VENDOR INSPECTION REPORT

RO Report No.: 999-34/72-2

Vendor: Babcock & Wilcox

Type of Vendor: Vessel Fabricator

Type of Inspection: Announced Vendor

Components Inspected For: Consumer Power Company
Midland 1 and 2
50-329 and 50-333

Tennessee Valley Authority
Browns Ferry 3
50-296

Toledo Edison Company
Davis-Besse
50-346

Dates of Inspection: August 28 - September 1, 1972

Dates of Previous Inspection: April 11 - 14, 1972

Principal Inspector: Ross L. Brown
Ross L. Brown, Reactor Inspector — October 6, 1972 (Date)

Accompanying Inspector: Ross L. Brown
for B. T. Resnick, RO:HQ

Licensee Representatives: A. J. Birkle and C. Q. Hills - Consumer Power Co.
T. L. Roth - Tennessee Valley Authority

Reviewed by: E. M. Howard
E. M. Howard, Chief, Reactor Construction Branch — 10-13-72 (Date)

Proprietary Information: NONE

SECTION I

Enforcement Action

A. Quality of Radiographs for Browns Ferry 3, RPV (Section II, Paragraph 4)

B. Placement Of penetrameters for Browns Ferry 3, RPV (Section II, Paragraph 5)

Licensee Action on Previously Identified Enforcement Matters

None

Status of Previously Reported Unresolved Items

Material qualification for the Davis-Besse reactor vessel flange (Serial No. 7-214-51-1). (Section IV, Paragraph 2)

Design Changes

None

Unusual Occurrences

None

Persons Contacted

Consumer Power Company Company (CPC)

Mr. C. Q. Hills, QA Engineer**
Mr. A. J. Birkle, Staff Engineer*

*Attended Management Interview on August 29, 1972
**Attended Management Interview on August 31, 1972

AEC, RO, Headquarters

Mr. B. T. Re[illegible]ck, Senior Reactor Inspector, Specialist** - ***

Tennessee Valley Authority

Mr. T. L. Roth, Materials Inspector***

General Electric Company (GE-APED)

Mr. R. K. Lon[illegible]beam, QC Engineer***

Babcock & Wilcox Company (B&W)

Mr. E. J. Domaleski, Component Manager (Barberton)*
Mr. T. E. Butcher, QC Engineer (Barberton)*
Mr. E. Snicer, QC Engineer (Barberton)*
Mr. C. E. Mahaney, Project Manager (NPGO, Lynchburg)*
Mr. R. L. Rogers, QC Manager (Mount Vernon)** - ***
Mr. J. E. Larty, Component Manager (Mount Vernon)**
Mr. R. Strunk, Component Manager (Mount Vernon)***
Mr. J. Johnson, QC Engineer (Mount Vernon)**
Mr. S. W. Coston, QC Engineer (Mount Vernon)**
Mr. O. D. Siers, Component Manager (Mount Vernon)**
Mr. W. P. Durant, Component Manager (Mount Vernon)**
Mr. J. J. Kirven, NDT Supervisor, (Mount Vernon)***
Mr. R. M. Pierce, QC Inspector (Mount Vernon)***
Mr. J. S. Gershom, QC Engineer Supervisor (Barberton)*

Management Interview

A. At the conclusion of the inspection on August 29, 1972, the inspector conducted a meeting at the Barberton Plant, with those persons listed. The main points of the discussions are summarized below:

The licensee stated that the length of time that the Midland Steam Generators will be in storage is unknown at this time, consequently, the storage of these vessels will be periodically inspected to assure protection against damage and/or contamination. Results

*Attended Management Interview on August 29, 1972
**Attended Management Interview on August 31, 1972
***Attended Management Interview on September 1, 1972

of the inspection will be recorded.

B. At the conclusion of the inspection of the Midland vessels and pipes at the Mount Vernon Plant, on August 31, 1972, the inspectors discussed the results of our findings with those persons listed. The main points of the discussion are summarized below:

The licensee and vendor management stated that the present shop travelers will be revised and QC instructions will be issued on September 5, 1972, to require monthly inspection of the Midland components in storage to assure protection against damage and/or contamination. Results of the inspections will be recorded. (Section III, paragraph 3)

C. On September 1, 1972, the inspectors conducted a meeting with those persons listed, to discuss our findings relative to the review of the Browns Ferry 3 records. The summary of this meeting is listed below:

1. The inspector stated that the disposition of the contract variations issued for this vessel appears to be satisfactory; however, the following two areas must have corrective action to prevent recurrence.

   a. The protective packaging to prevent contamination or damage of the vessel during overseas shipment. (Section II, paragraph 6)

   b. If Ishikawajima - Hirama Heavy Industries Ltd. (IHI) will be fabricating any future nuclear vessels, the Charpy Impact Test Machine must be capable of qualification in accordance with the ASTM requirements, or the material shall be qualified by a testing agency whose test equipment meets these requirements. (Section II, paragraph 7)

2. The inspector stated that the selective review of radiographs for this vessel identified two apparent nonconformances with the requirements of ASME Code, Section III.

   a. The N- 8, nozzle to Mk 57, shell weld. Unacceptable weld and film quality. (Section II, paragraph 4)

   b. The Mk 48, vessel flange to Mk 60, shell weld. The shooting sketch shows film side penetrameters, evidence of the qualification of this technique was not available for review. (Section II, paragraph 5)

   The B&W, QC Manager stated that, B&W will pursue these items and that B&W will take the necessary corrective action.

SECTION II

Additional Subjects Inspected, Not Identified in Section I, Where No Deficiencies or Unresolved Items Were Found

1. Status of Component Manufacture

	Site	Component	Estimated Shipment Date
a.	Davis-Besse	Reactor Vessel	September 30, 1972
b.	Davis-Besse	Steam Generators (2)	January 1973
c.	Davis-Besse	Pressurizer	Shipped
d.	Davis-Besse	Pipe 2 loops	September 2, 1972 September 30, 1972
e.	North Anna 3	Reactor Vessel	September 1, 1974
f.	DITTO	Steam Generators	May 1974 - August 1974
g.	DITTO	Pressurizer	September 1, 1974
h.	North Anna 4	Reactor Vessel	September 1, 1975
i.	DITTO	Steam Generators	Work starts first quarter of 1973
j.	DITTO	Pressurizer	September 1, 1975
k.	DITTO	Pipe	August 1, 1975
l.	TVA-X14	Reactor Vessel	June 1, 1975
m.	DITTO	Steam Generators	December 1974
n.	DITTO	Pressurizers	August 15, 1975

	Site	Component	Estimated Shipment Date
o.	DITTO	Pipe	June 1, 1975
p.	TVA-X15	Reactor Vessel, Steam Generators, Pressurizers, and Pipe	Mid 1976
q.	Detroit Edison, Greenwood 1 and 2	All vessels and pipes	1977 and 1979
r.	Midland 1 and 2	All components on hold	

2. The following fabrication records, material certifications, inspection records, and QC documents pertinent to the reactor pressure vessel, (RPV) steam generators, (SG) and pipe, relative to the Midland Unit 1 and 2 facilities.

   a. Material certifications for reactor pressure vessels.

      (1) Shell forgings.
      (2) Lower head dome and transition piece.
      (3) Vessel flange.
      (4) Outlet nozzles.

   b. Shop travelers sign-off. (RPV)

   c. Nondestructive testing records of base metal and welds. (RPV)

   d. Contract variation notices. (RPV)

   e. S. G. material certification.

      (1) Shell plates
      (2) Nozzles.

   f. S. G. traveler sign-off.

   g. S. G. nondestructive testing records for base metal and welds.

h. S. G. hydrostatic test procedure.

i. S. G. storage records.

j. Storage and surveillance procedure.

k. Material certification for coolant pipe and safe ends.

3. The following documents relative to the Brown Ferry 3, Reactor Pressure Vessel.

a. Contract variation notices and justifications for joint mismatch.

b. Contract variation notice and corrective action taken to clean and test vessel after rust and salt water contamination.

c. B&W Charph "V" notch qualification of vessel material.

Details of Subjects Discussed in Section I

4. Quality of Radiographs

The ASME, Code, Section III, 1965 Edition, states in part: " . . . The weld ripples or weld surface irregularities on both the inside and outside, shall be removed . . . to such a degree that the resulting radiographic contrast due to any irregularities cannot mask or be confused with the image of any unacceptable discontinuity."

Contrary to the above, the radiographs for the Mk 8. Nozzle to Mk 57 shell weld had what appeared to be the remainder of a temporary attachment weld and a weld valley that possibly could mask unacceptable discontinuities.

5. Placement of Penetrameters

The ASME Code, Section III, 1965 Edition, states in part: " . . . The penetrameter shall be placed on the side nearest the radiation source. Where it is physically impossible to do this, the penetrameter may be placed on the film side of the joint . . .: A test radiograph shall be made under substantially identical conditions as will be present on production radiography."

Contrary to the above, the radiographic shooting sketch, with the

film readers review sheets for the Mk 48, Vessel Flange to the Mk 60, Shell weld, showed film side penetrameters, evidence of the qualification of this technique was not available for review.

6. Protective Packaging to Prevent Contamination or Damage

A contract variation was issued against the Browns Ferry 3 Vessel, as a result of contamination and damage to the vessel during the overseas shipment.

The contract variation states in part: " . . . A visual inspection of the Final Vessel Assembly, revealed the variations described below:

a. Twenty-one (21) nozzles were exposed to salt water during shipment. In item "d" all the nozzles are identified with their serial numbers and the discrepancies which pertain to each. Salt water was able to contact these areas because Tectyl was put on only the remaining area of the nozzles after the cap and tape had been applied. This enabled the salt water to seep under the tape and down through the I.D. of the nozzle.

b. Three (3) of the above nozzles had damaged weld preps.

c. All (92) stud holes acquired some rust. This condition was also caused by the contact with salt water.

d. LIST OF ALL NOZZLES HAVING DISCREPANCIES

NOZZLE, S/N	REMARKS
7-145-6	Grease, dirt, and rust, 20°, 5" wide.
7-145-7	Dirt, grease and rust, 180°, 6" wide.
7-145-8	Grease and dirt.
7-145-9	Grease and dirt.
7-145-10	Grease, dirt and rust, 180°, 6" wide.
8-145-2	Grease and dirt.

NOZZLE S/N	REMARKS
10-145-1	Light rust, 360°, 4 1/2" wide.
10-145-2	Dirt and light rust, 360°, 4" wide.
10-145-3	Light rust, 360°, 4" wide.
10-145-4	Dirt, grease, and rust 360°, 12" wide on I.D. 10" wide on O.D.
10-145-5	Grease, dirt and very heavy rust on I.D. and O.D., 360°, 5" wide.
10-145-6	Grease, dirt, and rust, 20°, 5" wide.
11-145-2	Grease, dirt, and a nick on the Weld Prep.
12-139-7	Dirt, grease, and rust, 90°, 2" wide.
12-145-6	Dirt and rust, 90°, 1 1/4" wide. Damaged Weld Prep.
14-145-1	Light rust on O.D., 360°, 4" wide.
14-145-2	Light rust on O.D. 360°, 5" wide.
14-145-3	Rust 360° on safe end and weld prep. from 3" to 6" wide on I.D. and O.D.
14-145-4	Grease, dirt, and rust on I.D. and O.D., 360°, 6" wide.
B420-001	Damaged Weld Prep.

e. Before any of the nozzles were cleaned, a test was performed to determine the surface chloride on the nozzles specified below:

RESULTS:

SERIAL NO.	MG./ft^2 CHLORIDE	SERIAL NO.	MG/ft^2 CHLORIDE
7-145-10	4.4	12-139-7	.24
		12-145-6	1.36
7-145-8	.06	14-145-1	.65
7-145-7	.42	10-145-1	2.93
		10-145-2	.64
7-145-6	1.38	10-145-2	.66
11-145-2	1.43		

All nozzles were then cleaned by rinsing and buffing to remove all traces of discoloration and rust.

Then another chloride check was taken on the nozzles specified below, with the following results:

RESULTS:

SERIAL NO.	MG./ft^2 CHLORIDE
7-145-10	.42
7-145-6	.008
8-145-2	.004
10-145-4	.004
14-145-1	.010
10-145-5	.96

After complete buffing, all carbon steel surfaces were Magnetic Particle inspected, and all stainless steel safe ends were Dye Penetrant inspected. No rejectable indications were found.

f. The three (3) nozzles that had damaged weld preps were repaired. The repaired areas were machined to form the weld prep land. The weld prep was then Dye Penetrant inspected. There were no rejectable indications.

g. Due to the rust in the (92) stud holes, all bushings were removed. The stud holes were then cleaned by wire brushing until all rust was removed. The bushings and taperpins were then placed in the stud holes.

After final cleaning prior to shipment, the effluent rinse water of the vessel and head had a conductivity of 1.65 micromhos."

The inspector stated that in the future protective packaging design must be reviewed and the installation of the packaging inspected to assure the required protection.

7. Qualification of IHI. Charpy Impact Test Machine

It appears that the Pendulum striking edge is not in conformance with ASTM-E23, therefore, the machine cannot be qualified in accordance with this specification.

This deficiency was identifed by B&W, a Contract Variation was issued. Comparative tests conducted on the IHI machine and a machine qualified to ASTM, E23 indicated the IHI machine was 7% below the nominal value of the standards specimen, instead of 5% as permitted by E23.

Since the test values exceeded the minimum requirement by more than 7%, the qualification test conducted by IHI was accepted by General Electric Company.

SECTION III

Prepared By: B. T. Resnick, RO:RCB:HQ

Additional Subjects Inspected, Not Identified in Section I, Where No Deficiencies or Unresolved Items Were Found

1. General

As part of the routine vendor inspection, an inspection was made of s lected documents covering material certifications, material receipt inspections, operation processes, welding qualifications, procedures, and controls for the Midland 1 and 2 pressurizers, B&W contract numbers 620-0012-59-10 and 620-0013-59-10, respectively.

2. Status of the Two Pressurizers

The inspector was advised that the two pressurizers are partially completed to about the same degree of completion. The shell courses including the heater belts are welded into a single assembly. The top heads are partially completed with the manway ring, spray nozzle, pressurizer relief nozzle, vent nozzle and lifting lugs welded into the head.

The inspector noted that no manufacturing work was being performed on the pressurizer and that the shell courses and top heads were in storage. The shell courses are stored outside the manufacturing building. The inspector was advised that the shells are protected from the elements by a coating of Tectyl on the metallic surfaces and are further shrouded with several layers of protective plastic and the seams taped. The heads are stored inside the manufacturing building without any protective coatings.

B&W inspections of the stored assemblies are required to be conducted in accordance with procedure 12-2QT-106 Revision 0. Ho ever, inspection of the records indicated that a deviation not e had been issued specifying inspection every 90 days. The inspector was advised that the assemblies are being inspected every 30 days but only the 90-day inspection was documented. B&W advised the inspector that a letter will be sent to shop inspectors specifically requireing documentation of the 30-day inspection findings.

3. Records Reviewed

a. Material Certifications

An examination of the following certified material test reports established that they were in accordance with applicable ASME/ASTM specifications, code cases, and B&W Specification for Pressurizer, Contract No. 620-0012, 13 for Consumers Power Company, approved by B B. Cardwell, Jr., dated January 21, 1971:

(1) Upper Heater Belt Forging, Specification ASTM A-508 Class 1, modified by code case 1332-4, and ASME Code Section III, Article 3 modified.* Bethlehem Steel Report No. 438, dated March 24, 1970.

(2) Lower Heater Belt Forging, Specification ASTM A-508 Class 1, modified by code case 1332-4, and ASME Code Section III, Article 3 modified.* Bethlehem Steel Report No. 473, dated April 2, 1970.

(3) Manway Forging. ASTM A-508 Class 1, as modified by code case 1332-4, as modified by customers purchase order.* Bonney Forge and Foundry SO No. 0592-0 dated December 30,

The material certifications were signed and dated by responsible personnel of the supplier and B&W. The transition temperature curves, attached to Bethlehem Steel Report No. 438 were identified as Lower Heater Belt Forging, although the material markings for the material furnished under report No. 438 identified the material as Upper Heater Belt Forging. B&W contacted the supplier and determined that this was a typographical error, B&W will obtain a revised report with proper identification.

b. Cladding Thickness

A review of the following records pertaining to cladding thickness of the upper head indicated that the upper head thickness was in conformance with B&W Standard Equipment Sepcification for Pressurizer Vessel, Specification No. CS-3-32/0570, dated May 15, 1970:

*(Edition not specified.)

B&W S-102Y dated September 1, 1970, on quality control specification for UT inspection for defects and/or bond or cladding. B&W acceptance ticket No. 038659 indicated that the cladding thickness was verified and accepted. These documents were signed and dated by responsible B&W personnel.

c. Welding of Nozzles and Manway Into Upper Head

An examination was made of records for manufacturing processes including operation sequences No. 235 and No. 240, and applicable welding procedures, WP-33 Alt 1 Revision 2, dated February 25, 1970, the Record of Procedure and Qualification Test - QC 2E4- 122 dated February 5, 1970, and Weld Control Record - S/N A 019141. From this examination it was established that the upper head forging, originally purchased for use in B&W contract 620-009, and carrying that identification number, is being used in the contract number 620-012 pressurizer.

d. Transfer of Identification Marks

An inspection of shop process sheets and sketches indicated that identification marks were satisfactorily places on each segment of the upper and lower forgings were welded and segmented.

e. Deviation Notices

Deviation notices, signed and dated by responsible personnel, indicated acceptance of (1) a reduced welding gap between the manway and head; and (2) a reduced welding gap between the lifting lug and head.

The records examined also indicated that the weld preheat temperature was maintained in the range of 150° - 200°F. The specified weld preheat temperature range was 150°F. A maximum interpass temperature of 500°F was specified while the actual (documented) interpass temperature during manufacture was maintained between 150° - 250°F. These temperatures are in accordance with the welding procedure qualification range and in conformance with ASME Section IX, paragraph Q-11, V-5.

Subsequent to the inspection, the inspector determined by a telecon

with the vendor, that the records indicating the actual qualification weld preheat and interpass temperatures were on file in the B&W Barberton Ohio Plant. This item will be verified during a subsequent inspection.

SECTION IV

Additional Subjects Inspected, Not Identified In Section I, Where No Deficiencies Or Unresolved Items Were Found

1. General

Review of the reactor vessel flange material certification was the only item examined during this inspection.

Details of Subjects Discussed In Section I

2. Material Qualification for the Reactor Vessel Flange (Serial No. 7-214-51-1)

The corrected material certification dated April 20, 1972, for this component states in part: " --- All test coupons were stress relieved prior to testing at 1125°F + 25°F, held for 60 hours and furnace cooled at below 600°F. This item is considered resolved.