

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
REGION IV

Report No. 99900724/80-01

Program No. 51400

Company: Industrial Engineering Works
Ward Ave. Ext., P. O. Box 8008
Trenton, New Jersey 08650

Inspection Conducted: October 20-21, 1980

Inspector:

Wm. D. Kelley
Wm. D. Kelley, Contractor Inspector
Components Section I
Vendor Inspection Branch

12/16/80
Date

Approved by:

Wm. D. Kelley
for D. E. Whitesell, Chief
Components Section I
Vendor Inspection Branch

12/16/80
Date

Summary

Inspection on October 20-21, 1980 (99900724/80-01)

Areas Inspected: Implementation of 10 CFR 50, Appendix B, and applicable codes and standards including, quality assurance program review. Also, conducted an initial management meeting, reviewed documentation pertaining to (1) Tennessee Valley Authority report of certain construction deficiencies, identified at their Hartsville Nuclear Plant, and (2) Louisiana Power and Light Company reported construction deficiencies identified at their Waterford SES, Unit No. 3, and reported in conformance with 10 CFR Part 50.55(e), and conducted an exit interview. The inspection involved twelve (12) inspector-hours on site by one (1) NRC inspector.

Results:

Deviation: Reported Construction Deficiency - Waterford Unit 3 (Details paragraph E.4.c.) Failure to ultrasonic examine "T" weld one hundred (100) percent in two directions. Corrective action completed, deviation closed. (Details paragraph E.5)

No unresolved items were identified.

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DETAILSA. Persons ContactedIndustrial Engineering Works (IEW)

- *F. C. Berghuis - Vice President
- *H. K. Merritt - QA/C Manager
- T. Mawhinney - Vice President
- *H. Penxa - QA Inspector
- C. Worthington, Jr. - QC Inspector

*Denotes those persons who attended the Exit Interview. (See Paragraph H)

B. Initial Management Meeting1. Objectives

The objectives of this meeting were to accomplish the following:

- a. To meet with the Industrial Engineering Works (IEW) management and those persons responsible for the administration of the customer accepted Quality Assurance program, and to establish channels of communication.
- b. To determine the extent of the company's involvement in the commercial nuclear business.
- c. To explain NRC direct inspection program including the VIB organization, inspection methods, and documentation.

2. Method of Accomplishment

The preceding objectives were accomplished by a meeting on October 20, 1980. The following is a summary of the meeting:

- a. Attendees were:
 - F. C. Berghuis - Vice President
 - H. K. Merritt - Quality Assurance/Control Manager
 - H. Penxa - Quality Assurance Inspector
- b. The VIB organization was described and its relationship to NRC Region IV and the NRC Headquarters organizations of the Office of Inspection and Enforcement.

- c. The VIB function was described including the reasons for its establishment, its objectives, its implementation structure, and the more significant program changes.
- d. The conduct of VIB inspections was described and how the inspections results are documented and reported, and what the responses to reports, should include. How proprietary information is handled, the Public Document Room, and the White Book were also explained.
- e. The company's contribution to the nuclear industry was discussed including current and projected activities, the status of the ASME certification of authorization, and the third party inspection services.

3. Results

Management acknowledged the NRC presentation, and provided the inspector with the following information concerning the company's activities and products.

- a. The IEW does not hold ASME Certificates of Authorization.
- b. IEW is basically a job shop that fabricates structural components, such as reactor vessel shield walls, reactor coolant pump supports, reactor coolant system pipe stops, pipe whip restraints, pressurizer supports, safety injection tank supports and other steel structures, in accordance with customer supplied design drawings and specifications.
- c. Inspection for conformance to contract requirements and contract specified code requirements, is performed by the customer's representative.

C. QA Program Review

1. Objectives

The objectives of this inspection were to ascertain whether the QA program has been documented in writing, approved by the nuclear customer(s), and if properly implemented, will ensure that the quality of completed components has been achieved, in compliance with NRC rules and regulations, code and contract requirements and the commitments in the Quality Assurance Manual. Also, ascertain whether the program provides for the following:

- a. Management's policy statements concerning QA.
- b. Delineates how the QA organization is structured, to achieve appropriate independence from scheduling and costs, freedom and

independence to identify quality problems, initiate appropriate resolutions, and to verify corrective action.

- c. Whether the duties and authority of the QA staff is clearly delineated in writing, and that they have access to a level of management that can ensure effective implementation of the QA program elements, and to enforce positive and timely corrective action, of any adverse findings.
- d. Detailed written procedures are properly reviewed, approved, released, and issued to control quality activities, as appropriate.
- e. A training and indoctrination program to improve or maintain the proficiency of personnel performing quality activities, and personnel verifying that quality activities have been correctly performed.

2. Method of Accomplishment

The preceding objectives were accomplished by:

- a. Review of the customer accepted Quality Assurance Manual.
- b. Review of appropriate organization charts.
- c. Review of the documents concerning the authority duties, independence and freedom of the Quality Assurance staff.
- d. Review of Statement of Authority.
- e. Review of documents to verify that they had been reviewed and approved by authorized personnel.
- f. Review of the training and indoctrination program requirements and documentation.
- g. Interviews with cognizant personnel.
- h. Observation of work and test in progress.

3. Findings

- a. The evidence demonstrates that the QA program has been documented in writing and clearly defines the duties, authority, and organizational independence and freedom of the QA staff. Detailed written implementing documents are appropriately reviewed, approved, released, and issued by authorized personnel. The QA staff has access to a level of management to ensure effective implementation of the program and timely and positive corrective action of enforcement items. A viable training and indoctrination program has been provided for upgrading, and maintaining, the proficiencies of personnel involved in quality activities.

- b. Within this area of the inspection, no deviations, or unresolved items were identified.

D. Tennessee Valley Authority Reported Deficiency of Welding on Reactor Vessel Shield Wall.

1. Background

The Tennessee Valley Authority (TVA) notified the Nuclear Regulatory Commission (NRC) IE RII by telephone on February 15, 1980 and August 29, 1980 of potential rejectable voids and slag inclusions, in the shop welds at the joints between the reactor pressure vessel shield wall vertical stiffeners and the shield plates had been identified at the Hartsville A-1 Nuclear Plant, Units 1 and 2. The architect - engineering design of the reactor pressure vessel shield wall was performed by the General Electric Company, San Jose, California, (GE-SJ), the specifications for the shield wall were written by C. F. Braun & Company (CFB) Alhambra, California, and was purchased by TVA, Purchasing, Chattanooga, Tennessee.

2. Objectives

The objectives of this area of the inspection were to ascertain whether IEW had determined the cause of the problem; and whether the potential deficiencies had been processed, evaluated, and reported in a manner consistent with NRC regulations.

3. Method of Accomplishment

The objectives of this area of the inspection were accomplished.

- a. Review of IEW Quality Assurance/Control Manual, Second Edition, Revision 3, and verify that the Policy Statement committed IEW to meet the requirements of 10 CFR Part 50 Appendix B and ANSI N45.2.
- b. Review of TVA's letter of August 14, 1979 to IEW which stated the manual had been found acceptable for use on their contract 7GK72-820117-N6S-4.
- c. Review of TVA's Contract 7GK72-820117 dated March 25, 1976 for reactor pressure vessel shield wall structural steel for plants X-17 through X-22 (Hartsville Nuclear Plant and Phipps Bend Nuclear Plant) and ascertained that:
 - (1) IEW was required to meet the requirements of 10 CFR Part 50 Appendix B.

- (2) The Chief Materials Engineer would represent TVA in the inspection of shop work, and witnessing shop tests.
 - (3) IEW Purchased Orders obligates material suppliers to have quality assurance program consistent with 10 CFR 50 Appendix B.
 - (4) "All welding shall be performed in accordance with the AWS D1.1 "Structural Welding Code."
 - (5) IEW is required to submit its Qualified Welding Specifications to TVA for review and approval.
 - (6) IEW is required to perform magnetic particle examinations of all welded joints in accordance with a TVA approved procedure, that meets the requirements of ASTM specification E-109.
 - (7) 10 CFR 21 was not invoked by this nuclear customer.
- d. Review of the following CFB approved IEW welding procedure specifications (WPS);
- (1) IEW 227 dated 12-19-77,
 - (2) IEW 229 dated 12-19-77,
 - (3) IEW 221, dated 10-10-77, and
 - (4) IEW 226, dated 12-19-77.
- to verify that they had been qualified and approved in accordance with the requirements of the code specified in the purchase documents.
- e. Review of the following CFB approved nondestructive testing procedures.
- (1) IEW UT-120, Revision 2, "Ultrasonic Procedure,"
 - (2) IEW MT-141, Revision 2, "Magnetic Particle Inspection Procedure," and
 - (3) IEW VE-150, Revision 0, "Visual Weld Examination Procedure;"
- to verify that they had been demonstrated and approved in accordance with the requirements of the code specified purchase documents.

f. Review of the following IEW drawing approved by CFB.

- (1) Drawing T-1, Revision 2,
- (2) Drawing 2550Q-E4 (X-17, X-18), Revision 7, "Zero Degree Structure,"
- (3) Drawing 2550Q-E4A (X-17, X-18), Revision 4, "Layout for 0° Structure - RPV Shield Wall,"
- (4) Drawing 2550Q-E4 (X-17, X-18), Revision 7;

to ascertain whether the customer's fabrication and quality requirements accurately translated the requirements of the specified code. (AWS D.1 1-72.)

g. Review of shop travelers

- (1) SW-5, and
- (2) SW-7

to verify that the customer's mandatory hold point had been established, the customer had performed the inspection, and IEW had not by-passed their inspector's or customer's specified holdpoints. Also, to verify that approved procedures had been used to perform the welding and the NDE.

h. Review of IEW Nonconforming Material Reports

- (1) DIR-274, dated September 9, 1980, and
- (2) DIR-268, dated June 5, 1980.

to verify that they had been reported, evaluated, and dispositioned in accordance with the requirements of the customer approved Quality Assurance Manual.

4. Findings

From the documents reviewed and information obtained, the following determination was made.

- a. The manufacturing, inspections, and examinations records reviewed did not indicate any irregularities or departure from IEW's QA program and/or contract commitments.

- b. The quality of the welds were questioned by the licensee after the licensee removed a portion of the weld backing bars, to achieve specified alignment mismatch during erection at the site.
- c. IEW contracted with two outside independent consultants to evaluate the quality of the welds on the portions of the shield wall remaining in IEW's shops. Reports of the consultant evaluation and determination were not reviewed at the time of the inspection.

E. Reported Construction Deficiencies - Waterford Unit 3

1. Background

On December 5, 1979, Louisiana Power and Light Company (LPL) phoned the NRC, Region II office, to report a procedural and performance deficiency in the ultrasonic examination of the weldments of components for Waterford SES Unit 3. This early report was followed by a written "Interim Report of Significant Deficiency No. 15", dated January 2, 1980. The procedural deficiencies related to the coverage of the UT examination performed by Industrial Engineering Works (IEW) of the weldments in the pipe supports and component supports manufactured by IEW for LPL's Waterford 3.

The deficient implementation of the UT procedure was identified by Ebasco Services Inc. (ES), Level III during his visit to the IEW shop on November 26, 1979. ES's level III Examiner informed IEW that a UT examination using a 45 degree shear wave to examine a "T" weld, and 1½ inch material, would not provide complete coverage in 2 directions as required by the purchase documents.

2. Objectives

The objectives of this area of the inspection were to ascertain why the UT examinations did not comply with the procurement documents, and whether appropriate corrective action was implemented and whether the safety significance of the incomplete examination coverage had been evaluated.

3. Method of Accomplishment

The forgoing objectives were accomplished as follows:

- a. Review of ES's purchase order (PO) no. NY403573 and supplements to ascertain the governing code and quality requirements imposed by the customer.
- b. Review of ES letter to IEW, dated December 22, 1978, approving IEW's QA/QC Manual as satisfactory for ES QA requirements.

- c. Review of ES design drawings, LOU-5817 G696501, for Reactor Coolant Pipe Supports. An apparent inconsistency was observed in the codes specified by the customer's drawings and the one specified by his P.O. The drawings stipulated that the welding was to comply with Section IX, of the ASME codes, and the impact and heat treat to be in accordance with Article NF 4300 of Section III of the ASME Codes. The PO specified AWS D1.1.-72 as being the governing code.
- d. Review of IEW's procedures as follows:
- (1) UT 122, Revision 0, dated October 21, 1977. The scope of the procedure stated that it was in accordance with ASME Section V, Article V, Paragraph T530; with acceptance criteria of ASME Section III, subsection NF, Paragraph NF 5330. It was noted that the procedure had been reviewed by the Customer's authorized representative who had checked the box in the customer's stamp as being "reviewed without comment" and signed and dated November 10, 1977.
 - (2) UT 124, Revision 1, dated December 8, 1979, it was observed that this procedure also stated that the technique complied with paragraph T530, Section V of the ASME code, with the acceptance standard per NF 5330 of Section III. It was also noted that this procedure included the provision that where the geometry or laminations does not allow angle beam examinations from both sides of the weld from a single surface, or a combination of surfaces; a combination of angle beam and straight beam, or straight beam in two (2) directions at 90° to each other, are to be used.
 - (3) VE-152 Revision 0, a procedure for visual examinations of welds.
- e. Review of LPL's final report concerning a construction deficiency reported to the NRC in compliance with 10 CFR 50.55(e), on or about June 27, 1980. The report stated that the procedure used by IEW was to ASME Code Section III, Subsection NF requirements in lieu of ES specification requirements AWS D.1.1 and as performed by IEW did not provide detection and evaluation of fusion line indications. The conclusion of this report states, that the original problem definition should have been limited to proper implementation of procedures to assure 100% volumetric examination of all required welds were accomplished.
- f. Discussions with cognizant personnel.

4. Findings

From the documents reviewed and information obtained from the cognizant personnel, the following determination were made.

- a. IEW performed its UT examinations in accordance with its procedure UT122, Revision 0. They used a 45° angle search from two faces, which due to the "T" weld geometry and thickness of one material, resulted in approximately eighty (80) percent coverage of the welds. Had they used a 70° angle they would have met the requirements of AWS D.1.1. for "T" welds in 1½ inch material. It was noted that paragraph 5.B. of Procedure UT 122, provided for a range of beam angle from 40° to 75° with respect to the perpendicular to the entry surface, and it appears that the UT technician did not evaluate the beam angle required to achieve 100% coverage of the "T" welds in two (2) directions.
- b. In ES evaluation of the safety significance of the problem the following is identified.
 - (1) A total of 1,214 weld joints were required for the fabrication of the supports of the reactor coolant pump and the reactor coolant pipe stops. ES determined from its analysis and safety evaluation that 1,066 welds could have been designated as partial penetration, welds not requiring ultrasonic examination, leaving 148 welds required to be full penetration welds.
 - (2) All 166 of the welds in the pressurizer supports have been evaluated and reclassified by ES as partial penetration welds.
 - (3) All IEW welds requiring full penetration to satisfy stress levels, were re-examined at the Waterford III site and found acceptable by an independent testing laboratory.
- c. IEW's failure to correctly implement its procedure in a manner which would have insured complete coverage of its full penetration T welds is considered a deviation. (See Notice of Deviation)

5. Corrective Action of Ultrasonic Examination

The inspector verified that IEW had completed the re-examination of all full penetration welds, in a manner which assured 100 percent volumetric coverage of the weld and heat affected zone. The re-examination at both the shop and at the site had been performed by an independent laboratory, and monitored by the customer. All welds were determined to be acceptable.

6. Corrective Action to Prevent Recurrence

Ultrasonic examinations for future nuclear contracts when required will be performed by a qualified testing laboratory.

H. Exit Interview

At the conclusion of the inspection on October 21, 1980, the inspector met with the company's management, identified in paragraph A, for the purpose of informing them as to the results of the inspection. During this meeting management was informed no deviations or unresolved items were identified.

The company's management acknowledged the inspector's statement and had no additional comments.

However, subsequent to the inspection, a review of IEW's ultrasonic examination procedure U.T. 122, Revision 0, revealed that the ultrasonic technicians had failed to use proper shear wave angle. This item was discussed with the QA/QC Manager by phone on November 13, 1980 and he was informed that the use of a technique which resulted in the "T" welds not being examined one hundred (100) percent in two (2) directions constituted a deviation and would be so reported.

The company's QA/QC acknowledged the inspector's statement and had no additional comments.