and elevation of the same tolerance as the feature which the steel supports. Thus the tolerance can vary depending on whether the steel member is supporting an electrical feature or a mechanical feature. The QC inspector determines whether the feature is a mechanical item or an electrical item and then contacts the appropriate engineering unit for the allowable tolerance. Allowable tolerance of the structural member supporting the cable tray in question was given by an electrical engineering unit inspector based on information in procedure EEU-SOP-210, R0. Questions regarding whether or not standard operating procedures (SOP) are quality control documents was identified in a TVA Nuclear Safety Review Staff audit conducted in June and July of 1982. As a result of this audit, requirements in SOPs are being incorporated in QCP procedures or drawings. Drawing 4GA0059-X2-21, Tolerances for Cable Tray supports has been revised to include fabrication tolerances for cable tray supports.
- (3) Examination of requirements for verification that the correct structural steel item has been installed disclosed that an error was made in writing paragraph 6.2.5.3 of procedure QCP 2.15, R0. Procedure QCP-2.15, R0, lists several methods for verifying that the correct structural steel item has been installed. Paragraph 6.2.5.3 as written states verification can be based on "markings or physical dimensions". Discussions with responsible engineers and examination of procedures disclosed that paragraph 6.2.5.3 was originally written in procedure QCP 2.2 R11 as verification can be based on "markings or physical dimensions for contract items". This verification method was allowed only on contract items because welds on contract items are inspected by the contractor's

QA program which is audited by TVA. When structural steel installation was separated from, QCP 2.2 R11 and written as QCP 2.15 R0, an error was made by omitting the words "for contract items" from paragraph 6.2.5.3. Discussions with responsible QC inspectors disclosed that the method specified in Paragraph 6.2.5.3 was only being used for contract items and these items are readily identified by distinctive paint markings. The licensee indicated that procedure QCP 2.15, R0 will be revised to clarify wording in Paragraph 6.2.5.3. Clarification on verification methods for ensuring that the correct structural steel member is installed was identified to the licensee as Inspector Followup Item 438,439/83-03-03.

The concern regarding lack of knowledge of torque values by craft will be followed up in the licensee's response to Violation 438,439/83-03-02, Failure to train electrical craft foremen in requirements of QCP 2.15. The concern regarding dimensional tolerances being in nonquality documents was identified by TVA prior to the CAT team inspection and is being corrected by procedure revisions. The concern regarding verification methods in QCP 2.15, R0, that ensure the correct structural member is installed will be pursued by Inspector Followup Item 438,439/83-03-03.

Unresolved item 438, 439/83-02-28 is closed.