

U. S. ATOMIC ENERGY COMMISSION
DIRECTORATE OF REGULATORY OPERATIONS

REGION III

REPORT OF CONSTRUCTION INSPECTION

RO Inspection Report No. 050-346/72-06

Licensee: Toledo Edison Company
Edison Plaza
300 Madison
Toledo, Ohio 43652

Davis-Besse Nuclear Power Station
Oak Harbor, Ohio

License No. CPPR-80
Category: A

Type of Licensee: PWR (B&W) - 872 Mwe

Type of Inspection: Routine

Dates of Inspection: November 29 and 30, 1972

Follow-up Inspection: December 12 and 13, 1972

Dates of Previous Inspection: September 12 - 14, 1972

Principal Inspector: *C. M. Erb*
C. M. Erb

1-10-73
(Date)

Accompanying Inspectors: *D. W. Hayes*
D. W. Hayes
November 29 - 30, 1972

1-10-73
(Date)

R. A. Rohrbacher
R. A. Rohrbacher
November 29 - 30, 1972

1-10-73
(Date)

Other Accompanying Personnel: *C. Young*
C. Young
December 12 - 13, 1972

1-10-73
(Date)

Reviewed By: *D. W. Hayes*
D. W. Hayes, Senior Project Inspector (Acting)
Reactor Construction Branch

1-10-73
(Date)

8001270080

SUMMARY OF FINDINGS

Enforcement Action

A. Violations of AEC Requirements

1. Contrary to 10 CFR Part 50, Appendix B, and the Toledo Edison Company QA Manual, Class I piping, tack welded by unqualified personnel, was not identified nor segregated to prevent its inadvertent use or installation. Moreover, a nonconformance report covering this material had not been issued. (Paragraph 2)
2. Contrary to 10 CFR Part 50.55(e) prompt notification was not given nor was a written report issued, although a significant number of spools of shop fabricated Class I piping were found to have been tack welded by unqualified personnel in nonconformance with the applicable fabrication code. (Paragraph 2)

B. Safety Matters

No safety matters were identified.

Licensee Action on Previously Identified Enforcement Action

No previously identified enforcement matters were involved.

Design Changes

The instrumentation guide tubes and certain other related areas in the reactor pressure vessel had been redesigned and reworked at the Babcock and Wilcox (B&W) fabricating plant before shipment to the site. The licensee stated that the FSAR will include any required information.

Unusual Occurrences

No unusual occurrences were identified.

Other Significant Findings

A. Current Findings

1. Status of Construction

The reactor pressure vessel arrived at the site by barge on December 7, 1972. The head was shipped by rail and was received

on November 29, 1972. Installation of the reactor pressure vessel and steam generator supports, and related concrete work, has been delayed due to some of the work being withdrawn from P-X Engineering Company and contracted to other fabricators. As of November 1, 1972, the engineering effort was estimated to be 87% complete and plant construction 33% complete.

2. Personnel

H. A. Ablondi has been appointed supervisor of Bechtel Quality Assurance. He has replaced Mr. A. S. Martin in this position.

B. Unresolved Matters

Reactor Pressure Vessel and Steam Generator Restraints

During the inspection of November 29 - 30, 1972, the inspector observed that ultrasonic tests are specified for some of the subject restraints but not for others. During the follow-up inspection, Mr. M. Stutsfield of the Bechtel Washington, D.C. office was available and was questioned in regard to this matter. He stated that the ultrasonic tests will be performed at the construction site, instead of at the fabricator's plant. This matter is considered closed.

C. Status of Previously Reported Unresolved Matters

1. Storage of Class I Piping

The piping storage area was inspected and coverings, which were a hindrance to inspection and air circulation, have been removed. This matter is considered closed.

2. Primary Coolant Recirculation Piping Subassemblies

A manufacturer's data report for the above piping assemblies has not been received from the NSS supplier. This matter will remain open until the data report is received at the site.

3. Repaired Primary Pump Volute

A primary pump volute, which was damaged when it fell from the transporting truck while enroute from Byron-Jackson (B-J) to the site, has been repaired and returned to the site. The receiving documentation for this pump was examined, on December 13, 1972, and found to be in order. This matter is closed.

4. Tagging and Desiccant Indicators on Components from the NSS Contractor (B&W)

- (a) The tags on certain Class I components, stored outdoors, are not waterproof and legibility of information has been adversely affected by sun and moisture.
- (b) The indicator used to indicate the moisture content within sealed components has acquired a nondescriptive color. This makes it difficult to determine the condition of the atmosphere within the component and, thus, when the desiccant should be renewed. This matter remains open pending satisfactory resolution.

5. Valve Wall Thickness Measurements

The Toledo Edison Company (TECO) informed AEC Region III that Class I valves, installed within the reactor coolant pressure boundary which are over one inch in nominal size, will be verified as having met minimum wall thickness requirements. TECO and B&W purchase specifications are being revised to include a requirement for documentation that valves, in the above category being delivered to the Davis-Besse site, meet minimum wall thickness requirements of the specified codes and standards. The inspector will examine valve records on a continuing basis to assure that these requirements are met. (Paragraph 1)

Management Interview (November 29 - 30, 1972, Inspection)

- A. The following persons attended the management interview at conclusion of the inspection.

Toledo Edison Company (TECO)

L. A. Haigh, Mechanical Engineer - TECO, Main Office
C. M. Gardam, Station Electrical Engineer
G. W. Eichenauer, Field Quality Assurance Engineer
R. E. Blanchtong, Supervisor - Maintenance and Construction
K. M. Cantrell, Quality Assurance Engineer - Electrical
M. D. Calcamuggio, Power Plant Electrical Engineer
W. G. Moring, Field Quality Assurance Engineer

Bechtel Corporation (Bechtel)

L. F. Sirianni, Quality Assurance Coordinator - Washington Office
H. A. Ablondi, Supervisor - Quality Assurance

R. L. Lykens, Quality Control Engineer
D. L. Reddick, Project Field Engineer
R. J. McLaughlin, Quality Assurance - Electrical
A. Carr, Project Coordinator
D. C. La Valla, Quality Assurance Engineer

B. Matters discussed and comments on the part of management personnel were as follows.

1. The NSS supplier, B&W, is responsible for the manufacture and installation of primary recirculation piping subassemblies. The inspector commented that these items are in "hold" status because of the lack of a data report and should not be installed until the required documentation is received onsite. The licensee stated that he understood this requirement.
2. The inspector stated that the application of UT tests did not appear to be consistent for reactor vessel, steam generator, and primary pump structural supports. The licensee stated that the applicable Bechtel specification (No. C-508A) would be reviewed to determine the need for corrective action.
3. The inspector stated that he had examined several tags fixed to components supplied by the NSS supplier (B&W) and found that water had penetrated the tag covers, adversely affecting the legibility of tag information. The inspector also commented that indicators provided for sealed components containing desiccant had faded, apparently from exposure to the sun, such that meaningful information cannot be provided. The licensee stated that they would initiate the necessary corrective action. The inspector added that he would review the results.
4. The inspector stated that the overall commitments to single failure criterion, and provisions for electrical and physical separation of redundant system cables, appeared to be satisfactory. However, the inspector pointed out that details for implementing these commitments, normally found in specifications and design data, were apparently lacking in the following areas:
 - a. Minimum requirements for separation and protection of redundant system cables in potential fire and missile areas.
 - b. Provisions to avoid vertical stacking of redundant trays.
 - c. Provisions to prevent location of power cables (above 150 volts) in cable spreading, relay, and control rooms.

- d. Provisions to prevent routing nonvital cables with vital cables associated with more than one redundant system.

The licensee stated that they would review this matter and emphasized all Davis-Besse PSAR commitments would be met. The inspector stated that he did not consider this an unresolved item but that his purpose in discussing it at this time was to prevent possible future misunderstanding.

Management Interview (December 12 - 13, 1972, Followup Inspection)

A. Personnel in Attendance

Toledo Edison Company (TECO)

G. J. Sampson, Vice President - Power
L. E. Roe, Project Engineer
E. C. Novak, Assistant Project Engineer
J. D. Lenardson, Quality Assurance Engineer

B. Items Discussed

The inspector stated that he had reviewed records and talked to personnel at the Davis-Besse construction site concerning Class I (Q listed) piping spools fabricated by Grinnell Corporation (Grinnell) using unqualified personnel to perform tack welds in violation of the ASME Code. He stated further that he had inspected Grinnell piping in storage at the site and observed that some of the subject piping was being installed in the plant. The inspector commented that, contrary to the requirements of 10 CFR Part 50, Appendix B, and the TECO OA Manual, the subject piping had not been segregated or identified, although it was known that all or part of the piping was in nonconformance with specifications. In addition, a nonconformance report had not been issued.

The inspector added that, although TECO had notified RO:III of this problem on October 6, 1972, a written report had not been submitted as required by 10 CFR Part 50.55(e).

The inspector stated that these matters would be brought to the attention of corporate management by enclosure to the letter summarizing the results of the inspection.

REPORT DETAILS

Persons Contacted

The following persons, in addition to individuals listed under the Management Interview Section of this report, were contacted during the inspection.

Babcock and Wilcox Company (B&W)

R. Klingler, Site Project Manager
D. Kinsala, Site Quality Assurance Supervisor

Grinnell Corporation (Grinnell)

J. J. Rafferty, Project Manager
D. R. Giguere, Quality Control Manager
T. E. Martin, Welding Supervisor

Fischback and Moore, Incorporated (F&M) and Colgan Electric Company

M. (NMI) Macleod, Project Manager
J. D. Binford, Quality Control Manager
R. D. Wile, Assistant Project Manager - Construction

Results of Inspection

1. Valve Wall Thickness Measurements

- TECO has audited several valve vendors with regard to valve wall thickness measuring techniques. The Powell Valve Company (Powell) normally checks wall thickness by mechanical measurement but, if this is not practicable, then by ultrasonics. Audits were also made of Velan, Rockwell, and Crosby who, according to the licensee, implement procedures similar to those used by Powell.

2. Class I Piping with Welds Containing Tacks Made by Unqualified Personnel

Class I (Q listed) piping is being fabricated for the Davis-Besse facility by Grinnell at their Kernersville, North Carolina, plant. Portions of the piping was found, by the Bechtel shop inspector, to have been tack welded (during fitup) by unqualified personnel contrary to the requirements of ASME Boiler and Pressure Code, Section III, Nuclear Power Plant Components.

Information in regard to this matter is listed below:

- a. TECO personnel were informed of the matter by copy of a letter dated September 8, 1972, from Bechtel to the Grinnell Kernersville plant manager.
- b. A TECO QA engineer made a trip to the Grinnell plant on September 18 - 19, 1972, to investigate the matter and to participate in a Bechtel audit of the plant.
- c. TECO personnel were notified by a Bechtel letter dated September 20, 1972, that some of the piping, tack welded by unqualified personnel at Grinnell, had been shipped to the Davis-Besse site.
- d. TECO notified RO:III of the problem by telephone on October 6, 1972 (RO Inquiry Report No. 50-346/72-03Q).
- e. Only ASME Class II and Class III piping is involved. No ASME Class I is involved.
- f. About 433 "spools" of Q-listed, ASME Class II and Class III piping has been received at the Davis-Besse site from Grinnell. Some of the spools (exact number apparently unknown) were tack welded by unqualified personnel.
- g. The documentation at the Davis-Besse site, relative to the 433 spools of piping, indicate that all the piping meets the requirements of the ASME Code. The records do not contain information concerning the tack welding.
- h. The Grinnell piping, although known to have welds containing "tacks" made by unqualified personnel, was not segregated or otherwise identified as nonconforming.
- i. A letter from TECO to Bechtel dated October 6, 1972, established TECO's criteria for acceptance of the piping tack welded by unqualified personnel. The acceptance criteria included:
 - (1) Retroactive qualification of the personnel involved.
 - (2) Reexamination of radiograph film for ASME Class II pipe welds for defects arising from tacks. (Code requires 100% radiography of Class II piping welds.)

- (3) For the ASME Class III pipe, four welds minimum from two spools to be 100% radiographed for each unqualified welder. If the welder is no longer employed, then 100% of his welds to be radiographed. (The code does not require Class III pipe welds to be radiographed.)
- (4) The Grinnell QA program to be revised to prevent recurrence of the nonconformance.

During the inspection, it could not be clearly established that the piping onsite met TECO's acceptance criteria or if the NDT stamp was valid.

- j. TECO QA personnel verbally requested Bechtel not to install Grinnell shop fabricated ASME Class III piping in concrete embedments, unless the piping had been 100% radiographed. The request was documented by a TECO internal memo dated October 6, 1972.

The licensee was informed that it appeared that the quality and conformance to specifications of the subject piping had not been clearly established and that failure to segregate, or otherwise identify the piping, was in violation of the requirements of 10 CFR Part 50, Appendix B, Criterion XV. The licensee was also informed that it appeared this matter should have been reported under the requirements of 10 CFR Part 50.55(e).

The inspector stated that these matters would be brought to the attention of corporate management by enclosure to the letter summarizing the results of the inspection.

3. Electrical

a. Implementation of QA Program

The licensee, construction manager, and electrical contractor organization structures were reviewed with respect to both line and quality control organizations for procurement, receiving, installation, and testing of electrical components and equipment (including cables) and appeared to conform to the licensee's commitments, as well as 10 CFR Part 50, Appendix B.

Bechtel is the architect engineer and construction manager for the Davis-Besse facility. Bechtel prepares purchase and installation specifications for all Class I electrical components and equipment. TECO approves the specifications and procures the

majority of electrical Class I material. Bechtel performs vendor shop QC inspections and receives all TECO purchased material. The electrical contractor, F&M, and Colgan Electric Company, Incorporated,* has storage, installation, and most testing responsibilities but will procure and receive some Class I electrical components, such as cable trays, conduit, supports, fittings, etc.

F&M will have a site quality control group consisting initially of three inspectors and a manager. Additional inspectors will be added as required. F&M also has an offsite QA group who will perform periodic audits of site activities. Bechtel and TECO site QA personnel will also audit electrical work (including work performed by vendors). In addition, Bechtel site QC engineers will perform routine inspections of receipt, storage, installation, and testing of electrical components and equipment. Audit and inspection results will be documented.

The approved F-M QA/QC manual was reviewed and judged to meet requirements of specifications and 10 CFR Part 50, Appendix B, except as noted below:

- (1) Preparation of all work and inspection procedures and documentation forms have not been completed.
- (2) The manual did not clearly state that NDT procedures would be qualified or specify qualification requirements for NDT personnel.

The licensee's representative and the F-M project and QC managers assured the inspectors that work and inspection procedures would be completed and approved prior to starting the work involved. Also, that NDT procedures and personnel would be qualified in accordance with applicable standards.

b. Review of QC Systems

- (1) TECO engineering will perform the necessary relay coordination studies and specify protective relay settings. Relay specialists (within the TECO organization) will calibrate, set, and test protective relays. Dated and initialed stickers will be attached to devices following successful completion of tests.

* The Colgan Electric Company, Incorporated, is a local contractor and will provide the electrical craftsmen.

- (2) Two electrical purchase specifications for Class I-E electrical equipment (Q-list items) were reviewed for inspection and testing provisions . . . Bechtel Specification No. 7749-E-7, Revision 1 (June 26, 1972) titled "480-Volt Unit Substations," and Bechtel Specification No. 7749-E-5, Revision 1 (June 26, 1972) titled "4160 and 13,800-Volt Metal-Clad Switch Gear." These specifications adequately cover provisions for testing and QC procedures including requirements for earthquake resistance and certification of prototype and production testing. QC requirements of these specifications provide for documentation to establish that the specific requirements of 10 CFR Part 50, Appendix B, have been met by the manufacturer.

4. Electrical - Instrument Cables and Terminations

- a. Implementation of QA Program.
See item a., under item No. 3, Electrical.

b. Review of QC Systems

- (1) The Davis-Besse PSAR commitments provide assurances, with regard to installation of electrical cable, such that:
- (1) No single component failure will prevent operation of the reactor protection system or required engineered safety features, and (2) electrical and physical separation of cables associated with redundant elements of engineered safety features and reactor protective system will be provided. Available installation specifications, or design data, did not appear to provide details as to how these commitments would be satisfied relative to:
- (a) Minimum requirements for separation and protection of redundant system cables in potential fire and missile areas.
 - (b) Provisions to avoid vertical stacking of redundant trays.
 - (c) Provision to prevent routing or locating power cables (above 150 volts) in cable spreading, relay, and control rooms.
 - (d) Provisions to prevent routing nonvital cables with vital cables associated with more than one redundant system.

In response to questioning, the licensee's representative stated that he had discussed this matter with the Bechtel project engineer who assured him that the Davis-Besse PSAR commitments would be met but that no further elaboration of design criteria was planned beyond that provided in response to "L" question No. 7.5. This is not considered an open item, but future inspections will be made in these areas in terms of the basic commitments stated above.

- (2) Two electrical cable purchase specifications for Class I-E cable were reviewed for inspection and testing provisions (Bechtel Specification No. 7749-E-13, Revision 1, June 14, 1972, medium voltage cable, and Bechtel Specification No. 7749-E-15, Revision 1, November 7, 1972, low voltage power and control cable). These specifications adequately cover provisions for testing and QC procedures (inspections and records). Prototype tests include radiation resistance, flame resistance, and physical tests. Production tests include high voltage, insulation, power factor, corona, and continuity tests. The QC requirements of these specifications require documentation to establish that requirements of 10 CFR Part 50, Appendix B, have been met by the manufacturer.
- (3) The Bechtel Procedure for material receipt and inspection of TECO furnished Q-list items (Davis-Besse field quality control procedure No. D-4, Revision 7 dated June 23, 1972) and the Bechtel field quality control procedures for processing of nonconforming items (Davis-Besse field quality control procedure No. D-5, Revision 3 dated March 17, 1972) were reviewed and found to be adequate in areas of receipt inspection and documentation, reporting and processing of nonconforming components or work, and quarantine of nonconforming components.
- (4) Installation specifications for electric cable routing and tray loading is included in Bechtel engineering Procedure No. EF-553. Tray loadings greater than design intent (40% by volume) will be identified. Cable record cards (for cable pulls) will not be made up until it has been established that the cable meets applicable requirements. Most of the power cables will be installed in conduit. At the present time, covered cable trays are not expected to be used. Site NDT cable testing provisions include megger and hi-pot tests.

F-M will install (but will not terminate) cables to instrument components in the field or to terminal strips in analog, logic, and control room panels. The instrument installation contractor is to make these terminations.

Electrical terminations made in switchgear cabinets, MCC's, etc., will use crimp type connectors. A locking type crimping tool will be used to assure proper connections.

Design review is still in progress regarding routing of DC power cables to analog, logic, and control room panels.

It is a policy of Bechtel not to allow cable splicing in trays. If splicing is unavoidable, authorization in advance must be made by the Bechtel construction manager.

Electrical system design will be based on: (1) relevant ANSI, NEC, NEMA, and IEEE recommendations, (2) a requirement for electrical and physical separation of cable and equipment associated with redundant elements of engineered safety features, and (3) a requirement that no single component failure will prevent operation of required engineered safety features.

5. Reactor Coolant Pressure Boundary Piping - Welding

Review of QC System

Grinnell work and QC procedures related to weld rod control were reviewed. Procedures for storage (before use and at the work site) issue control, and disposal of unused rod were found to be adequate. (Grinnell colors all weld rod ends green to aid in identifying Grinnell rod at the construction site.)

6. Reactor Pressure Vessel

- a. Handling and lifting procedures will be used by B&W for any lift over 50 tons. Lifting equipment will be proof tested and steel billets will be used for these tests. The steam generators and the reactor pressure vessel will be lifted with the same equipment.
- b. In-service inspection of the reactor pressure vessel will be performed by Southwest Research Institute. Base line inspection will be performed by B&W Nuclear Steam Supply from Lynchburg, Virginia.

c. Quality Control System

All welders will be hired locally but are to be qualified by B&W personnel from Copley, Ohio. All test materials will be supplied from the Copley Plant. Nondestructive test services will be performed by personnel from the Copley Plant.

d. The approved Quality Control Manual from B&W is onsite.

7. Reactor Pressure Vessel Supports, Steam Generator Supports, and Pipe Restraints on Main Recirculation Piping

Bechtel Specifications C-48 and C-48A govern with respect to NDT of the subject items. Due to scheduling requirements, steam generator supports No. 349-3 and No. 349-4 will be returned to the site from P-X Engineering and required NDT is to be completed by B&W.

The reactor pressure vessel supports, supplied by P-X Engineering, have been accepted and are in place. The RPV pipe whip restraints are still in the P-X Engineering Shop pending completion of RT of butt welds and UT of fillet welds.

L. A. Bentley & Son are to complete one hot leg restraint, with full radiography of all butt welds.

Qualification of L. A. Bentley welders will be handled by Pittsburgh Testing Laboratory.

Nondestructive testing for production welding performed by L. A. Bentley will be handled by Testmaster.

The L. A. Bentley weld procedure was qualified to AWS D.2.0.69 and approved by TECO on September 22, 1972.

The coolant pump support frames are being produced by CB&I instead of P-X Engineering. Qualified procedures, welders, and NDT will be furnished by CB&I.