

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-346/82-16(DETP)

Docket No. 50-346

License No. NPF-3

Licensee: Toledo Edison Company
Edison Plaza
300 Madison Avenue
Toledo, OH 43652

Facility Name: Davis-Besse Nuclear Power Station, Unit 1

Inspection At: Davis-Besse Site, Port Clinton, OH

Inspection Conducted: May 21, 25, June 3, 18, 23, 24, 30, July 1 and 28,
and August 2, 1982

Inspector: *D. H. Danielson*
for K. D. Ward

8/10/82

Approved By: *D. H. Danielson*
D. H. Danielson, Chief
Materials and Processes Section

8/10/82

Inspection Summary

Inspection on May 21, 25, June 3, 18, 23, 24, 30, July 1 and 28, and
August 2, 1982 (Report No. 50-346/82-16(DETP))

Areas Inspected: Repair and replacement of damaged internal auxiliary
feedwater (AFW) headers, A & B steam generators (SG). This inspection
involved a total of 56 inspector-hours by one NRC inspector.

Results: No items of noncompliance or deviations were identified.

DETAILS

Persons Contacted

The Toledo Edison Company (TECo)

*C. Daft, QA Director
T. Myers, Nuclear Licensing Manager
R. Peters, Operational Licensing Specialist
F. Pointe, QA Engineer
R. West, Welding Foreman
J. Bedford, Maintenance Foreman

Babcock and Wilcox Company (B&W)

C. Thompson, Group Leader, ISI
T. Harmon, Field Project Engineer
A. Gladney, Inspection Engineer
R. Nelson, Senior Quality Assurance Engineer (Level III)

The Hartford Steam Inspection and Insurance Company

T. Sanford, Authorized Nuclear Service Inspector (ANII)

The inspector also contacted and interviewed other licensee and contractor employees.

*Denotes those present at the exit interview.

Licensee Action on IE Bulletins

Reference: a. IE Bulletin No. 81-01 titled, "Surveillance of Mechanical Snubbers", dated January 28, 1981, and Revision 1, dated March 5, 1981.
b. TECo letter to RIII, dated March 6, 1981, interim response on snubbers.

(Open) IE Bulletin 81-01, final response will be submitted within 60 days after the completion of the inspection which may be completed prior to completion of the present refueling outage.

Functional or Program Areas Inspected

1. General

Reference: a. NRC Report 50-346/82-11 (Inservice Inspection)
b. NRC Report 50-346/82-12 (Inservice Inspection)
c. NRC Report 50-346/82-13 ("A" and "B" SG)

- d. NRC Report 50-346/82-14 (Damage to auxiliary feed-water headers inside "A" and "B" steam generators)

On May 19, 1982, the inspector attended a meeting at the NRC Headquarters in Bethesda, Maryland with personnel representing Davis-Besse (TECo Licensing) to discuss plans for repairing the damaged steam generators.

TECo established an organization for the purpose of planning, engineering, checking and making the repairs. In addition to TECo, the organization included B&W and Bechtel assisting with the design effort and MPR Associates and EDS Nuclear providing third party reviews of the engineering and analysis efforts.

TECo described several repair options and selected the option which involved boring eight holes in each steam generator shell and shroud. The holes in the shells and shrouds are approximately five inches diameter. Initially, the holes were 1/2 inch, but were progressively enlarged to final diameter after the proper positioning of the holes with respect to potential interferences were verified.

On June 18, 1982, the inspector attended another meeting at the NRC Headquarters in Bethesda, Maryland with personnel representing Davis-Besse (TECo Licensing) to discuss repair progress including stabilization work.

The dowel pins and brackets were removed. All dowel pins and internal brackets that were found to be missing were located except one pin. TECo states that the pin is captured in the annulus or is no longer in the portion of the main steam system which could cause interference with an active component of safety concern.

While looking for the dowel pin, another pin was found. The two 36" diameter main steam isolation valves #MS100 and #MS101 were disassembled inspected for integrity and missing pins. Valve #MS100 had a missing pin which was replaced and plug welded. The valve #MS101 pin was rewelded in place.

The bottom of the internal headers were secured to the shroud in eight locations in each SG around the circumference after being centered. These were oriented above and adjacent to the circumferential location of the shell to shroud alignment pins. At each location a 7 inch long continuous fillet weld was used to attach the outside of the shroud to the bottom of the header. In the same locations 1/2 inch thick by 5 inch long by 3 inch wide gusset plates were fillet welded to the bottom of the header and the outer face of the shroud. The fillet welds and 5" gusset plates acting together or separately were designed to take the forces and moments generated by normal operating or accident conditions.

The thermal sleeves used to direct AFW to the internal headers were removed. A flange was welded to the existing nozzle and a blind flange was used to seal the opening in each SG.

A major consideration in the repair approach was to provide access to the damaged internal headers with a minimum of machining on the shell. An engineering evaluation indicated that 5" diameter holes would provide sufficient access for securing the header while still complying with the ASME Section XI, 1977 Edition, Summer 1978 Addenda for the mechanical strength of the steam generator shell. A demonstration of the ability to secure an internal header to the shroud by the described method was performed on a full scale steam generator mock-up.

The new external headers were connected to the existing plant auxiliary feedwater lines by 6" diameter piping. The headers are approximately 300° circumferential rings made from 6 inch schedule 80 pipe SA 106 Grade B material capped at each end. The plant employed eight 3 inch schedule 80 pipe, SA 106 Grade B, risers for each SG spaced around the rings to feed auxiliary feedwater through the steam generator shell and shroud to the secondary side of the tubes. Flanges were located in the vertical riser just above the rings and at the point of entry into the steam generators shell.

The centerline of the risers inlet to the steam generators are located approximately 14 inches above the top (15th) tube support plate. Tapered thermal sleeves will direct the flow from the shell opening through the shroud to the steam generator secondary side. The risers will contain variable size orifices at the flange in the vertical run to help equalize distribution of flow.

Eddy current examinations were performed after securing the headers to the shrouds to locate any wall thinned tubes that needed to be stabilized and plugged and to verify that a 1/8" clearance still existed between the headers and the peripheral tubes. In SG "A" the 1/8" clearance was found to be acceptable and three tubes had to be stabilized and plugged. In SG "B" the 1/8" clearance was found to be acceptable and four tubes had to be stabilized and plugged.

A field hydrostatic test will be performed on the new auxiliary feedwater piping, ring header and risers and on the internal AFW header inlet nozzle and blind flange. These tests will be in accordance with the ASME Section XI, 1977 Edition, Summer 1978 Addenda except where relief from these requirements as outlined in Toledo Edison letter Serial No. 830 has been granted by an NRC letter dated July 29, 1982. A cold flow demonstration test will be run to verify that all lines are clear and free from obstructions.

2. Procedure and Drawing Review

The inspector reviewed the following procedures and drawings:

- . B&W, OTSG Feedwater Inlet Connections and Details DWG #1132212E, Revision 2.
- . B&W, Engineering Recommendation of Drilling and Inspecting of AFW Injection Holes DWG #51-1134299-00.

- . B&W, Auxiliary Feedwater Header General Arrangement, DWG #1134883.F, Revision 0.
- . B&W, Auxiliary Feedwater Penetration Layout DWG #1134898, Revision 1.
- . B&W, Auxiliary Feed Header Rigid Attachment 8 Risers, DWG #1134906F, Revision 0.
- . B&W, Layout of OTSG Handholes, Field Construction Procedure FCP #DB-AFW-1-01.
- . B&W, Layout of OTSG Handholes, Field Construction Procedure FCP #DB-AFW-1-02.
- . B&W Handhole Machining in OTSG Shell FCP #DB-AFW2.
- . B&W, External AFW Assembly, DB-AFW7, Revision 7 (Hydro).
- . B&W, OTSG 1-2 Process Pipe Welding, DB-AFW9.
- . Ultrasonic Examination for Thickness Measurement Using Pulse-Echo Techniques, ISI-112, Revision 7.
- . B&W, Ultrasonic Examination of Outer Vertical Plate of the Auxiliary Feedwater Header for Cracking. ISI-127, Revision 0.
- . B&W, Ultrasonic Examination of OTSG, Shell for AFW. Nozzle Hole Locations and AFW Nozzle Integrity ISI-136, Revision 0.
- . B&W, Procedure for Liquid Penetrant Examinations of Nozzle Bore and Inside Radius Section, ISI-243, Revision 3.
- . B&W, Penetrant Examination of Surface on OTSG Auxiliary Feedwater Internal Header, ISI-244, Revision 0.
- . B&W, Eddy Current Examination for Defects in OTSG Tubing, ISI-401, Revision 11.
- . B&W, Eddy Current Procedure for Determining the Clearance Between OTSG Tubes and the Internal Auxiliary Feedwater Header ISI-413, Revision 0.
- . B&W, Cleanliness Requirements, 9-CP-100, Revision 1.
- . B&W, Access Control 9-CP-101, Revision 1.
- . B&W, Maintenance of Material Identification, 9-MR-100, Revision 2.
- . B&W, Resequencing of Field Construction Procedure 9-QCP-102.4, Revision 0.

- . B&W, Upgrading of Field Construction Procedures, 9-QPP-102.8, Revision 0.
- . B&W, Receiving Inspection, 9-QPP-108, Revision 4.
- . B&W, General Procedure for Radiographic Examinations 9-RT-100, Revision 11.
- . B&W, Qualification of Welders, 9-WG-100, Revision 7.
- . B&W, Visual Examination of Auxiliary Feed Header Rigid Attachment Welds, 9-WG-113, Revision 0.
- . B&W, General Procedure for Semi-Automatic Metal Arc Welding (GMAW) 9-WP-301, Revision 0.
- . B&W, General Procedure for Semi-Automatic Flux Cored Arc Welding 9-WP-400, Revision 0.

The inspector also reviewed several procedure qualification tests.

- . Bechtel, Main Steam and Reheat System, DWG #M-003, Revision 33.
- . Bechtel, Steam Generator Secondary System, DWG #M-007, Revision 35.

No items of noncompliance or deviations were identified.

3. Personnel Certification and Observation

The inspector reviewed several NDE personnel certifications in accordance with SNT-TC-1A, 1975 Edition and welding personnel certifications in accordance with ASME Section IX 1977 Edition, Summer 1978 Addenda.

The inspector observed the following:

- . B&W craft laborers and TECo station personnel being trained in the hole drilling through the shell and shroud of the steam generator mock up.
- . B&W craft labor personnel drilling on SG "A" and TECo station personnel drilling on SG "B". This included the following:
 - . Drilling 1/2" pilot holes through shell and shroud.
 - . Attaching the drilling template.
 - . Using the spade drills and boring bars completing the 5" holes.
- . Qualification/certification of welders for welding the seven inches of weld and a gusset through a hole in the shell for access.

- . Qualification/certification of welders for welding SA 106 Grade B seamless carbon steel pipe risers.
- . Visually examining the welding of the headers to the shrouds and the gussets through the holes in the shells.
- . Visually examined the welds and pipe of the external feedwater ring headers prior to installation.
- . Quality Control performing receiving inspection in accordance with B&W procedure 9-QPP-108, Revision 4 on material received.
- . Machining on steam generators around 5" holes for reducing weld neck flanges.
- . Visually examined new thermal sleeves.
- . The inspector visually examined the repair and modification on each SG and determined that applicable welding procedures and material were used and the appearance of weld surfaces were acceptable.

No items of noncompliance or deviations were identified.

4. Data, Material Certification and Audit Review

The inspector reviewed documents related to the following:

- . UT of AFW lower annular plate through SG shell penetration holes 4 and 5.
- . UT of SG shell for AFW nozzle hole locations.
- . PT of AFW nozzle inside bore and radius.
- . UT of internal AFW header outer vertical plate.
- . PT 3" area where retaining ring segments were removed.
- . PT AFW internal header.
- . ET of steam generators.
- . Radiographic interpretation of the following welds in the NSS-14 system in accordance with ASME Section III, 1977 Edition, Summer 1978 Addenda.

<u>Weld No.</u>	<u>Thickness</u>	<u>Diameter</u>
SG1-1-1 Top	0.300"	3.5"
SG1-1-1 Bottom	0.300"	3.5"
SG1-1-2 Top W1	0.300"	3.5"
SG1-1-2 Top W2	0.300"	3.5"

<u>Weld No.</u>	<u>Thickness</u>	<u>Diameter</u>
SG1-1-2 Bottom	0.300"	3.5"
SG1-1-3 Top	0.300"	3.5"
SG1-1-3 Bottom	0.300"	3.5"
SG1-1-4 Top	0.300"	3.5"
SG1-1-4 Bottom	0.300"	3.5"
SG1-1-5 Top	0.300"	3.5"
SG1-1-5 Bottom	0.300"	3.5"
SG1-1-6 Top	0.300"	3.5"
SG1-1-6 Bottom	0.300"	3.5"
SG1-1-7 Top	0.300"	3.5"
SG1-1-7 Bottom	0.300"	3.5"
SG1-1-8 Top	0.300"	3.5"
SG1-1-8 Bottom	0.300"	3.5"
SG1-2-9 Top	0.300"	3.5"
SG1-2-9 Bottom	0.300"	3.5"
SG1-2-10 Top	0.300"	3.5"
SG1-2-10 Bottom	0.300"	3.5"
SG1-2-11 Top	0.300"	3.5"
SG1-2-11 Bottom	0.300"	3.5"
SG1-2-12 Top	0.300"	3.5"
SG1-2-12 Bottom	0.300"	3.5"
SG1-2-13 Top	0.300"	3.5"
SG1-2-13 Bottom	0.300"	3.5"
SG1-2-14 Top	0.300"	3.5"
SG1-2-14 Bottom	0.300"	3.5"
SG1-2-15 Top	0.300"	3.5"
SG1-2-15 Bottom	0.300"	3.5"
SG1-2-16 Top	0.300"	3.5"
SG1-2-16 Bottom	0.300"	3.5"
SG1-1-WGF-1017	1/2"	6 1/2"
SG1-2-WGF-1017	1/2"	6 1/2"
SG1-1A574-597	0.486	6"
SG1-1A574-574	1/2"	6"
SG1-2A574-A597	3/16" - 0.486"	6"
A574	1/2"	6 1/2"
A575	1/2"	6 1/2"
FW36	0.438"	6"
FW39	0.438"	6"
FW41	0.438"	6"
FW34	0.438"	6"
FW35	0.438"	6"
FW42	0.438"	6"
FW43	0.438"	6"
FW33	0.438"	6"
FW4	0.486"	6 1/2"
FW37	0.486"	6 1/2"
FW30	0.486"	6 1/2"
FW32	0.486"	6 1/2"
FW44	0.486"	6 1/2"
FW40	0.486"	6 1/2"
FW31	0.438"	6"
FW45	0.483"	6"

The inspector also reviewed Teco QC Surveillance/Inspection Reports of the AFW header repair, dated June 10, June 4, May 26, May 12, April 30, April 12, and March 8, 1982 and QA audits dated June 28, and July 16, 1982.

Material certifications were reviewed of inlet header sub-assemblies, pipe, flanges, caps, ties, elbows, rings, thermal sleeves, studs and also filler metal certifications.

No items of noncompliance or deviations were identified.

Exit Interview

The inspector met with C. Daft at the conclusion of the inspection. The inspector summarized the scope and findings of the inspection noted in this report.