



UNITED STATES
 NUCLEAR REGULATORY COMMISSION
 REGION II
 101 MARIETTA STREET, N.W.
 ATLANTA, GEORGIA 30323

Report Nos.: 50-259/90-26, 50-260/90-26, and 50-296/90-26

Licensee: Tennessee Valley Authority
 6N 38A Lookout Place
 1101 Market Street
 Chattanooga, TN 37402-2801

Docket Nos.: 50-259, 50-260 and 50-296

License Nos.: DPR-33, DPR-52,
 and DPR-68

Facility Name: Browns Ferry 1, 2, and 3

Inspection Conducted: August 6-10, 1990

Inspector: *J. E. Blake*
 R. E. Chou, Reactor Inspector

8/29/90
 Date Signed

Inspector: *J. E. Blake*
 W. P. Kleinsorge P. E., Reactor Inspector

8/29/90
 Date Signed

Approved by: *J. E. Blake*
 J. J. Blake, Chief
 Materials and Processes Section
 Engineering Branch
 Division of Reactor Safety

8/29/90
 Date Signed

SUMMARY

Scope:

This routine announced inspection was conducted in the areas of licensee actions on previous inspection findings, reportable occurrences, pipe support modifications for the licensee's IEBs 79-02/79-14 program, and welding.

Results:

Only one out of 33 pipe supports was found to have a minor discrepancy. This indicates a significant improvement in quality, especially welding workmanship, when compared to previous inspections.

In the areas inspected, one violation was identified relating to inadequate controls for welding. No deviations were identified. (Paragraph 5.e.)



REPORT DETAILS

1. Persons Contacted

Licensee Employees

R. Baird, Civil Engineer
*R. Baron, Quality Control (QC) Manager/Quality Assurance (QA)
*P. Carier, Site Licensing Manager
*R. Cutsinger, Lead Civil Engineer
*J. Danier, Site Programs
*J. Davenport, Site Licensing
*D. Gruber, Maintenance Programs Manager
G. Guffey, QC Mechanical and Welding Inspector
G. Hunt, QC Manager
*W. Massie, Site Licensing Engineer
*B. McKinney, Technical Support Manager
*M. Norrison, Nuclear Engineer - Compliance And Licensing
*P. Osborne, Principal Civil Engineer
M. Reischman, Field Engineer - Modifications
*E. Ridgell, Compliance and Licensing
*P. Salas, Compliance and Licensing Supervisor
*D. Smith, Chemical and Environmental Manager
*J. Smithson, Engineers Supervisor - Modifications
M. Strickland, QC Inspector
D. Winchester, Mechanical Engineer - Modifications

Other licensee employees contacted during this inspection included craftsmen, engineers, mechanics, technicians, and administrative personnel.

NRC Resident Inspectors

D. Carpenter, Senior Resident Inspector
C. Patterson, Senior Resident Inspector
W. Bearden, Resident Inspector
K. Ivey, Resident Inspector

2. Licensee Actions on Previous Inspection Findings

a. Violation

(Closed) Violation 50-260/89-57-01, Pipe Support Discrepancies

This violation involved discrepancies found during two previous inspections of the support modification program. All items in the violation and the commitments in the response to the violation from the licensee had been reviewed and closed in Inspection Report Nos.



90-09 and 90-19 except commitments item 3. This was a commitment for the licensee's Modification group and QC department to perform walkdowns of in-process Engineering Change Notes (ECNs) and Design Change Notices (DCNs) to ensure that there were no further examples of the conditions identified in the NRC violation. This effort was to be performed in parallel with the 79-02/79-14 modification effort. However, the licensee's internal memorandum R28 900306 901, dated March 7, 1990, deviated from the above commitment in that QC would not be required to participate in the effort. In response to the NRC concerns regarding this change, the licensee issued internal memorandum R80 900412 967, dated April 12, 1990, to fulfill the commitment. The memorandum with the attached action plan and checklist stated that:

- 1) Effective April 16, 1990, the Modification team composed of a responsible engineer and a craft supervisor, will be assigned to perform the final walkdown for all completed work plans;
- 2) QC department will perform an independent walkdown on a randomly selected samples of completed final walkdowns performed by the Modification team; and
- 3) A 10 percent sample of 79-02/79-14 work plans that were completed before April 16, 1990, will be jointly walked down by QC and Modifications.

The inspectors discussed the violation and commitment with the licensee's engineers and reviewed the information provided. The licensee's QC and Modification team walked down 10 percent of approximately 580 pipe supports whose work plans were completed before April 16, 1990. The Modification team walked down 100 percent of about 1000 pipe supports independently or jointly with QC for the work plans completed after April 16, 1990. QC performed a walkdown of about 200 supports independently or jointly with the Modification team whose work plans were completed after April 16, 1990. The Modification team and QC did not find a major discrepancy, but did find 11 minor discrepancies such as dimension differences for support locations, differences between the Bill of Materials and as installed, component configurations and part numbers not matched, old parts not removed, snubber settings out of range, loose lock nuts, rust in components, etc. Based on the licensee's effort, progress, and the continuing commitment, the violation is considered closed.

b. Inspector Followup Items

(Closed) Item 50-259,260,296/87-33-04: "Deficient Welds In EECW Piping Discovered During MIC Inspection"

This item was discovered during a review of activities related to the Browns Ferry Microbiologically Induced Corrosion (MIC) Program. As the result of this review three concerns were identified and



subsequently documented in NRC Report No. 50-259,260,296/87-33-04, one of which was discussed and closed in NRC Report No. 50-259,260,296/89-20.

Of the two remaining concerns, the one relating to weld defects, is addressed in NRC Report No. 50-259,260,296/88-35, which indicated that the resident inspectors had reviewed, and found acceptable for fuel load, the licensee's actions relating to this concern. It remained open pending a scheduled review, by NRC staff Nondestructive Examination (NDE) personnel, of 95 Emergency Essential Cooling Water (EECW) piping weld radiographs. This review was completed on December 23, 1988, and documented in NRC Office of Nuclear Reactor Regulations (NRR) Letter dated March 1989 which closed this portion of this followup item .

The remaining concern related to the adequacy of the licensee's proposed program, as discussed in NRC Report 50-259,260,296/89-20. On October 24, 1989, NRR issued Supplement 1 to the Safety Evaluation Report (SER) on The Browns Ferry Nuclear Performance Plan, which concludes, in paragraph 3.14, that the licensee's inspection and monitoring program for MIC will provide reasonable assurance that those systems will not lose their capability to perform their safety functions due to MIC damage. All the concerns being adequately addressed this matter is considered closed.

(Open) Item 50-260/89-16-09: "System Flow Loss Due to Corrosion of Carbon Steel Piping"

This item concerned the licensee's method for calculation of pressure drop in carbon steel piping and the fact that the method did not account for an increase in relative roughness of pipe internal surfaces as the piping ages (due to corrosion or other causes). The specific concern was related to the Core Spray (CS) system.

The licensee indicated that the CS system at BFN contains condensate grade water and is not susceptible to internal corrosion other than a smooth iron oxide film. This film is not a factor which would adversely affect pressure loss. The licensee concluded that the methodology in the pressure drop calculations was appropriate.

Because the licensee did not provide any basis to support the statement that the condensate grade water would not affect the internal roughness of carbon steel piping, This matter remains open.

3. Reportable Occurrences (92700)

The Licensee Event Reports (LERs) listed below were reviewed to determine if the information provided met NRC requirements. The determinations included the verification of compliance with TS and regulatory require-

ments, and addressed the adequacy of the event description, the corrective actions taken, the existence of potential generic problems, compliance with reporting requirements, and the relative safety significance of each event. Additional in-plant reviews and discussions with plant personnel, as appropriate, were conducted.

(Closed) LER 50-259/89-01: "Design Oversight on Seismic Qualification of 4160 Volt and 480 Volt Breakers Places the Plant in Unanalyzed Condition"

On January 18, 1989, the licensee determined that seismic documentation could not be established for various positions of 4160 and 480 volt safety related circuit breakers. This determination resulted in the plant being in an unanalyzed condition. The licensee put the affected breakers in an analyzed position or removed them from the vicinity of safety related equipment. In addition the licensee committed to provide administrative controls by March 8, 1989 to ensure breaker seismic qualification is maintained.

(Closed) LER 50-260/89-16: "Technical Specification Violation Due to a Seismic Unqualified 480 Volt Shutdown Board"

On May 30, 1989, the licensee determined that the 480 volt Shutdown Board 2A had not been maintained in a seismically qualified configuration in that the normal feeder breaker for the board was in the disconnect position with the breaker compartment door open. This placed the Core Spray Loop 1 in an inoperable condition. The core spray loop was required to comply with the technical specifications. This event resulted from an "unidentified person" failing to comply with the administrative controls instituted as the result of LER 50-259/89-01 discussed above.

The inspectors performed a walkdown inspection of 33 safety-related panels containing approximately 1500 breakers to evaluate compliance with the administrative controls instituted as the result of LER 50-259/89-01. In addition, the inspectors reviewed the package submitted by the licensee for the closure of both LERs discussed above. The results of these inspections are discussed below.

The inspectors noted three panel doors open including one on a breaker, all of which are violations of the above discussed administrative controls. It should be noted that, because all three units are defueled, all seismic controls have been suspended, and the percentage of noncompliance with the administrative controls is very small, there is no safety significance to this matter.

The inspectors noted that, in the LERs, there was no mention of training to assure understanding, and compliance with the instituted administrative controls. Additional investigation indicated that training had been performed though not discussed. The inspectors determined that the licensee's corrective actions have been adequate to prevent recurrence of this event. Both the above items are considered closed.

4. Licensee Action on Pipe Support Modifications

Reference 1: IE Bulletin 79-02, "Pipe Support Base Plate Designs Using Concrete Expansion Anchor Bolts"

Reference 2: IE Bulletin 79-14, "Seismic Analyses For As-Built Safety-Related Piping System"

a. Status

The inspection involved pipe support modifications required to meet IEBs 79-02 and 79-14 before the restart of Unit 2. The last inspection in this area was documented in Inspection Report Nos. 50-259, 260, 296/90-19

The licensee has completed approximately 1700 pipe support modifications, which represents about 70 percent of the total to be completed before restart. All pipe support modifications are scheduled to be completed to support a fuel load schedule of October 1990.

b. Walkdown Re-Inspection

The inspectors randomly selected 33 pipe supports which had previously been inspected and accepted by the licensee construction foreman and QC inspectors. The 33 pipe supports were all in large bore piping for three different safety-related systems located both inside and outside of containment. The walkdown re-inspection was completed with assistance from licensee's engineers and a QC mechanical inspector who was also qualified as a welding inspector. The supports were partially re-inspected against detail drawings, including the original walkdown sketches, the Design Change Notices (DCNs), and the Field Design Change Notices (FDCNs). They were checked for configuration, identification, fastener/ anchor installation, anchor size, anchor type, anchor marking, anchor edge distance, base plate size and thickness, plate warpage, member size, weld sizes, component identification numbers, component sizes and settings, dimensions, oxidation accumulation, maintenance, and damage/protection. The supports re-inspected during the current inspection are listed below.



Table IWalkdown Re-Inspection Supports

<u>Item No.</u>	<u>Support No.</u>	<u>Comments/Discrepancies</u>
1.	2-47B406S0018	
2.	2-47B408S0045	
3.	2-47B408S0046	
4.	2-47B408S0047	The snubber end attachment was binding with the recirculation pump lug.
5.	2-47B408S0048	
6.	2-47B408S0053	
7.	2-47B408S0061	
8.	2-47B408S0062	
9.	2-47B408S0071	
10.	2-47B408S0078	
11.	2-47B408S0081	
12.	2-47B415H0002	
13.	2-47B415H0004	
14.	2-47B415H0006	
15.	2-47B415S0007	
16.	2-47B415S0008	
17.	2-47B415S0009	
18.	2-47B553H0001	
19.	2-47B553H0002	
20.	2-47B553H0003	
21.	2-47B553H0004	
22.	2-47B553H0005	
23.	2-47B553H0007	
24.	2-47B553H0008	
25.	2-47B553H0009	
26.	2-47B553H0010	
27.	2-47B553H0011	
28.	2-47B553H0012	
29.	2-47B553H0014	
30.	2-47B553H0015	
31.	2-47B553H0016	
32.	2-47B553H0017	
33.	2-47B553H0018	



All The support modifications reinspected were found to be acceptable except Support No. 2-47B408S0047. For this item the plate at the end attachment of the snubber was found to have bound with the recirculation pump lug. The licensee's engineer and QC inspector reinspected the situation and established a 1/32 inch clearance by manually rotating the snubber. However, after a further investigation, it was found that the recirculation pump movement during the operation will cause the hydraulic snubber to bind. The licensee agreed to perform further evaluation to determine any possible clearance problems for this support and other supports on the recirculation pumps and will have observations for clearances on all supports on the recirculation pumps during hot function test. This item is identified as Inspector Followup Item (IFI) 50-260/90-26-01, Clearance Problems for Pipe Supports around Recirculation Pumps.

c. Support Calculation Review

The design calculations listed below on Table II were partially reviewed and evaluated for thoroughness, clarity, consistency, and accuracy. The calculations contained the purpose, assumptions, references, design loads, support evaluations, summary of results, conclusion, and attachments. The attachments included existing pipe support configuration from walkdowns, proposed support modifications or Design Change Notices (DCNs), Employee Concerns Checklist, and computer input and output for frame and base plate analyses. The review included: that the applied loads used were taken from the latest stress calculation; computer model, computer input and output, check of displacements, member size, weld sizes, and symbols, bolt sizes, and standard component capacity and settings. In general, the design calculations were of good quality.

TABLE II

Support Calculations Reviewed

<u>Support No.</u>	<u>Calculation No.</u>	<u>Rev.</u>
2-47B406S0018	CDQ-2069870457	3
2-47B408S0081	CDQ-2068900016	0
2-47B553H0001	CDQ-2002892663	1
2-47B553H0002	CDQ-2002892664	0
2-47B553H0011	CDQ-2002892672	0

Within the areas examined, no violations or deviations were identified.



5. Welding (55050)

The inspectors reviewed procedures, observed work activities in progress, and reviewed records of completed work, as indicated below, to determine whether the licensee's welding procedures, welding work activities, and welding records are in conformance with applicable codes, standards, and regulatory commitments. The applicable codes for welding work activities are specified below.

Pipe Welding: ANSI-B31.1-67

Pipe Support Welding: AISC Specification, 8th Edition/AWS-D1.1-1980

Other Applicable Codes: ASME Section IX latest at time of qualification

a. Base Material and Filler Material Compatibility

The inspectors verified the following: base material-welding material combinations are appropriate and consistent with code and regulatory requirements; the licensee/contractor has established procedures for purchasing, receiving, storing, distributing, and handling of welding consumables; welding materials purchasing and receiving are conducted in accordance with approved procedures; welding material storage procedures contain appropriate identification and environmental controls; welding materials are clearly identified and controlled; the licensee/contractor has a single system for controlling welding consumables; distribution of welding filler materials including issue return and stubs/scrap are properly controlled and ASME required tests are performed on each lot of welding filler materials. The above was accomplished by review of procedures, interviews with craft personnel, inspection of welding consumables issue stations, observation of work activities, and review of selected records.

<u>Type</u>	<u>Welding Materials Examined</u>	
	<u>Size</u>	<u>Heat Lot or Batch No</u>
E7018	3/32"	2B726AF0
E7018	1/8"	29827C
E-70S3	3/32"	J6629

b. Welding Procedures

The inspectors reviewed the below listed Welding Procedure Specifications (WPSs) and their associated Procedure Qualification Record (PQRs) to determine whether: the licensee has established adequate procedures to control the preparation, qualification, approval, distribution and revision of WPSs; WPSs define essential, supplementary essential, and nonessential variables in accordance with the applicable code sections; WPSs were qualified in accordance with applicable code sections; PQRs list essential variables as required by



the code; appropriate mechanical tests were performed in accordance with code requirements; PQRs were properly certified and mechanical test results meet or exceed code minimum requirements; changes to WPS essential variables are supported by requalification; changes to WPS nonessential variables are properly identified and documented; and WPSs comply with appropriate Regulatory Guides.

WPSs Examined

<u>WPS Identification</u>	<u>Process*</u>	<u>PQR</u>
GT-SM11-0-03B	GTAW/SMAW	GT-SM11-0-3 GT-SM11-0-3-C

*SMAW-Shielded Metal Arc Welding; GTAW-Gas Tungsten Arc Welding

c. Welder Performance Qualification

The inspectors reviewed procedures and welder/welding operator Performance Qualification Test Records (PQTR) to determine whether the licensee: has established adequate procedures for the qualification of welders/welding operators consistent with the applicable code; has a workable system for maintaining a continuous record for qualification status; and has qualified and maintained the qualification of welders/welding operators who are currently performing production welding.

Welder/Welding Operator PQTRs Examined

BF-932, BF-898, BF-451, BF-904, and BF-1027

d. Production Welding

The inspectors observed welding on the below indicated components/structures to determine the following: work conducted in accordance with a "traveler"; WPSs and drawings were available to the welder/welding operator; WPS assignment in accordance with the applicable code; welding technique and sequence were specified; base materials and welding materials were as specified, identified and traceable to test reports; joint geometry and preparation was as specified; fit up configuration and dimensions were as specified; temporary attachments were attached by qualified welders in accordance with a qualified WPS; purging gas was as specified; preheat was in accordance with the applicable WPS; welder technique was in accordance with the applicable WPS; welding electrodes were used only in positions and with the electrical characteristics specified by the WPS; shielding gas flow and composition were as specified in the WPS; shielding gas flowmeters are appropriate to the gas used; welding equipment including cables were in good condition; interpass temperature was properly controlled; interpass cleaning was conducted

in accordance with applicable procedures; backgouging was performed as specified; temporary attachments, arc strikes, and weld spatter were removed and inspected in accordance with applicable procedures; process control system has provisions for repairs; repairs are conducted in accordance with specified procedures; repairs were properly documented; welders/welding operators were properly qualified; no peening was done on the root or surface layer of the weld or the base metal at the edge of the weld; and the licensee/contractor has a maintenance program for welding equipment.

<u>Component/Structure Identification</u>	<u>Unit</u>	<u>Type</u>
3-47B-451-R0076	3	Pipe Support Weld
3-47B-451-S0025	3	Pipe support Weld
EECW-3-002-001	3	Pipe Weld

e. Observations

- Contrary to ASME Code Section IX Paragraph IW-200.2 (c), which states in part "The PQR shall list actual variables used within the limits of a narrow range rather than the full range of the variables allowed. . . .," PQR GT-SM11-0-3-C lists wide ranges for shielding gas flow, welding current and arc voltage. This is of concern because the minimum value for the nonessential variable QW-408.3 "A decrease of 10% or more in the flow rate of shielding gas..." and the maximum value for the nonessential variable QW-409.1 "...an increase in heat input..." cannot be properly determined for specification in the WPS.
- Contrary to ASME Code Section IX paragraph QW-403.6, which states "...For thickness of 5/8 in. and greater the minimum thickness qualified is 5/8 in.," PQR GT-SM11-0-3-C, an impact tested PQR, stated the test plate thickness was 1-7/8" and the minimum thickness qualified was 3/16". In addition there is no referenced PQR that would support welding with WPS GT-SM11-0-03B on base material thickness less than 0.432" even though TVA General Construction Specification G-29 permits welding with WPS GT-SM11-0-03B on material thickness as thin as 0.187".

The above are examples of lack of adequate control of the welding process at the Browns Ferry site, in that it appears that PQR GT-SM11-0-3-C does not appropriately support welding for impact test required applications. Failure to control welding is a violation of 10 CFR 50, Appendix B, Criterion IX, which requires adequate measures be established to control special processes, including welding, to assure accomplishment of those special processes in accordance with applicable codes and standards. This violation will be identified as 50-259,260,296/90-26-02: "Failure to Control Welding for Impact Test Required Applications."



In addition to the violation noted above, the inspectors identified the following items of lesser safety significance.

- The inspectors noted on the Weld Data Sheet for weld EECW-3-002-001 the following:
 - The welder foreman erroneously documented the Weld Procedure Number as GT-SM11-B3 vice GT-SM11-0-3B, in several locations. The QC inspector who made the fitup inspection made the same error.
 - Although the welding had progressed past the fitup stage, the space for the Authorized Nuclear Inservice Inspector's (ANII's) hold point had not been signed off. The inspectors were informed that the ANII had indeed signed off for the fitup in a separate location in the package. The reason given for the remote sign-off was due to a dispute over the number of places the ANIIs are required sign-off in each package.
- The licensee has no formal documented program for the maintenance of welding equipment with the exception of BF 14.28, dated 10/17/83, "CONTROL OF PORTABLE ELECTRICAL CORDS AND DEVICES" which should cover welding cables. The licensee had a program for welding equipment maintenance described in procedure MAI -12, but that procedure was discontinued in 1987. This is of concern, in view of the non-isolable leak in control rod drive tubing, which was caused by an arc from a degraded welding cable, that occurred August 8, 1990.

No violations or deviations were identified except as noted in paragraph 5.e.

6. Exit Interview

The inspection scope and results were summarized on August 10, 1990, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results listed below. The item concerning welding was identified as an unresolved item at the exit interview.

The licensee was informed by telephone on August 15, 1990 that the welding item would be cited as a violation. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

(Open) IFI 50-260/90-26-01: "Clearance Problems for Pipe Supports around Recirculation Pumps" - Paragraph 4.b.

(Open) Violation 50-259,260,296/90-26-02: "Failure to Control Welding" - Paragraph 5.e.

