

TENNESSEE VALLEY AUTHORITY

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MAR 29 1989

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D.C. 20555

Gentlemen:

In the Matter of the Application of ) Docket Nos. 50-390  
Tennessee Valley Authority ) 50-391

WATTS BAR NUCLEAR PLANT (WBN) - RESPONSE TO QUESTIONS FROM WATTS BAR'S WELDING  
CORRECTIVE ACTION PROGRAM (CAP) PLAN PRESENTATION

On February 8, 1989, a meeting was held in Rockville, Maryland, at the request of TVA between NRC's staff and representatives of TVA. The purpose of this meeting was for TVA to present the WBN welding CAP. During the discussion of the plan, 10 specific questions were identified that required additional investigation by TVA before responding.

The enclosure contains the responses to these questions with supporting information to resolve the misidentified radiograph issue contained in attachments A and B. These responses are based on the most recent information available. Periodic updates will be provided to the WBN resident inspector with the latest status of each issue until its completion.

Because these are complex issues and have a direct correlation to the welding CAP plan, TVA would like to request the opportunity to discuss this response further. We will be available to discuss this response or any additional questions you may have with the CAP plan at your earliest convenience.

If there are any questions, please telephone D. E. McCloud at (615) 365-8650.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

*R. Gridley*  
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Enclosure  
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U.S. Nuclear Regulatory Commission

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ENCLOSURE

WATTS BAR NUCLEAR PLANT UNIT 1 (WBN)  
RESPONSE TO QUESTIONS FROM WATTS BAR WELDING  
CORRECTIVE ACTION PROGRAM (CAP) PLAN PRESENTATION

ITEM NO. 1

With respect to the weld deficiencies identified on elevation 741 in the Control Building, how many other areas were identified with similar weld deficiencies?

RESPONSE

The TVA welding project (WP) and EG&G Idaho, Inc. (EG&G), performed separate reviews of applicable TVA documents to ensure proper and total bounding of all deficiencies similar to those found on elevation 741. Included in these reviews and as a part of the corrective action for Significant Condition Report (SCR) WBN CEB 8689 R0, a review of all structural steel drawings was conducted to determine the complete scope of the issue. From this review, an additional 72 connections with configuration similar to those previously identified on elevation 741 were identified. These connections are as follows:

- ° Elevation 729 - 64 connections on main building steel in the Control Building.
- ° Elevation 755 - 6 connections--four on main building steel and two on miscellaneous steel, all in the Control Building.
- ° Elevation 776 - 2 connections on miscellaneous steel in the Auxiliary Building.

These connections were bounded with those connections identified on elevation 741 and have been subsequently known as the "elevation 741 issue." No other connections were identified.

ITEM NO. 2

Provide references of the elevation 741 welds that were evaluated to meet code and were not repaired.

RESPONSE

TVA is currently compiling the requested references and has agreed with the NRC resident inspector to provide them to him.

ITEM NO. 3

Has the authorized nuclear inspector (ANI) reviewed the radiographs for ASME piping welds associated with repairs resulting from the rereview, and have supplements been provided to the affected N-5 data reports?

RESPONSE

The ANI will rereview all radiographs associated with ASME Section III weld repairs resulting from the TVA rereview of all ASME Section III radiographs.

To date, approximately 90 percent of the ASME weld repairs have been completed, and the ANI has rereviewed all radiographs associated with them. N-5 data report supplements will be generated by Nuclear Construction (NC) with ANI concurrence to support system completion.

ITEM NO. 4

Is the level III rereview of radiographs a 100 percent review or is it conducted on an audit basis?

RESPONSE

Radiographs for 100 percent of WBN unit 1 and common (to unit 2) ASME Section III safety-related piping welds were rereviewed by a level III examiner certified to interpret radiographic film. All ASME piping welds, made in the future and requiring radiography, require a level III examiner to rereview all radiographs in addition to the initial review performed by the level II film interpreter.

ITEM NO. 5

Explain how code case N-318-3 addresses attachments like shear lugs.

RESPONSE

Code case N-318-3 applies if "the attachment is welded to the pipe by a full penetration weld, a fillet or partial penetration weld along at least three sides of the attachment, or a fillet or partial penetration weld along the two long sides of the attachment, where the length of the long side is at least three times the length of the short side."

At WBN, shear lugs are welded to pipe by a full penetration weld or a fillet or partial penetration weld along two long sides of the attachment, where the length of the long side is at least three times the length of the short side. Code case N-318-3 is, therefore, applicable for evaluation of these attachments.

ITEM NO. 6

Will applicable drawings be revised to reflect the adequacy, as demonstrated by TVA tests, of the wall-mounted instrument panel welds?

RESPONSE

Yes. The typical drawing 47A061-11A has been revised to refer to SCR W-559-PS which includes the wall-mounted instrument panel welds corrective action.

ITEM NO. 7

Has TVA performed a quality inspection of the HVAC duct support welds and HVAC duct welds?

RESPONSE

HVAC Duct Supports

HVAC duct supports were quality inspected during initial construction to WBNP-Quality Control Procedure (QCP)-4.8, "Inspection and Documentation Requirements for Mechanical Supports."

HVAC Ductwork

Safety-related ductwork (including the hydrogen collection system) was fabricated and installed (1978 timeframe) without a quality assurance program (QAP) and without specific welding requirements from engineering. Therefore, a quality inspection was not performed on HVAC duct welds during its initial fabrication and installation.

In August 1980, QCP-4.27, "Inspection and Documentation of Ductwork," was established for safety-related ductwork systems including welding inspection requirements. Subsequently, design drawings were revised in December 1980 to require full penetration welds.

Welds completed before specification of this penetration requirement were not visually inspected for compliance with this criteria. As a result, in April 1981, a stop-work order was issued for all safety-related HVAC systems, and a violation was issued to document the lack of quality inspections and failure to report a significant deficiency.

The stop-work order was lifted in September 1981 based upon development of an "alternate acceptance criteria" to be used for all safety-related ductwork in lieu of the quality inspection requirements of QCP-4.27. This criteria specified a leak test for inaccessible welds. Later, the criteria was revised to be applicable to both accessible and inaccessible welds. During the interim period of this criteria revision, none of the accessible welds were visually inspected to QCP-4.27.

The alternate acceptance criteria was subsequently (December 1985) determined to be inadequate since leak testing alone will not provide a basis for seismic adequacy of the welded joints. SCRs WBN MEB 8721, 8722, and 8714 were issued to document the inadequate criteria.

During its review, EG&G identified some partial penetration welds where full penetration welds are specified. Two stop-work orders on the circumferential welds in all safety-related HVAC ducts, including the hydrogen collection system, were issued on January 12, 1987. At this time, none of the welds had been visually inspected to QCP-4.27.

Subsequently, TVA established a program to establish the structural adequacy of all field welds on safety-related HVAC systems and the hydrogen collection system. Results of this program are documented in the Nuclear Engineering (NE) calculation entitled, "Safety Significance Evaluation for Seismic Category I HVAC Duct Welding Concerns."

The program involved the following for unit 1:

1. Identification of all welds by locating, numbering, and classifying (weld type) all welds. This work was completed by NC and verified by Nuclear Quality Assurance (NQA).
2. Eddy current testing of about 25 percent of all unit 1 welds (approximately 6800) to determine weld presence.
3. Independent verification by NQA of about 860 welds using WBN WP-26, "Project Walkdown Procedure." This verification was done through existing protective coatings and included visual inspection for determination of the existence of proper fit-up (if determinable by observation), size of butt weld (complete fill), fillet weld size, porosity, slag, cracks, and complete weld. Actual existing conditions were documented and reviewed by NE for acceptability.
4. For welded spiral round duct, rectangular duct, and pipe (functionally qualified as duct), an analysis of required joint penetration in low and high stress areas.
5. For high stress areas:
  - Removal of ten samples from the most highly stressed welds and determination of the average joint penetration thickness.
  - Evaluation of inaccessible welds (by observation through access doors and inspection ports) to determine presence of weld.
  - Visual quality inspection by NQA of 54 high stress welds (51 accessible and 3 partially inaccessible) in accordance with WBN QCP-4.13-FU&VC, "Fit-up and Visual Civil." This inspection was done after removal of existing protective coatings and included visual inspection for the existence of weld size and complete fusion and underfilled craters. Actual existing conditions were documented and reviewed by NE for acceptability.

Results of this program support the adequacy and safety significance of safety-related duct welds at WBN.

WBN Construction Specification N3M-914, "Quality Assurance Requirements for Construction Testing; and Inspection of Safety-Related HVAC Systems," was revised to require visual inspection of welds. The Final Safety Analysis Report (FSAR) is also being updated to include acceptance criteria for the welding and design of safety-related HVAC systems. Design drawings have also been revised to reflect the new acceptance criteria.

ITEM NO. 8

What was the basis for the selection of 16 vendors for evaluation of vendor welds? What is the total number of vendors supplying safety-related welds? Will the program be expanded beyond 16 vendors?

RESPONSE

The TVA program for addressing welds in vendor made components was described in TVA's letter to NRC dated December 5, 1986 (L44 861205 806). The report on this issue was submitted by TVA's letter to NRC dated March 23, 1989 (L44 890321 805).

NQA performed an evaluation of quality indicators (QIs) relating to vendor weld concerns. These indicators included site-generated indicators assembled by the WP. These indicators also provided the bases for welding evaluations performed by the WP. The sources of QIs evaluated consisted of:

- Construction Appraisal Team Reports
- NRC Inspection Reports
- EG&G Concerns
- Corrective Action Reports
- Generic Employee Concerns
- Nonconforming Condition Reports

From the total population of QIs developed by the WP, 98 QIs related to vendor welding were reviewed. This review included a determination of whether previous corrective actions (rework, repair, or use-as-is) had addressed generic implications for vendor quality. TVA has a high confidence level that by using the total population of QIs developed by the WP for this review the significant issues as related to vendor welding have been captured.

This evaluation identified a total of 20 vendors, 4 where previous corrective actions had adequately addressed vendor deficiencies and 16 requiring further assessment. The 16 vendors with potential welding problems were further assessed, using additional information that was not available during the review of the QIs, to identify the scope of vendor welding with corrective action required. This assessment determined that 5 of the 16 vendors required reinspection. Previous corrective actions had adequately addressed vendor deficiencies for 11 of the 16 vendors.

The total number of vendors supplying safety-related welded items to WBN was not determined as part of the vendor weld evaluation. This is addressed in TVA's letter to NRC dated March 23, 1989 (L44 890321 805).

TVA does not believe that there is a need for assessment of welds in components supplied by other vendors since no QIs were identified for other vendors; however, based on findings to date, the evaluation has been expanded for the 5 vendors that required reinspection.

ITEM NO. 9

Provide the basis for resolution of the misidentified radiograph issue. In light of 18 radiographic identification discrepancies being identified, why is a 100-percent review not warranted?

RESPONSE

During the nondestructive examination (NDE) level II and III rereviews (2 separate rereviews) of radiographs for ASME Section III piping welds, radiographs for 16 welds were determined to have 18 radiographic identification discrepancies. (There were 2 welds identified to have 2 different types of discrepancies).

During the repair program resulting from these rereviews, 2 additional welds were determined to have 2 radiographic identification discrepancies. See attachments A and B for details of the 20 discrepancies.

The initial concern after identification of these discrepancies was whether TVA could demonstrate that all welds were radiographed in their final and acceptable condition. This issue is included in SCR WBN NEB 8651, initiated in October 1986, and addressed in a response to an NRC concern (reference TVA's letter to NRC letter dated October 16, 1987). All deficiencies relating to this issue will be addressed in the closure to the SCR.

In order to evaluate the extent of the radiograph misidentification problem, TVA decided to first review the entire population of those radiographs which were for welds either repaired and/or reradiographed, either during initial construction or during the rereview of radiographs. This decision was based on the judgment that the potential for misidentifications was much greater on welds which were reradiographed for any reason.

Of the about 2,650 WBN unit 1 and common (to unit 2) ASME Section III piping welds requiring radiographic testing by the code, about 2,080 welds were radiographed, interpreted as accepted during construction, and independently reviewed and accepted during the rereview. The remaining about 570 welds required repair or reradiography, either during construction and/or as a result of the rereview program. This population of approximately 570 welds was selected for the basis for additional evaluation of radiographic identification discrepancies.

Of these 570 welds, approximately 400 welds required repair during initial construction. Of these 400 welds, approximately 300 welds did not require repair and/or additional radiography as a result of the rereviews. The remaining approximately 270 welds required repair and/or additional radiography as a result of the rereviews.

As part of the rereview, the level III matched the repair radiographs (400 welds) to the original radiographs for repaired welds to ensure that the correct area was repaired and that the repair radiograph matched the original weld. No additional discrepancies were identified.

During repair and/or reradiography of the 270 weld population, the new radiographs, verified as corresponding to the correct welds, were compared against the existing radiographs. Two additional discrepancies were identified (see paragraph A of attachment A and item 12 of attachment B).

TVA believes that the results of the two independent rereviews of the ASME Section III piping welds (2,650 population) and the additional evaluations of the 270 and 300 weld populations (about 22 percent of the total population) demonstrate that upon completion of the repair program, ASME piping welds requiring radiography will comply with TVA licensing commitments and that further evaluation for misidentified radiographs is not necessary.

ITEM NO. 10

Monthly status reports should be provided to the NRC resident inspector on the implementation of welding corrective actions.

RESPONSE

A periodic status report on the implementation of welding corrective actions will be provided to the NRC resident inspector by Frank E. Laurent, who has been recently assigned the project manager for the WBN welding CAP.

WBN Site Licensing will coordinate with the NRC resident inspector to determine the format, content, and frequency for welding CAP status updates.

DISCUSSION OF 18 WELDS WITH DISCREPANCIES

A. Of the 18 welds, 15 were determined to have 17 radiographic identification deficiencies (see items 1 through 6 and 9 through 12 of attachment B).

- ° Discrepancies for 5 of these 15 welds occurred as a result of repairs or undocumented repairs to welds (see items 3, 4, 9, 10, and 11 of attachment B); therefore, these type of discrepancies should not exist within the 2,080 population since none of them were repaired.
- ° An additional 3 of the 15 welds had discrepancies involving 2 different sets of radiographs in the file for the same weld (see items 1 and 2 of attachment B). This resulted from the welds being reworked or cut out and the original sets of radiographs allowed to remain in the file. An acceptable set of radiographs did exist in the files for the 3 welds. If this condition exists in the 2,080 population, it would not be detrimental to the quality of the welds. In addition, this condition should not exist since none of this population was reworked or cut out.
- ° There were 5 of the 15 welds that had discrepancies involving switching of radiographic identification numbers during dark room activities (see item 5 of attachment B). These discrepancies were identified during the 2 rereviews of the 2,650 population. None were identified during the additional evaluation of the 300 population, and none have been identified to date during the repair/reradiograph program involving the 270 population.

There were 2 of this same 5 welds that had additional discrepancies caused by changing of the weld numbers by the TVA inservice inspection group after review and acceptance of the initial set of radiographs (see item 6 of attachment B). This is not considered to truly be a misidentified radiograph issue but was addressed under this program. Even though the radiographs were for the applicable welds and the radiographs and welds were acceptable to ASME III, they did not match the weld numbers because the numbers had been subsequently changed. This condition will have no affect on weld quality of the 2,080 population. These 2 welds were also within the 5 welds discussed in the previous paragraph.

- ° There were 2 of the 15 welds that had discrepancies caused by switching of the weld numbers at the welds during initial construction (see Item 12 of attachment B). Even though the radiographs were for the applicable welds, they did not match the weld numbers assigned to the welds on the weld map. Both welds were repaired during construction without the identification deficiencies being identified; however, each weld was repaired as required.

The rereview required one of the welds to be reradiographed due to improper technique. The deficiencies were identified during preparation for this reradiography.

Only one problem of this type occurred in the evaluations of the 300 and 270 weld populations. In addition, this condition would have no affect on the quality of 2080 weld population since the radiographs and repairs were for the actual welds; the weld numbers were just reversed.

- B. There was 1 of the 18 welds that was not initially radiographed because an adjacent weld in a parallel train was radiographed twice, e.g., once for itself and once for the weld that was not radiographed (see item 7 of attachment B). The weld in question was radiographed and determined acceptable during the repair program resulting from the rereview of radiographs. In addition, during the evaluation of the 270 population, new radiographs were compared to the existing radiographs to determine if this type discrepancy existed in this population. As previously stated, no other discrepancies were identified.
- C. There were 2 of the 18 welds that had discrepancies resulting from repair and reradiograph activities being reversed for the 2 welds (see item 8 of attachment B). This issue resulted in a defect being allowed to remain in one of the welds. Of all the discrepancies identified, this is the only instance which resulted in a rejectable indication not being repaired. This discrepancy resulted from the need of a repair; therefore, this type discrepancy should not exist within the 2,080 population since none of them required repair. An engineering analysis of this weld demonstrates that it would have maintained its integrity for the design life of the plant had it not been repaired.
- D. The above issues for the previously discussed 18 welds have been documented with condition adverse to quality reports (CAQRs) or other internal TVA documents as warranted by the severity of the particular issue. These documents provide corrective actions, root cause analyses, and recurrence controls for the issues.

RADIOGRAPHIC IDENTIFICATION DISCREPANCIES

ITEM NO. 1

The radiographic film rereview program identified two separate film packages with the same identification number (1-063AD074-08B); however, it was evident from review of the film that they were of two different welds. A review of applicable records revealed that the original weld was cut out because of an engineering change, and subsequently another weld was installed.

The documentation for the original weld was purged from the files but the radiographic film packages were not. When the weld was replaced it was considered an original weld instead of cut 1.

Weld 1-063AD074-08A was also involved with the same engineering change and was also, upon review, determined to have the original and replacement radiographic film packages in the file as did weld -08B.

ITEM NO.2

The rereview program identified that two views of the four required for complete coverage of weld 1-063AD073-11A did not appear to match the actual weld upon comparison. Further investigation of applicable inspection records indicated that field weld -11A was removed from the system as the result of rework of the piping system. The new weld was identified as -10A. The radiographs for -10A match the actual weld and were accepted during the rereview program.

ITEM NO. 3

Views 2-3 and 3-0 of weld 1-001A-D009-16 were reradiographed for unacceptable weld quality on August 5, 1987. The new radiographs indicated a repair had been made at the "O" location. A review of applicable records indicated no evidence of repair at this location.

The undocumented portion of this weld was removed and repaired in accordance with applicable repair requirements including acceptable radiography.

In addition, a review was performed to determine if an additional weld was involved. The search consisted of review of welds in the immediate area of weld -16 for which welding and/or repair was done. No other discrepancy was determined.

ITEM NO. 4

During review of radiographs of weld 1-074AD048-06, additional radiography was required to be performed due to inadequate coverage of repair. The new radiographs indicate that repairs had been made in views 0-1, 2-3, and 3-0. Comparison of these new radiographs to the existing radiographs indicated that the repair in view 2-3 had not been previously radiographed.

Review of applicable existing documentation indicated that the radiographic data sheet showed views 0-1, 2-3, and 3-0 as rejectable and the repair weld operation sheet showed that views 0-1, 2-3, and 3-0 were repaired.

The reject entry on the data sheet for view 2-3 was lined through on February 2, 1977, and applicable documentation changed to indicate its acceptability. Apparently this only resulted in the radiographers reradiographing views 0-1 and 3-0. However, in the interim, construction personnel had repaired views 0-1, 2-3, and 3-0 as required by the data sheet before its revision.

View 2-3 was radiographed during the investigation and was interpreted as acceptable.

ITEM NO.5

Comparison of the radiographic film for weld 1-003BD372-07B indicated that the film did not match the actual weld. Further investigation determined the radiographs for this weld and for welds 1-003BD372-07A and 1-003BD372-037 were misnumbered during dark room activities involving the "flashing" of identification numbers on the film. All of the radiographs were taken on the same day.

A similar occurrence involving welds 1-063BD089-07A and 1-063BD089-08A was identified while radiographing weld -08A for information.

In each case, with the aid of the daily radiography log book, TVA was able to match the radiographs to the welds and renumber the radiographs correctly. This review confirmed that the welds were properly radiographed.

ITEM NO. 6

While investigating CAQR WBP 870469, it was discovered that the weld numbers stamped adjacent to welds 1-063BD089-07A and 1-063BD089-08A (same welds as in last paragraph of item 5 above) did not agree with the weld map.

Further investigation revealed that the weld numbers were placed on the welds by the TVA inservice inspection group during performance of the preservice inspection (PSI). Subsequent to the PSI, the weld maps were revised by Nuclear Construction. The PSI program did not require the weld numbers to be corrected; therefore, the change in numbers on the weld map did not result in changing the stamped numbers at the weld.

ITEM NO. 7

Review of radiographic film packages for welds 1-062AD023-05 and 1-062AD022-16 indicated that the film was of the same weld. Further investigation revealed that weld -16 was welded before -05 and acceptable by radiography. When weld -05 (in a parallel train with weld -16) was later completed, the radiographer inadvertently reradiographed weld -16 and incorrectly identified it as weld -05. Weld -05 was radiographed and is acceptable.

ITEM NO. 8

During the rereview program, it was identified that radiographs for repair of weld 1-003BD002-07 did not match the original weld. Further inspection revealed that the original radiographs identified as 1-003BD002-07 were actually of weld 1-003BD002-20 and the radiographs for -20 were actually of -07.

The radiographs identified as -07 (actually -20) had a rejectable indication in view 0-1. The repair of the area thought to be defective and subsequent acceptable radiographically were actually performed on weld -07 leaving the defect remaining in -20.

Radiographic views 2-3 and 3-0 identified as -20 (actually -07) were rejected for film quality. The reshot of these views was performed on weld -20. Views 2-3 and 3-0 of weld -07 did not have acceptable radiographs.

The defect in view 0-1 of weld -20 has been repaired and the weld determined acceptable by radiography. Views 2-3 and 3-0 of weld -07 have been reradiographed and accepted.

ITEM NO. 9

Nonconformance Report (NCR) 4485R was initiated in 1982 because of an undocumented repair to weld 1-001AD003-09. The NCR required removal of the undocumented portion of the weld and repair in accordance with applicable requirements. The repair and radiography were inadvertently performed on a vendor weld adjacent to -09 resulting in the repair required by the NCR not being completed. This discrepancy was identified during the rereview program.

The undocumented portion of this weld was removed and repaired in accordance with applicable repair requirements including radiography.

The repair made on the vendor weld was radiographed and accepted.

ITEM NO. 10

During the rereview program, radiographs for weld 1-074AD051-06 were rejected for inadequate coverage of weld repair. Subsequent radiography demonstrated that the view 2-3 repair radiograph was not for weld -06. Radiographs of view 2-3 for weld -06 taken August 4, 1987, were accepted.

ITEM NO. 11

During investigation of item 10 above (1-074AD051-06) it was determined that radiographs of the repair of views 3-4 and 4-0 of weld 1-074AD051-05 were actually taken on weld -06. Radiographs of weld -05 taken January 27, 1988, confirm that the weld was successfully repaired.

ITEM NO. 12

During the repair program resulting from the rereview, weld 1-072BD070-11 was required to be reradiographed for improper technique. During preparation for this reradiography, it was determined that the weld identification numbers (at the welds) for weld -10 and weld 1-072BD070-11 were reversed (from weld numbers specified by the weld map).

Both welds required repair and were correctly repaired and accepted during construction; however, the discrepancies were not identified at this time. The numbers have been corrected and weld -11 was reradiographed and accepted.