



UNITED STATES
 NUCLEAR REGULATORY COMMISSION
 REGION II
 101 MARIETTA STREET, N.W., SUITE 2900
 ATLANTA, GEORGIA 30323

Report Nos.: 50-259/87-01, 50-260/87-01, and 50-296/87-01

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

Inspection Conducted: January 5-9, 1987

Inspectors:	<u>B.R. Crowley for</u>	<u>1/29/87</u>
	E. H. Girard	Date Signed
	<u>B.R. Crowley for</u>	<u>1/29/87</u>
	J. L. Coley	Date Signed
Approved by:	<u>B.R. Crowley for</u>	<u>1/29/87</u>
	J. J. Blake, Section Chief	Date Signed
	Materials and Processes Section	
	Division of Reactor Safety	

SUMMARY

Scope: This routine, announced inspection was in the areas of recirculation system piping replacement, review of previously identified enforcement matters and open items.

Results: Two violations were identified - Ferrite measurement requirements for welding material, paragraph 3.c; and storage of compressed gas cylinders, paragraph 5.a.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *R. L. Lewis, Plant Manager
- *J. A. Savage, Compliance Engineer
- *C. McFall, Compliance Engineer
- *S. P. Stagnolia, Section Manager, Nozzle Replacement Group
- *R. Bentley, NDE Engineer
- *R. Latimer, Supervisor, Inservice Inspection
- *H. E. Hodes, Engineer, Technical Support Mechanical Test Section
- L. Clardy, Quality Assurance Supervisor
- J. C. Pettitt, Section Supervisor, Nozzle Replacement Group
- T. Everitt, Welding Engineer, Nozzle Replacement Group
- S. Logan, Manager, Industrial Safety and Fire Protection

Other licensee employees contacted included construction craftsmen, engineers, technicians, and office personnel.

NRC Resident Inspectors

- *G. L. Paulk, Senior Resident Inspector
- *C. A. Patterson, Resident Inspector
- *C. Brooks, Resident Inspector

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on January 9, 1987, with those persons indicated in paragraph 1 above. The inspector described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

Violation 259, 260, 296/87-01-01: Ferrite Measurement Requirements for Welding Material, paragraph 3.c.

Violation 259, 260, 296/87-01-02: Storage of Compressed Gas Cylinders, paragraph 5.a.

Unresolved Item 260/87-01-03, Program Weaknesses in NDE and Welding, paragraph 5.b.

The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection.

3. Licensee Action on Previous Enforcement Matters

- a. (Open) Unresolved Item (259, 260, 296/85-01-01): Adequacy of Actions Taken with Regard to Allegations Concerning Category 1 Supports.

This item was opened to express concern that the licensee failed to sufficiently investigate the alleged violation of procedures by a general foreman and a project engineer. During NRC Inspection 85-07, the Browns Ferry plant manager committed to a further investigation. This further investigation was completed by licensee Concerns Program personnel in October 1986 and it confirmed that the subject general foreman had knowingly and repeatedly violated procedural requirements for work on safety-related items. The charge against the project engineer was not resolved. The NRC inspector notes, however, that the engineer's involvement appears much more indirect and limited in importance than that of the general foreman.

The NRC inspector previously reviewed the further investigation performed by concerns program personnel, as described in NRC Inspection 86-42. In that inspection the inspector questioned licensee personnel as to whether any personnel action was anticipated in response to the investigation findings. The inspector was informed that the need for personnel action would be determined by management in their review of the matter. At that time the inspector informed the licensee that pending completion of the TVA management review, and NRC examination of the results of that review, the matter would remain an open item.

During the current inspection the inspector questioned TVA management as to the status of this matter. The inspector was informed that the report of the investigation, completed and signed by the Concerns Program investigator on November 16, 1986, was still under review by Concerns Program Management. The inspector noted that management's attention to resolution of this matter, originally questioned in 1985, has been exemplified by continued indecisiveness and delay. The item remains open.

- b. (Open) Violation (259, 260, 296/86-04-01): Snubber Storage

This violation involved snubbers which were improperly stored and tagged. The storage instructions for the specific snubbers required them to be covered with a water proof tarp and required that all openings into the snubbers be capped, plugged or sealed. Instead, the snubbers were uncovered and openings into snubbers were observed to be unprotected. Parts had been removed from these snubbers and they were considered to be on "Hold." "Hold" tags required to be complete and affixed to the snubbers to aid in identifying their "Hold" status did not have proper identification entered on them and were not properly attached to the snubbers.

TVA's letter of response to the violation dated April 10, 1986, was reviewed and determined acceptable by Region II. The stated corrective action was as follows:

- (1) Based on a visual examination, past storage deficiencies were determined not to have caused deleterious conditions to the snubbers.
- (2) The snubbers identified in the violation were placed in proper storage conditions.
- (3) Storage personnel were given training as to proper storage requirements and use of "Hold" tags.

The NRC inspector held discussions with the licensee's representatives and examined the corrective actions stated in the letter of response. Based on the discussions and examinations the inspector considers that the corrective actions stated were performed. However, in his examination, the inspector toured the licensee's storage yard and found additional examples of snubbers stored uncovered in an open door building. Rust was observed on the surfaces of the snubbers. "Hold" tags had not been applied to the snubbers, implying that they were considered acceptable for issue. The NRC inspector questioned a TVA QA surveillance inspector, who had accompanied him in his tour, as to the acceptability of the conditions observed. The TVA surveillance inspector stated that widespread improper storage conditions had been identified previously and that corrective action had been taken to assure the acceptability of improperly restored items prior to release. He indicated that the corrective action was as follows:

- No safety related items are released from storage without QC authorization.
- Before they authorize release, QC inspectors obtain engineering evaluations of the acceptability of all items whose conditions are not unquestionably acceptable.

The inspector noted that this permitted items that were deteriorating because of improper storage to continue to deteriorate. The inspector informed the licensee that their controls to limit deterioration of stored items and assure that unsatisfactory items were not released would be reviewed in a subsequent inspection and that the violation would remain open pending that review.

- c. (Closed) Unresolved Item (259, 260, 296/86-42-01): Ferrite Measurement Requirements for Welding Material

This item expressed concern that based on a review of material certifications, welding material purchased for recirculation system piping replacement did not comply with engineering requirements. The

subject engineering requirements are specified by drawing 47A1408, paragraph 4.2.4. The licensee's Engineering Change Notice (ECN) which specifies the Unit 2 recirculation system piping replacement, ECN P0957, imposes drawing 47A2408 requirements, which, in turn, impose the drawing 47A1408 requirements.

The requirements of drawing 47A1408 which did not appear to be met were that the delta ferrite content of all stainless steel weld metal "shall be determined in accordance with the magnetic instrument option of NB-2400 using Types A or C instruments" and that "the minimum delta ferrite content shall be 8 ferrite number."

During the current inspection, the NRC inspector reviewed the licensee's purchase requisitions and found that the requisitions had failed to properly specify the engineering requirements for the welding material. The inspector observed the following:

- Purchase requisition 87 PBF-376995, for stainless steel Type 308L weld wire, failed to require delta ferrite determination by magnetic method.
- Purchase requisition 87 PBF-376996, for IN 308L stainless steel consumable welding inserts, failed to require that the delta ferrite be determined by the magnetic method and that the material have a minimum ferrite number of 8.

The licensee's failure to properly incorporate the specified ferrite measurement methods and minimum ferrite number in their purchase documents is considered a violation of 10 CFR 50, Appendix B, Criterion IV. This is identified as violation 259, 260, 296/87-01-01, Ferrite Measurement Requirements for Welding Material. This replaces the original unresolved item.

4. Unresolved Items

Unresolved items are matters about which more information is required to determine whether they are acceptable or may involve violations or deviations. One unresolved item identified during this inspection is discussed in paragraph 5.b.

5. Inspection of Replacement of Recirculation Piping (Unit 2)(TI 2512/13)

The licensee is replacing portions of their Unit 2 recirculation piping up to the reactor vessel inlet nozzle. The NRC inspectors examined selected aspects of the licensee's related work and records to verify that the replacement activities were technically adequate and that they complied with NRC requirements and licensee commitments. Details of the examination conducted by the inspectors are as follows:

a. Observation Welding and Welding - Related Activities (55050)

The inspectors observed examples of welding and welding activities performed to install new safe ends on the reactor vessel inlet nozzles and to apply corrosion resistant cladding (CRC) to unreplaced piping where it will be joined to replacement piping. Both the replacement piping, which is of a special composition, and the CRC were specified by the licensee to aid in avoiding the intergranular stress corrosion cracking (IGSCC) that has plagued Boiling Water Reactor (BWR) primary coolant stainless steel piping welds.

The inspectors observations of welding and welding activities were directed to the following welds:

<u>Nozzle No.</u>	<u>Weld Type</u>
H	CRC
G	Safe and to nozzle
J	Tacks for safe end to nozzle

The inspectors observed the above welding and related activities and reviewed related procedures and in process records to verify the following:

- Work was conducted in accordance with work plans which coordinated and sequenced all operations, referenced procedures or instructions, established hold points, and provided for production and QC sign offs. These documents were at the work station.
- Welding procedures, detailed drawings, instructions and weld data sheets were at the work station.
- Welding was performed in accordance with the parameters of the welding procedure (GTA-88C-5).
- Welding Technique and sequence requirements were specified.
- Base metals and welding filler materials were of the specified type and grade, and were traceable to test reports or certifications.
- Weld joint geometry was as specified and surfaces to be welded had been prepared, cleaned, and inspected in accordance with applicable procedures or instructions.
- Components to be welded are assembled and held in place within specified gap and alignment tolerances.

- Welding technique of each welder was in accordance with the welding procedure.
- Welding equipment was in good condition.

In addition to the verifications listed above the inspectors also reviewed the certification records for the following welding and inspection personnel assigned to the recirculation system pipe replacement activities:

Site Quality Control Examiners

C.O.C.
W.L.G.
C.H.
C.L.G.

Inservice Inspection Ultrasonic Examiners

D.A.D.
B.K.L.
M.D.R.
E.L.
G.N.H.

Welding Operators (Note: Qualification radiographs were reviewed)

Rice
Posey
Craft
Moore
Walls
Taylor
Atchley
Call
Casey
Christopher
Clements
Gary
Jackson
Kimbrell
Patterson

While observing performance of the welds listed above the inspectors noted that five cylinders of compressed gas to be used for the welding were not properly secured. These cylinders were stored in the reactor buildings, adjacent to the path used for exit. Also, they were not far from the drywell entrance. The cylinders were only loosely secured by a fiber rope draped around the valves at the tops of the cylinders. Although only one of the five improperly secured cylinders appeared to be in use, none had valve protection caps in place. This is contrary to the Fire Protection Program Plan, Procedure No. FPT-01, which requires that:

- Cylinders when stored inside shall not be located near exits, stairways or in areas normally used or intended for the safe exit of people.
- Compressed gas cylinders shall be secured in an upright position - 3/4 of the cylinder height from the floor by wire, chain, or other suitable means.
- Valve protection caps shall be in place whenever the cylinder is not connected for use.

The inspectors informed the Industrial Safety and Fire Protection manager of the improperly stored cylinders on January 7, but observed that the conditions remained uncorrected on January 9. Another example of an improperly secured compressed gas cylinder was observed by the inspectors in the Power Stores Storage yard on January 8. Further, the inspectors were informed that the NRC resident inspectors had also observed and informed the licensee of improperly stored gas cylinders, as described in NRC Inspection Report 86-40. The inspectors informed the licensee that their nonconformance with storage requirements of Procedure FPP-01 was considered a violation of 10 CFR 50, Appendix B Criterion V. This was identified as violation 259, 260, 296/87-01-02, Storage of Compressed Gas Cylinders.

b. Review of Radiographs (57090)

When the inspectors arrived at the Browns Ferry facility on January 5, 1987, they were informed by the NRC resident inspector that the licensee was experiencing serious difficulties in producing welds that would pass radiographic examination.

During the inspectors surveillance of the welding activities delineated in paragraph a. above cognizant personnel were questioned as to the details of the problem, the cause, and the planned corrective actions. The inspectors found that none of the individuals questioned gave the same reply as to the nature of the rejectable weld defects observed on the radiographs.

Prior to performing any production welding on the actual replacement system piping, the licensee had prepared and welded mock-ups of the welds to aid in assuring the replacement work could be completed acceptably with minimum personnel exposures from the high radiation levels that exist at the replacement locations. Radiography performed on the mock-up welds had not identified rejectable defects. To aid in understanding the problems being experienced by the licensee in their production welding, the inspectors reviewed the radiographic film of the mock-up welds and the production welds performed to date. Also, film for welding operator qualifications was reviewed by the

inspectors, as described in 5.a above. Based on their film review, discussions with licensee personnel and observations of welding activities the inspectors observed the following:

- (1) Radiographic Film for "B" mock-up of the nozzle to safe end weld showed approximately 5 inches of lack of fusion that had not been rejected by a Level II radiographic examiner. Failure to identify welding discrepancies during the mock-up stage of welding allowed welding process errors to go uncorrected to production welding activities.
- (2) There was no Level III radiographic examiner overview prior to production welding.
- (3) The indication reported in (1) above was also detectable by ultrasonic examination. Ultrasonic examination, however, had not been performed on the welded mock-ups. The production welds will require preservice inspection using ultrasonic examination. Use of ultrasonic examination on the mock-up would aid in assuring acceptable welding.
- (4) The root pass installation weld for nozzle "G" safe end was accepted by a Level II radiographic examiner. This joint was subsequently rejected by the same radiographic examiner after several additional weld layers had been added to the joint. The discrepancy that rejected the weld was also on the film when the root pass radiography was performed but was not recognized by the radiographers.
- (5) Radiographic readers sheets for in-process production radiographs indicated that certain film segments of the welded joint were acceptable. However, the radiographic examiner also had an overlay made for the welders to remove the weld in this segment because the area in the film was actually considered unacceptable.
- (6) Mock-ups used to train welders for the nozzle to safe-end weld did not have exactly the same joint preparation as the production weld. The production weld had a 12 degree taper on the bottom surface of the nozzle weld prep that was not on the mock-up. This taper could result in accenting a root edge condition on film and could result in incorrect interpretation of the production radiographs. In addition, this condition is almost impossible to verify on the inside surface of the production weld.
- (7) The inspectors noted that the weld bead width on the mock-ups for the CRC welds were very narrow. However, the first four production CRC welds had much wider weld beads, indicating that the welding parameters changed between mock-up welding and production

welding. The mock-up weld radiographs were acceptable, however, three of the first four production welds were unacceptable. When the licensee reverted to the narrow bead widths for production CRC welds the welds were radiographically acceptable.

- (8) During the review of QC examiners qualifications, one visual examiner was noted to have the results of several eye examinations in his folder. One eye certification issued in 1984 required the individual to wear glasses when performing inspection activities. The 1985 and 1986 eye examination records did not require glasses.
- (9) Welding parameters for the background pulse in welding procedure GTA-88C5 were incorrect due to a misplaced decimal point. This was an obvious typographical error to the welding machine operator because his welding machine limited his obtaining this setting. The NRC inspector, however, was concerned that if the licensee's review would allow typographical errors to go uncorrected in the welding parameters of their welding procedure, how reliable is the technical input to the procedure particularly when serious welding problems are occurring.

The licensee had identified or was aware of the program findings observed by the inspectors above. However, the licensee's welding problems appear to result primarily from failure of TVA inspectors to properly evaluate radiographic information available on previously welded mock-ups and failure of the welding organization to follow the welding techniques, welding parameters and joint preparation used on the mock-up specimen's. The cause of the examiner failures and the deviations in welding appear to be due to lack of examiner overview during mock-up stage of welding and inadequate management control of welding and inspection activities. The inspectors finding were reported as unresolved item 260/87-01-03, Program Weakness in NDE and Welding Activities.

c. Materials (35065 and 55050)

The inspectors reviewed in-process and completed records for the replacement piping and welding materials. The materials were as follows:

Piping, Type 316(NG) - Purchase Requisition No. 84K05-834606, Heat No. 131BN, NDE Serial No. 1147 A thru L (except E)

Welding Material, IN308L Consumable Inserts - Purchase Requisition No. 87PBF-376996, Heat No. 5493T308L

Welding Material, ER308L, Wire - Purchase Requisition No. 87PBF-376995, Heat Nos. S8E0591 and S8A2688

The records were reviewed by the inspectors to verify the following:

- (1) Procurement requisitions contain or reference applicable technical requirements and QA requirements
- (2) 10 CFR 21 imposed
- (3) Supplier is on approved list
- (4) Receiving inspection performed
- (5) Mechanical test results, chemical analyses and other examinations comply with ASME Code requirements and NUREG-0313, Rev. 2 Draft Report
- (6) Material identification and traceability comply with ASME Code and licensee procedural requirements
- (7) Welding materials issued in accordance with licensee procedures

Apparent deficiencies were found in the welding material procurement requisitions and are described in paragraph 3.c. above.

Within the areas examined, no violation or deviations were identified except as noted in 5.c above.

6. Inspector Followup Items (IFIs)

- a. (Closed) IFI (259, 260, 296/84-40-03): Justification for Pump Test Allowable Ranges

The licensee's new program for inservice testing of pumps and valves, which was submitted to the NRC on December 23, 1986, provides justification for the allowable ranges of pump test values specified in the licensee's procedures. This justification was reviewed by the inspector and appears acceptable. This matter is considered closed.

- b. (Closed) Inspector Followup Item 260/86-39-01, Enhancement of Examination Procedure Needed

On November 18, 1986, TVA's inservice inspection (ISI) personnel were requested by the inspectors to demonstrate their ultrasonic inspection procedure (N-UT-24) for determining the thickness of weld butter remaining on the reactor N-2 nozzles after the safe-ends are removed. The ultrasonic procedure demonstration performed by the ISI examiners at the site was not successful in achieving the examination objectives. On November 20, 1986, the inspectors were requested by TVA to allow the ISI Technical Engineering Branch to come to the NRC Regional Office on

November 25, 1986 and demonstrate that the procedure could be used effectively. As a result of the technical meeting with TVA the inspectors concluded that the procedure could achieve its examination objectives if enhanced to insure that the following items were adequately addressed: (1) examiners performing examinations using this procedure should receive special training from the Technical Engineering Branch on signal recognition; (2) transducers used to performed these examination should be described in the examination procedure; and (3) an appropriate calibration block should be provided and described in the examination procedure. On January 8, 1987, the inspectors reviewed procedure N-UT-43, Revision 0, which had been written to replace N-UT-24, observed records of examiner training given on the procedure and witnessed a performance demonstration of the procedure by site ultrasonic examiners. Each of the inspectors concerns had been addressed by the licensee and the demonstration was successful in achieving its examination objectives. This item is therefore considered closed.

- c. (Closed) IFI (259, 260, 296/86-04-04): Storage of Radiographs

This item was opened to identify inspector interest in instances of improperly stored radiographs identified by the licensee in one of their audits. During the current inspection the inspector reviewed records of the licensee's findings, corrective actions, and closure of the original audit item. The inspector considers that no further review of this matter appears necessary.

- d. (Closed) IFI (259, 260, 296/86-42-02): Possible Improvements/Corrections to Instruction for Determining Bolt Torque Requirements

This item identified an NRC inspector's concern that the licensee's instruction for determining Bolt Torque Requirements contained some data that was not fully legible and that the instruction appeared excessively complex.

During the current inspection the NRC inspector discussed the subject instruction with the individual who prepared its previous revision and with other personnel involved in updating and improving the licensee's procedures and instructions. The inspector accepted explanations as to why the instruction was so complex and detailed. Licensee personnel acknowledged the illegibility of some data in the instruction, noted that clarifications could be readily obtained by going to the source of the data, and stated that improved graphics would be incorporated in the instruction by mid 1987. The inspector accepted these explanations and, noting that the instruction will be subject to further review in routine NRC inspections, considers the matter closed.