WATTS BAR NUCLEAR PLANT

UNIT 1

WELDING

CORRECTIVE ACTION PROGRAM PLAN

REVISION 1

James A. Keeler 4/24/89
Prepared

Edward D Hogue 4/24/89
Reviewed ~~(Lead Engineer)~~ EDH 4/24/89

James F. Murdock 4/24/89
Approved (Branch Chief)

P K Mauldin 5/1/89
Submitted (Project Engineer)

[signature] 5/3/89
Approved (Site Director)

[signature] 5/4/89
Concurred (Watts Bar Program Team)

8905220062 890512
PDR ADOCK 05000390
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WELDING

CORRECTIVE ACTION PROGRAM PLAN

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WELDING

CORRECTIVE ACTION PROGRAM PLAN

1.0 INTRODUCTION

During the course of Tennessee Valley Authority (TVA) work at its nuclear plants, conditions related to welding were identified that did not meet TVA licensing requirements. These conditions were identified by the United States Nuclear Regulatory Commission (NRC), the TVA Nuclear Safety Review Staff (NSRS), and TVA personnel through quality indicators such as nonconformance reports, audit findings, employee concerns, and NRC inspection reports. The documents relating to these conditions are referenced in attachment 1.

In October 1985, the NRC requested (reference 1) a meeting with TVA to discuss welding program concerns including the TVA plan to address, resolve, and correct identified problems. In addition, the Employee Concerns Special Program (ECSP) instituted at the Watts Bar Nuclear Plant (WBN) provided additional questions from TVA employees about the adequacy of TVA welding activities.

After assessing the above issues, TVA concluded that additional reviews were needed to determine the adequacy of the overall TVA welding program including that at WBN. The TVA Welding Project (WP) was established as an independent group in late 1985 to conduct these reviews. The responsibility of the WP was to provide TVA, the NRC, and the public with a high degree of confidence in the adequacy of the overall TVA welding program and in the reliability of the welded structures, systems, and components including those at WBN.

At the request of the NRC (reference 2), vendor supplied welds for WBN were added to the scope of the TVA weld evaluation (reference 3). Specific employee concerns related to vendor welding were evaluated by the WP, and TVA developed and implemented a program for evaluation of the remaining vendor welds (see attachment 5, Item 5).

Segments of the overall assessment are at varying stages of completion as described in this plan. Even though the formal Root Cause Analysis (RCA) is currently being performed, several corrective actions have been implemented to address hardware adequacy and to improve the overall TVA welding program.

2.0 OBJECTIVE

The objective of this Corrective Action Program (CAP) plan is to provide assurance that WBN unit 1 safety-related welds meet (or will meet upon completion of corrective action programs) TVA licensing requirements. The plan for recurrence control is also provided.

This objective was to be accomplished by conducting a comprehensive review of the TVA welding program to determine the adequacy of TVA welded, safety-related structures, systems, and components currently in place at WBN. In addition, TVA was to determine any remedial actions that may be needed, and take those actions deemed necessary to enhance the TVA welding program and to ensure that future welding activities at WBN are in accordance with licensing requirements. TVA also initiated efforts to address the adequacy of vendor supplied welds.

This CAP also provides the specific corrective actions, including weld repairs and rework, and their implementation for the WBN unit 1 welding program.

3.0 SCOPE

The scope of this CAP includes WBN unit 1 safety related welding. TVAs review covers the WBN written welding program and the following TVA welds associated with safety-related structures, systems, and components: piping welds, welds in building and miscellaneous steel, and welds in component supports; e.g., pipe, instrument and control, electrical, and HVAC.

All employee concerns related specifically to vendor welding were evaluated. In addition, vendors were selected for evaluation using quality indicators defined by the WP. Sixteen (16) vendors were selected for evaluation.

4.0 DESCRIPTION OF PROGRAM

Evaluation of the WBN welding program is being approached in three phases as discussed below. The TVA WP maintains responsibility for all work performed during these phases:

- Phase I was a programmatic assessment of the WBN welding program.
- Phase II was an in-depth review of the implementation of the welding program at WBN.
- Phase III is an evaluation, integration, and upgrading of welding related programs and procedures to ensure that future welding activities at TVA, including those at WBN, are conducted in accordance with licensing requirements.

As part of both Phases I and II, an independent review of welding activities was performed by the Department of Energy Weld Evaluation Project (DOE/WEP). DOE selected EG&G to perform this independent evaluation. TVA is performing all work related to the Phase III effort.

The following is a discussion of the major elements of the CAP including corrective actions resulting from WP, DOE/WEP, ESCP, and Nuclear Quality Assurance (NQA) efforts. A flowchart of and fragnet for CAP activities are shown in attachments 2 and 3, respectively.

4.1 Phase I Program

Phase I was a programmatic assessment of the WBN welding program which was performed by both TVA and DOE/WEP. The purpose of this assessment was threefold: (1) to determine the quality assurance and technical requirements for welding by reviewing the codes, standards, and regulations to which TVA committed for the design, construction, and operation of the plant, (2) to determine if the welding commitments were reflected in the design output documents, and (3) to determine if the construction and operation programs reflected the quality and technical requirements of these design output documents (reference 4).

This phase was initiated in January 1986. The DOE/WEP assessment is complete and the results are included in the DOE/WEP report forwarded to the NRC in February 1988. The TVA assessment is also complete, and the TVA Phase I report was forwarded to NRC on February 21, 1989. This report includes the results of the DOE/WEP assessment. R1

During the Phase I Program evaluation, the WP conducted reviews of the welding programs for the three TVA line organizations that were responsible for defining and implementing the welding program; i.e., Nuclear Engineering (NE), Nuclear Construction (NC), and Nuclear Operations (NO).

The NE program review was based on the following elements:

1. Determination of the welding-related commitments from the FSAR and other licensing documents.

2. Determination if the welding-related commitments were properly reflected in the design output documents.

3. Analysis of quality indicators and employee concerns applicable to NE for indications of programmatic deficiencies.

4. Determination of the adequacy of the NE program to produce documents that correctly reflect the technical requirements required by the welding commitments.

The NC program review was based on the following elements:

1. A review of the construction site implementing procedures to determine if they correctly incorporate and convey all of the necessary welding requirements.

2. Evaluation of weld repair and weld cutout rates of safety-related pipe welds.

3. Analysis of quality indicators and employee concerns applicable to NC for indications of programmatic deficiencies.

The NO program review was based on the following elements:

1. A review of the NO site implementing procedures to determine if they correctly incorporate and convey all of the necessary welding requirements.

2. Analysis of quality indicators and employee concerns applicable to NO for indications of programmatic deficiencies.

Two deficiencies relating to program implementation were identified during the Phase I effort, mainly hardware to mitigate the effects of pipe rupture and HVAC ductwork. In the area of pipe rupture mitigative hardware, requirements of the construction specification had not been incorporated into the site implementing procedures in some instances. Because of a change to the engineering criteria for visual inspection which occurred in February 1981, the visual inspections performed on pipe rupture mitigative devices fabricated after February 1981 may not have been to the same criteria specified in the construction specification. The differences in the criteria were not significant enough to warrant a sample selection for reinspection. Nevertheless, those pipe rupture mitigative devices that were inspected during the Phase II effort were shown by engineering calculations to be acceptable as is.

The review also revealed that the FSAR requirements for HVAC fabrication required compliance with the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) code. The SMACNA code allows techniques based on constructor's skills and technology. It does not provide requirements normally commensurate with safety-related requirements. The HVAC concern was evaluated during the Phase II efforts and resulted in a corrective action (see attachment 4, page 4 of 7).

In addition, the Phase I program resulted in several general and programmatic recommendations for improving the WBN welding program including recommendations for training and revisions to engineering specifications. A complete list of these preliminary recommendations is included in the Phase I report.

4.2 Phase II Program

Phase II was an in-depth review of the implementation of the welding program at WBN. The principal elements of this phase of the evaluation were:

1) A physical reinspection of the welded structures and components in the plant,
2) detailed evaluation of the welding-related employee concerns (EC's) identified through the WBN ECSP, and
3) a review and analysis of welding-related quality indicators (QI's).

DOE/WEP's program included the above principal elements. In addition, the WP, in concert with the ECSP, performed an evaluation of welding-related ECs.

DOE/WEP identified 115 groups of welded items or components, which included approximately 18,000 welds, and developed an assessment plan for each group. The welds were then evaluated using various combinations of document review, engineering evaluation, and physical reinspection of the hardware. About 70 percent of the evaluations were performed by reinspection/reexamination, using visual inspection and nondestructive examination. Reinspection results of these welds were used to evaluate the quality of welds and the field implementation of the welding program, and to address specific ECs and QIs (documented weld-related problems and deficiencies).

DOE/WEP evaluated 472 ECs that involved safety-related weld issues at WBN. In addition, DOE/WEP reviewed about 8000 quality documents produced since 1972 as a part of the WBN quality assurance program for identifying and correcting nonconforming conditions. DOE/WEP identified and evaluated 134 QIs from this review. Results of the EC and QI evaluations are included in the DOE/WEP report.

In addition, the WP performed detailed evaluations of 390 welding-related ECs. Three hundred thirty-nine of these 390 concerns were included in the 472 ECs evaluated by DOE/WEP. The specific issue raised in each concern was investigated in detail as it pertained to the welding program, NRC inspection reports, and TVA deficiency reporting documents. These reviews considered documents issued from the beginning of construction through 1985. Where appropriate, cognizant TVA individuals were interviewed. Where the ECs raised issues relating to the quality of TVA welds, the results of the DOE/WEP reinspections were also included in the evaluations. As a result, most of the EC issues were addressed by both the WP evaluations and the DOE/WEP reinspection effort.

Due to the manner in which the ECs were stated, it was sometimes difficult to determine if the ECs were applicable to WBN unit 1, unit 2, or both. DOE/WEP evaluated 472 ECs which it felt made inference to or might have impact on unit 1. The WP evaluated 390 which it felt might have impact on any WBN welding. However, all ECs relating to safety-related welding at WBN unit 1 were evaluated by the WP and/or DOE/WEP. For those ECs reviewed by both the WP and DOE/WEP, results of the reviews and corrective actions identified, where applicable, were the same. Details of the EC reviews are included in the DOE/WEP reports. Results of the TVA EC evaluation will be included in the ECSP WBN Subcategory Report 50400 and TVA Welding Category Report 50000.

Nine areas of deficiency were identified for which corrective actions have been initiated, either as a direct result of the DOE/WEP reinspections, by TVA concurrently with the reinspections, and/or as a result of EC evaluations. The nine areas of deficiency and the associated corrective actions are summarized in attachment 4. TVA has evaluated these conditions and determined that they would not have precluded safe shutdown of the unit had they remained undetected and uncorrected.

During the Phase II evaluation, other conditions were identified that were not within the scope of this phase but which required further evaluation and/or resolution. Corrective actions were required for three of these conditions, items 10, 11, and 12 in attachment 4. Other identified actions which are in various stages of evaluation and/or resolution are described in attachment 5. R1

The DOE/WEP evaluation is complete and the results are included in the aforementioned DOE/WEP report. The TVA Phase II report was forwarded to NRC in early April 1989. R1

Throughout Phase I and Phase II efforts, several recommendations were made to modify and enhance the TVA welding program. However, it should be noted that in addition to programmatic changes, many welds have been repaired or replaced when necessary to meet structural requirements (see attachment 4).

4.3 Phase III Program

Phase III is an evaluation, integration, and upgrading of welding related programs and procedures to ensure that future welding activities at TVA, including those at WBN, are conducted in accordance with licensing requirements. This phase is being accomplished in four steps:

1. Evaluation of the effectiveness of modifications to the welding program as a result of commitments from the Phase I and Phase II efforts. This evaluation is specific to each TVA nuclear site including WBN.

2. Completion of a Root Cause Analysis (RCA) to determine the most basic, fundamental cause(s) of the TVA welding problems including those at WBN. An integrated assessment of all identified welding-related problems will be included in this analysis.

3. Development of a recurrence control plan for TVA welding problems. At WBN this will be based upon the results of the above two items and the WBN corrective actions.

4. Generation of the WP Final Report to document the overall, final results of the WP for all TVA nuclear sites including WBN.

The Phase I and Phase II reports for the WBN evaluation provide recommendations for program improvement. These recommendations, which were provided to appropriate line organizations in preliminary form, were based on areas and items needing improvement that became evident during the Phase I and Phase II work. R1

Actions have been taken, and are currently underway, to modify the welding program based on the preliminary recommendations from the Phase I and Phase II efforts. After implementation of these modifications, NQA will perform an evaluation of the effectiveness of these program modifications. Further corrective actions will be implemented if deemed necessary by the evaluation.

The in-depth RCA is currently being performed to determine the most basic, fundamental cause(s) of the problems encountered in the TVA welding program, including those at WBN. Results will be included in the WP Final Report.

A recurrence control plan will then be developed based on the results of specific WBN corrective actions, the program modification effectiveness evaluation, and the RCA to ensure the effectiveness of the WBN welding program. A WP Final Report will then be issued to document final results.

In addition to the aforementioned activities, each TVA nuclear organization associated with welding has and/or is making applicable revisions to its individual program to establish a single, unified program that can be implemented for initial construction, modification, and maintenance activities within the particular

organization's area of responsibility. The Welding Program Coordination Team (WPCT), described below, will review the summation of these parts to assure an effective, overall program for TVA. The changes made to the program, new procedures and specifications provide sufficient controls to assure compliance to TVA licensing commitments. Summaries of the organizational activities and WPCT charter and scope are provided as follows:

1. Welding Program Coordination Team (WPCT)

   The WPCT was formed as the result of a recommendation presented by NQA during an evaluation of the NQA welding program performed in April 1988. A three-member WPCT has been formed consisting of a member from each of NQA, NC, and NE. These members were selected by the Vice Presidents of NQA, NC, and NE, as applicable, and have been given the necessary authority to make program changes.

   The objective of this team is to optimize the Nuclear Power Group (NPG) welding activities among NQA, NC, and NE. The WPCT is also responsible for ensuring an effective transition of remaining activities from the WP to the appropriate line organizations.

2. NE Welding Program

   Two major activities are currently ongoing within NE to provide additional assurance that adequate and effective welding requirements are included in design output documents for future construction, modification, and maintenance activities. These are as follows:

   - In addition to the WP review, NE is conducting a comprehensive review of licensing and regulatory commitments relating to welding. Based on the review results, a series of new specifications will be prepared to delineate these requirements. These specifications will in turn lead to site-specific, activity-directed documents, i.e., engineering requirement specifications.

   - The G-29 specification, "Process Specification for Welding, Heat Treatment, Nondestructive Examination, and Allied Field Fabrication Operations," consists of a mixture of welding and welding related specifications, implementing procedures such as NDE and welder performance qualification procedures, and the welding procedures for the physical welding process.

Engineering requirements of G-29 shall be incorporated into the new NE welding specifications, as applicable. Implementing procedures shall become the responsibility of the applicable user organizations. Welding procedures will be issued in a separate manual as "Welding Procedure Specifications" which are user friendly and concise.

3. NC Welding Program

NC is currently developing an integrated program for the control of field welding and related processes. This program will serve to consolidate the many existing programs into a single, unified program which will be implemented for initial construction, modification, and maintenance activities.

This program will be defined in accordance with an integrated system of quality assurance program and management procedures within the Nuclear Procedures System. This system provides for interorganizational review of all directives and standards generated within that system.

The essential program elements which will be addressed by standards in this program are as follows:

- Process control for welding and related processes.
- Welder qualification and continuity.
- Weld filler material control.

An organization-level procedure, welding activity verification, will also be included. This procedure will give the overall field welding program a continuing management overview which will serve to quickly detect and correct any problems in the installation program at the first line level.

Additionally, there will be a series of implementing technical procedures which extract detailed technical requirements from installation specifications (products of the NE effort). These procedures will establish a base for the installation instructions. They will then be translated into detailed field installation instructions which will provide applicable technical requirements to field engineers, managers, and craftsmen.

These installation procedures will be prepared by field engineers and construction managers who have extensive experience in field erection and modifications activities.

4. NQA Welding Program

NQA identified and implemented changes to their portion of the welding program. These are as follows:

- The welding quality assurance program was revised in 1980 to include HVAC ductwork (see attachment 4, Page 4 of 7, Item 5).

- Throughout an extensive portion of the construction activities at WBN unit 1, personnel responsible for quality activities reported to NC. To provide additional assurance of organizational independence as required by 10 CFR 50, Appendix B, TVA assigned total quality responsibilities to NQA in 1986. All quality functions including inspection, examination, surveillance, and assurance activities are now the responsibility of NQA.

- A corporate Level III monitoring program has been implemented to reinforce and calibrate inspection/examination personnel that are certified to the TVA quality assurance program. This program encompasses visual inspection and examination and NDE (including radiography and rereview of radiographic film) and requires a periodic sampling of all welding related work at all sites by certified Level III individuals knowledgable of the standards, procedures, and methods used. This program includes observation of actual work activities and review of resulting documentation.

- As a result of an evaluation performed in 1980, training programs were evaluated and necessary changes made to provide a clear, concise training program for welding related quality activities.

- Proficiency testing and examinations will be added to the program for certification of contractor personnel performing quality inspections and examinations.

- A peer review program was implemented in which certified inspectors perform reinspections of work previously inspected by other certified inspectors. Results are compared and discussed and corrective actions implemented as necessary. This program provides another level of confidence for the quality assurance process.

- In addition to the required compliance audits, a program for performance based audits was implemented in 1988. This program is more of a preventive rather than corrective program and is based upon "real time" auditing by auditors with extensive experience in the area being audited.

- The various methods for documenting and dispositioning nonconforming conditions were consolidated into a single program (Corrective Action Program) which provides a more controllable program designed to accelerate disposition and closure.

In addition, NQA is currently implementing a plan, which when complete will (as with NC) provide a single, unified welding program for NQA. Activities as delineated by this plan are as follows:

- Assign the responsibility for all NQA welding activities to one NQA central office branch. The NDE/Engineering branch was designated this responsibility in June 1988.

- Designate one individual within the NDE/Engineering branch to develop, implement, coordinate, and maintain NQA's overall welding program. This individual was assigned in June 1988.

- Designate a NQA individual at each site as the site NQA welding representative. This individual was assigned for WBN in August 1988.

- Collect and review NQA audit and surveillance reports from the WBN site and those performed by NQA central staff at WBN involving welding activities for 1986 to date to determine if adequate audit/surveillances have been and are being performed. Identify program changes indicated as necessary by the results of the review. Evaluation of the WBN audit program from the time the first safety-related weld was made at WBN unit 1 (April 1974) to early 1986 was performed by a composite team of TVA and DOE/WEP personnel (see attachment 5, Item 1).

- Collect and review examples of the NQA inspection/ examination reports that are currently required for welds and welding activities to determine their adequacy. Identify changes indicated to be necessary by the results of the review.

- Perform a review of the adequacy and effectiveness of working level items and activities such as implementing procedures, training programs and qualifications of personnel. Identify and implement changes as deemed necessary.

- Perform an in-depth review of NQA's overall welding program to determine which activities should be revised or added. The results of WBN applicable corrective action programs, WP Phase I and II reports, the Root Cause Analysis, the WP Final Report, and other activities mentioned above will be considered.

4.4 Recurrence Control

The recommendations and conclusions of the WP Phase I, II, and III efforts and the WP Final Report will be integrated with the results of all WBN specific corrective action programs to ensure that the overall WBN welding program is modified to preclude a recurrence of similar problems in the future with welding activities at WBN.

4.5 Licensing Assessment

Comprehensive Phase I and Phase II reviews of the WBN written welding program and safety-related weldments for WBN unit 1 have identified a number of deficiencies requiring associated corrective actions. Phase III reviews are being performed to evaluate and integrate the results of Phase I and Phase II reviews to define recommendations for programmatic improvement and recurrence control. Completion of these reviews and the implementation of the corrective actions will provide TVA with the reasonable assurance that the WBN written welding program and safety-related weldments meet applicable WBN licensing requirements. Any FSAR revisions will be submitted to NRC for review, and licensing commitment changes will be proposed only when technically justified.

5.0 PROGRAM INTERFACES

A number of corrective actions are completed, underway, or planned as a result of the WP activities. These are discussed in section 4.0 above. Little interface with other WBN programs is anticipated as a result of those individual corrective actions (attachment 4, Page 3 of 7, HAAUP interface). It is anticipated that the WBN Phase II Report and the WP Final Report will result in recommendations leading to some programmatic revisions in portions of the welding program not yet addressed by existing corrective actions.

6.0 PROGRAM IMPLEMENTATION

Implementation of corrective actions of the CAP is the responsibility of the affected WBN line organization(s). Recommendations of the WP Phase I, Phase II, and Final Reports will be evaluated by the applicable line organization(s) and implemented as appropriate. Implementation of these recommendations may occur differently than recommended; however, modifications to the welding program, as a result of the WP Phase I, Phase II, and Final Report recommendations, will be evaluated in the future by NQA to determine their effectivity. R1

Interface between the WP and other TVA organizations (NE, NC, NO, and NQA) is essential to completion of this effort. In addition, implementation of any recommendations and corrective actions will require interface between NE, NC, NO, and NQA.

7.0 PROGRAM DOCUMENTATION

The DOE/WEP evaluations as previously discussed in this CAP were documented in a series of reports. These reports were transmitted to the NRC in February 1988 (reference 5).

The WP has issued two reports (i.e., Phase I and Phase II) and will issue a third report (Final Report) which present TVA's bases for determining that welding of structures, systems, and components currently in place at WBN is adequate (or will be upon completion of specific corrective actions) to meet TVA's licensing requirements. In addition, the Final Report will identify any remedial actions required to prevent recurrence. R1

In addition, a report for CAP closure will also be issued.

8.0 CONCLUSIONS

This program, when completed, will provide reasonable assurance that existing welds at WBN are adequate, that future welding activities will meet licensing requirements, and that a welding program is in place that can demonstrate compliance with these requirements.

9.0 REFERENCES

1. NRC letter to TVA, "Welding Concerns," October 29, 1985 (L44 851105 451).

2. NRC letter to TVA, "Request for Additional Information Concerning the Project Management Plan for the Department of Energy Weld Evaluation Project for the Watts Bar Nuclear Plant, Units 1 and 2," July 24, 1986 (L44 860731 726).

3. TVA letter to NRC, December 5, 1986 (L44 861205 806).

4. TVA WP Volume 1, "Program Description."

5. TVA letter to NRC, February 17, 1988, (L44 880217 808).

6. TVA letter to NRC, "Watts Bar Nuclear Plant - Units 1 and 2 - Inadequate As-Constructed Weld Connections for Control Building Structural Framing - Final Report," August 11, 1987 (L44 870811 800).

7. TVA letter to NRC, "Watts Bar Nuclear Plant (WBN) Units 1 and 2 - Questionable Weld Radiographs Previously Accepted," July 7, 1988 (L44 880707 808).

8. TVA letter to NRC, "Watts Bar Nuclear Plant (WBN) Units 1 and 2 - Deficient Welds for Hanger Lugs on ASME Code Piping," February 27, 1989 (L44 890227 802).

9. TVA letter to NRC, "Watts Bar Nuclear Plant (WBN) Units 1 and 2 - Improper Fabrication, Inspection, and Documentation of Wall-Mounted Instrument Panels," March 16, 1988 (L44 880316 809).

10. TVA letter to NRC, "Watts Bar Nuclear Plant (WBN) Units 1 and 2 - Safety Related HVAC Duct Welding," April 12, 1988 (L44 880421 806).

11. TVA internal report, "Watts Bar Nuclear Plant (WBN) - Quality Assurance Program Review," November 25, 1987, (T19 871125 981).

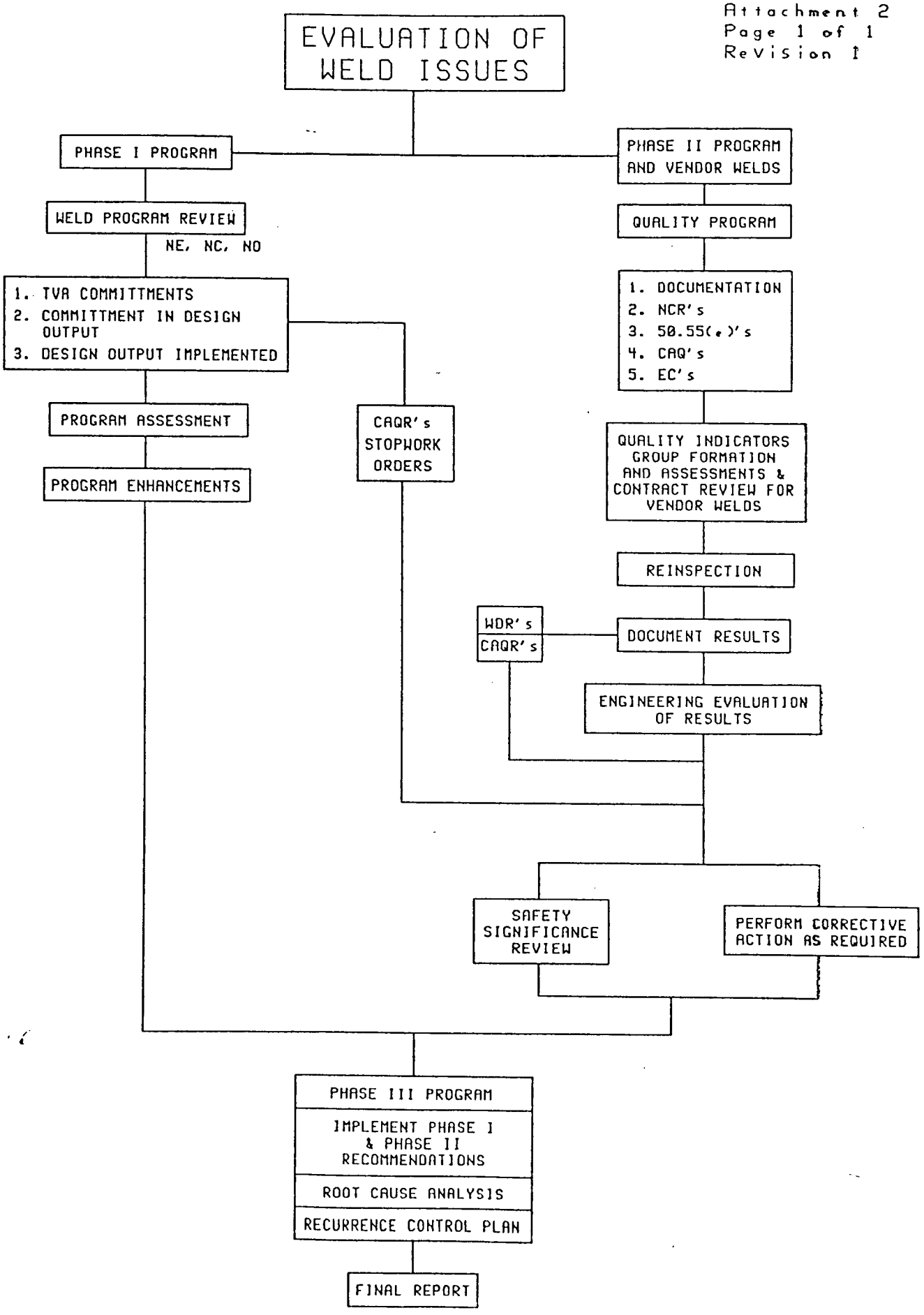
12. NRC letter to TVA, "Meeting Summary for the June 26, 1987, Meeting Between NRC and TVA Regarding Commitment to ASME Section III Requirements for Welding Activities" (T03 870714 908).

13. TVA response to NRC concern 390/86-21-05, September 25, 1988.

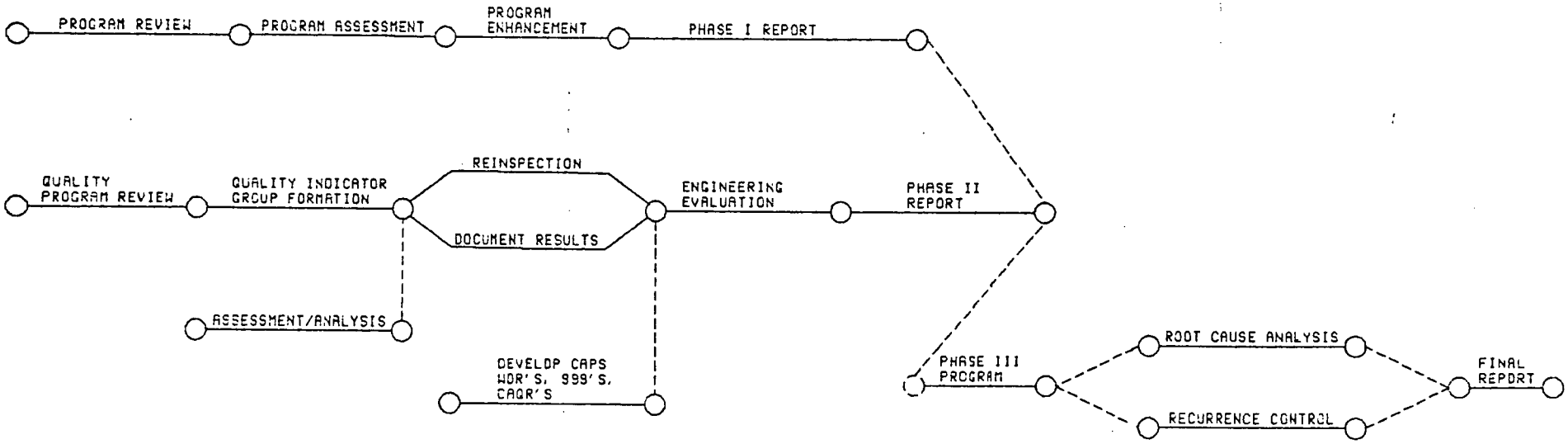
BASIS OF CAP

Several hundred Employee Concerns were reviewed to evaluate their applicability to welding problems and to establish groupings. These are found in the Weld Evaluation Project Aggregate Results of Weld Assessment Report, DOE/ID-10175-8, and Weld Evaluation Project Formation of Homogeneous Groupings of Welds, DOE/ID-10175-2.

Approximately 8,000 quality documents such as NCRs and 10 CFR 50.55(e) reports were reviewed to determine possible problem areas. The types of documents reviewed are discussed in Weld Evaluation Project Formation of Homogeneous Groupings of Welds DOE/lD-10175-2. The individual listing of each document is in the master list of Quality Indicators reviewed by DOE/WEP in January 1987. This is available to NRC upon request.


EVALUATION OF WELD ISSUES
PHASE I PROGRAM
PHASE II PROGRAM AND VENDOR WELDS
WELD PROGRAM REVIEW
NE, NC, NO
QUALITY PROGRAM
1. TVA COMMITTMENTS
2. COMMITTMENT IN DESIGN OUTPUT
3. DESIGN OUTPUT IMPLEMENTED
1. DOCUMENTATION
2. NCR's
3. 50.55(e)'s
4. CAQ's
5. EC's
PROGRAM ASSESSMENT
CAQR's STOPWORK ORDERS
QUALITY INDICATORS GROUP FORMATION AND ASSESSMENTS & CONTRACT REVIEW FOR VENDOR WELDS
PROGRAM ENHANCEMENTS
REINSPECTION
WDR's
CAQR's
DOCUMENT RESULTS
ENGINEERING EVALUATION OF RESULTS
SAFETY SIGNIFICANCE REVIEW
PERFORM CORRECTIVE ACTION AS REQUIRED
PHASE III PROGRAM
IMPLEMENT PHASE I & PHASE II RECOMMENDATIONS
ROOT CAUSE ANALYSIS
RECURRENCE CONTROL PLAN
FINAL REPORT

FRAGNET


PROGRAM REVIEW
PROGRAM ASSESSMENT
PROGRAM ENHANCEMENT
PHASE I REPORT
QUALITY PROGRAM REVIEW
QUALITY INDICATOR GROUP FORMATION
REINSPECTION
DOCUMENT RESULTS
ENGINEERING EVALUATION
PHASE II REPORT
ASSESSMENT/ANALYSIS
DEVELOP CAPS WDR'S, 999'S, CAQR'S
PHASE III PROGRAM
ROOT CAUSE ANALYSIS
RECURRENCE CONTROL
FINAL REPORT

DEFICIENCIES ADDRESSED IN PHASE II REPORT R1

1. Structural Platform Welds - Elevation 741.0

As a result of Weld Deviation Reports (WDRs) for the WBN weld program, calculations were made to check the adequacy of the as-constructed welded connections for mainframing and bracing due to cable tray support loads in the Control Building (Elevation 741.0). Ten WDRs were determined to have connections exceeding design allowables as a result of these evaluations for unit 1. This problem was identified by DOE/WEP during their evaluation and is included under TVA's Corrective Action Report SCRWBNCEB8689 which was reported under 10 CFR 50.55(e) (reference 6).

TVA performed a walkdown to inspect, evaluate, and document all field-welded connections of structural platforms at Elevation 741.0. Configurations not meeting design criteria allowables were subsequently redesigned. All deviant welds were subsequently replaced or repaired to the applicable design criteria.

The boundary for this corrective action, although commonly specified as Elevation 741.0 included welded connections on Elevations 729.0, 741.0, and 755.0 of the Control Building; and 776.0 of the Auxiliary Building. As part of the bounding process, a drawing search of structural and miscellaneous steel drawings was conducted to determine if other welded connections having unclear weld specifications existed. These were included in the boundary evaluations. The total number of connections evaluated is 1098. Most connections were reworked. R1

TVA evaluated the specific safety implications of this deficiency by performing a reanalysis of floor structure using the latest design criteria. This reanalysis assumed that the deficient connections failed, forcing loads to redistribute to other structural members. Evaluation of the floor framing system indicated that the ultimate strengths of the steel members and connections were not exceeded and, therefore, no members were in danger of failing to perform their intended safety function. R1

2. Radiographs for ASME Piping Welds

The DOE/WEP weld inspection program included the review of radiographs of ASME Section III piping which were completed during the construction period of unit 1. Approximately 400 previously accepted radiographs, representing 86 welds, were reevaluated. The review identified indications in two welds that did not meet ASME Section III requirements. Further investigation of these 400 radiographs by TVA, which included additional radiography, identified one additional unacceptable indication. The radiographic review population was subsequently expanded to include all radiographs associated with ASME Section III piping welds. This expanded review involved approximately 2,700 welds and associated radiography.

In this expanded review, all radiographs have been rereviewed during two separate rereviews, i.e., one rereview by a Level II examiner and one by a Level III examiner. An estimated 500 radiographs were rejected, representing about 350 welds. Of these, 185 welds have unacceptable indications. The remainder were rejected because of radiographic technique discrepancies or base material indications. (This includes 58 socket welds which were radiographed at the request of Westinghouse.)

All indications which deviate from ASME Section III requirements have been identified. Corrective actions, including repair of unacceptable indications and radiography for technique and film quality discrepancies, are almost complete. There have been 178 welds repaired; 4 of these welds require reradiography, and the 7 remaining welds require repair and reradiography. Completion of all corrective actions, hydrostatic testing, and final documentation of repairs on unit 1 will be completed before fuel loading. R1

TVA has identified two welds in the containment sleeves at the residual heat removal (RHR) sump suction with radiographic indications which exceed the acceptance criteria of ASME Section III. These sleeves are a part of the containment pressure boundary and not the RHR system pressure boundary. As such, they will experience no more than peak containment pressure during a design basis accident. Because the welds are embedded in concrete, repair would be extremely difficult. TVA has requested approval in accordance with 10 CFR 50.55a(a)(3) of an alternative to ASME Section III requirements.

TVA performed an evaluation of all the unit 1 welds with rejectable indications utilizing the criteria of ASME Section XI, IWB 3640, and the proposed criteria for IWB 3650 (which has been approved by the ASME Boiler and Pressure Vessel Committee and is in the process for adoption by the ASME). The results of this evaluation are that, using current piping stresses and conservative assumptions for flaw sizes, all but one of the welds with unacceptable radiographic indications in systems performing safety-related functions would have maintained their integrity for the design life of the plant had they not been identified and repaired.

One weld, when subjected to the worst design loading conditions, exceeded the conservative allowable flaw limits established by ASME Section XI. This weld is located in a portion of the steam generator wet layup system which performs no safety function (Category I (L) only) and was unnecessarily classified ASME Section III. Evaluation of this weld demonstrates that even if it failed, it would not have compromised the safe operation or shutdown of the plant.

This problem was identified under Significant Condition Reports WBN NEB 8651 which was reported under 10 CFR 50.55(e) (reference 7).

3. Piping Shear Lugs

During rework activities on unit 1 pipe supports, it was discovered that welds joining the piping shear lugs to the pipe were not complete penetration as required by the design drawings. In addition, the welds on some of the shear lugs did not extend the entire length of the lug. This nonconformance was also identified by DOE/WEP during their evaluation and was reported under SCR W-518-P for unit 1 which was reported under 10 CFR 50.55(e) (reference 8).

All shear lugs on safety-related systems will be addressed. At present, all ASME Section III, Class 1, lugs have been determined to be acceptable by ultrasonic examination. Lugs on ASME Section III, Class 2 and Class 3 code piping, where full penetration welds were specified on the design drawings, will be reanalyzed using ASME Code Case N-318 to determine the required size for fillet welds or partial penetration welds. For lugs found not to have a reinforcing fillet weld, the required minimum penetration will be established. For welds not meeting minimum requirements, fillet welds, meeting the requirements of Code Case N-318, will be added. Additionally, although the ASME Code Case is not applicable to B31.1 code piping, its logic will be used in the same manner on Category I and Category I(L) pressure boundary lugs attached with full penetration welds to this class piping located in Category I structures. The welds will require reinspection to determine if the existing fillet welds are of sufficient size to meet design requirements. The completion of this evaluation is dependent on the completion of TVA's Hanger and Analysis Up-Date Program (HAAUP). The WBN FSAR will be revised to allow the use of ASME Code Case N-318 as endorsed by NRC Regulatory Guide 1.84. R1

Reanalysis began in February 1988, is presently ongoing, and is scheduled to complete before fuel load of unit 1. The schedule for reinspection and rework, if required, will be developed based on the results of the reanalysis which is being accomplished as part of TVA's HAAUP.

An evaluation was performed to determine safety significance by selectively inspecting 120 existing lugs and performing evaluations based on design loads. Although the lugs were originally designed for a full penetration weld, the evaluation was, in general, based on the measured external fillet weld reinforcement which is consistent with ASME Code Case N-318. Of the 120 lugs, 115 were suitable for service with only the fillet welds. For the remaining five lugs, the required minimum weld penetration was determined and was confirmed to meet design requirements for the existing installation. R1

4. Wall-Mounted Instrument Panels

The seismic adequacy of approximately 122 unit 1, site-fabricated local instrument panels in several safety-related systems at WBN was questioned because of discrepancies identified in the fabricated configuration.

Weld joints were shown on the design drawings to require full penetration, single-bevel welds. However, these welds were found to generically lack the required complete penetration and joint configuration. In addition, TVA did not perform adequate structural (configuration and material verification) inspections of the instrument panels which, in conjunction with the identified weld deficiency, render the overall adequacy of the panels questionable. This problem was identified by TVA in unit 2 and reviewed for applicability in unit 1 and is included under TVA's Corrective Action Report SCR-W-559-PS, which was reported under 10 CFR 50.55(e) (reference 9).

TVA performed static load testing on two panels that were determined to exhibit the least amount of effective weld. The static tests demonstrated that the existing unit 1 panels meet long-term service qualification requirements with a significant margin. Therefore, only the two panels that were tested will be replaced.

All work is complete with the exception of reinspection of the two panels which were replaced and revision to the drawings to reflect the as-constructed condition for the remaining panels. R1

5. HVAC Ductwork Welding

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.

A QAP was established for these systems in 1980. Subsequently, the engineering design drawings were revised (December 1980) to require full penetration welds. Welds completed before this full penetration requirement were not visually inspected for compliance with this criteria. As a result, in April 1981, a stop-work order was issued (QAM 810401-002) to document the lack of a QAP and the failure to report a significant deficiency. The stop-work order was lifted in September 1981 based, in part, upon the development of an "alternate acceptance criteria" for inspection and testing. The alternate acceptance criteria established for the HVAC system included a leak test in lieu of visual weld inspection for inaccessible welds. Later, the "alternate acceptance criteria" was authorized to apply not only to inaccessible welds but to all welds. This criteria was incorporated into Construction Specification N3M-914, R2, and was applied to all safety-related HVAC ductwork, including the hydrogen collection system. Because the leak tests were performed to 25 percent over design pressure with less than 1 percent of total volume leakage, the systems were accepted as constructed.

During review of the welded HVAC ductwork, it was recognized that some partial penetration welds existed where full penetration welds are specified. This condition had escaped recognition because the alternate acceptance criteria specified in revision 2 of the Construction Specification N3M-914 permitted leak tests in lieu of weld inspection.

Two stop-work orders on the circumferential welds in all safety-related HVAC ducts (spiral-welded duct and hydrogen collection pipe) were issued on January 12, 1987. In addition, TVA developed a program to establish the structural adequacy of the welds in safety-related ductwork (including the hydrogen collection piping) for all operating conditions including a seismic event. This program includes weld survey, seismic analysis, and weld repairs, as required. R1

Safety significance evaluations are complete and design drawings have been revised to reflect the new acceptance criteria.

The safety significance evaluation for the HVAC Duct Welding Concern is documented in the NE calculation entitled "Safety Significance Evaluation for Seismic Category I HVAC Duct Welding Concern" (B41 880705 800).

This problem was identified by DOE/WEP during their evaluation and is included under Significant Condition Reports WBN MEB 8714 and 8721 which was reported under 10 CFR 50.55(e) (reference 10).

6. Structural Steel Partition Wall - Elevation 755.0

NCR 3454 required TVA to visually inspect a sample of the structural steel partition wall welds (Drawing 48N1322-1) at Elevation 755 of the Control Building at WBN unit 1. No documentation could be found to prove that the visual inspections required by this NCR had been performed.

The WEP review of TVA drawing 48N1322-1 identified 279 welds required to fabricate the structural steel partition wall. Visual inspection performed by WEP indicated 118 deviant welds requiring engineering analysis to determine structural acceptability and two structural steel beams which were found removed to accommodate HVAC equipment. Also, one bolt anchor connection had only one bolt anchor in place of two, and the splice details were shown incorrectly. The corrective action specified was to document reanalysis of the structure, perform safety significance and revise calculations and drawings as required, and repair, as necessary.

Engineering calculations have determined that the wall would not have failed assuming the deviant conditions had gone undetected.

7. Temporary Attachments - Piping

Employee Concern WI-85-053-003 indicated that the documentation for required NDE of postweld heat treatment (PWHT) thermocouple (minor temporary attachments) removal areas could not be located. This condition was documented utilizing NCR-W-599-P. Areas were identified and required magnetic particle (MT) examination performed with no rejectable areas identified by the MT. However, minimum wall thickness requirements were not met on two components and four welds due to grinding operations. Work to correct these violations is ongoing. This item was identified by DOE/WEP and is included in their report.

8. Classification of Containment Liner Welds

During the review of WBN unit 1 welding, several discrepancies were identified by TVA and DOE/WEP personnel on drawings for ASME Section III Class MC (metal containment) welds. Some attachments were classified as TVA Piping Class I which had never been defined. This issue was resolved under TVA's Corrective Action Reports WBP 870561, WBP 870562, and WBP 870563. All affected drawings are being revised to reflect the correct class by DCN P-00385-A for unit 1. DOE/WEP reported that some attachments that were classified as MC welds possibly should have been classified as AWS welds. TVA's review of the design drawings revealed that the welds were properly classified. These welds were installed as TVA Class B welds which are equivalent to ASME Code Class MC; therefore, there was no impact on hardware.

9. Monorail Assembly - Missing Structural Brace

During the DOE/WEP reinspection of Group 263, "Safety-Related Civil Welds Fabricated and Installed Prior to February 13, 1981"; the component selected at random for reinspection was found to vary from the as-constructed drawing. A support brace noted as having been installed was missing. The engineering evaluation of the component, a monorail support assembly, showed the component to be unacceptable for use-as-is. The missing brace had never been installed, but has been installed as part of the corrective actions taken for CAQR WBP 870661. R1

10. Independent Weld Deviation Reports (IDRs)

During the course of field work by DOE/WEP and TVA personnel, perceived hardware discrepancies outside the scope of the unit 1 weld evaluation were identified and documented on IDRs. These IDRs have been evaluated by the responsible WBN line organization to determine their validity and to determine if the condition was adverse to quality.

Of 474 IDRs issued, approximately 50 CAQRs were issued addressing approximately 250 of the issues raised in the IDRs. These CAQRs are in various stages of evaluation and completion and a limited number to date required rework.

11. Employee Response Team Investigation Report IN-85-851-001 identified discrepancies in several welds on one of the main steam impingement sleeves located outside of the unit 1 Auxiliary Building. The slugged girth weld discrepancy was confirmed and resolved by NCR W-325-P; however, the WP has been unable to locate evidence that the remaining discrepancies have been addressed. TVA will investigate the remaining discrepancies as part of the overall WBN welding evaluation.

12. Welds in the unit 1 north/south valve room evaluated by DOE/WEP were found to be acceptable upon completion of the engineering evaluation; however, DOE/WEP recommended further review of welds in the north/south valve room. An assessment of structural welds that were examined by UT has been completed by engineering calculations which concluded that the welds were acceptable as-is. The assessment of other weld connections of fabricated members has not been completed. TVA is currently developing a recommendation for these connections.

OTHER ACTIVITIES ASSOCIATED WITH WELDING R1

1. Audit Program Review

   At the request of NRC, a review of the WBN audit program for the period of 1974 through 1986 was conducted by a joint team of TVA and DOE/WEP personnel. The review was completed, and a report was issued by NQA (reference 11). The results of this review and applicable recommendations are included in the TVA Phase II report. R1

2. Evaluation of Generic NCRs

   A number of generic (containing large populations of welds) nonconforming condition reports (NCRs) were initiated throughout the TVA welding program beginning in 1980. The nonconforming conditions related principally to the geometric attributes of fillet and socket welds. At WBN, NCRs were issued against large groups of like items, e.g., structural steel welds, electrical support welds, pipe support welds, etc. Because many of the weld deviations reported through the DOE/WEP reinspections also related to weld geometry (size, length, and location), WP elected to review the NCRs to determine if a significant number of the currently reported deviations might also have been addressed earlier by the TVA quality assurance program. R1

TVA conducted a number of sample reinspections to evaluate hardware addressed by the NCRs. Based on the sample selected, the entire population of components was considered to be acceptable. WP will compare the conclusions of these NCRs with DOE/WEP unit 1 conclusions and will document the results of the comparison in the WP Final Report. R1

The following NCRs for the hardware indicated are covered by this activity:

NCR 2019R	Pipe Supports
NCR 2111R4	ASME Code Fillet Welds
NCR 2375R1	Cable Tray Supports Miscellaneous Steel Items Conduit Supports
NCR 2654R1	HVAC Duct Supports
NCR WBNSWP8008 NCR 2807R	Fillet Welded Skewed T-Joints
NCR 3001R3	Pipe Rupture Protection Devices R1
NCR 3523R	Protection Devices before 1-1-81
NCR 3579R	Misc. Platforms, Ladders, and Stairs
NCR 4093R	All Structural and Misc. Steel except Platforms, Ladders, and Stairs,
NCR 4753R	Structural Steel

3. Code Applicability for Work Performed After Completion of N-5 Data Reports

After completion of the N-5 Data Reports for ASME Section III piping systems, welding activities have been performed at WBN in accordance with ASME Section XI, Inservice Inspection. In June 1987, a meeting was held between TVA and the NRC to discuss code applicability for these activities. The NRC advised TVA that they consider WBN to be a plant still under construction, and the NRC position, provided in a July 1987

letter (reference 12), stated that ASME welding activities at WBN should be performed to the construction Code of Record, ASME Section III, 1971 Edition through Summer 1973 Addenda. In addition, the NRC required TVA to review any such activities to identify where work was performed in accordance with ASME Section XI or by a nonstamp holder. TVA was required to identify these as exceptions to the Code of Record and to request approval from the NRC for the proposed alternatives as prescribed by 10CFR50.55a(a)(3).

TVA has revised the WBN welding program to require that welding activities affecting ASME code systems be performed in accordance with the construction Code of Record.

TVA reviewed repair, replacement, and modification activities that had been performed on ASME code systems since the completion of the system N-5 data report forms. This review identified 215 workplans and 313 maintenance requests that represent exceptions to the construction Code of Record.

TVA evaluated these exceptions and determined that all welding was performed in accordance with ASME Section III. However, required pressure tests were performed in accordance with ASME Section XI rather than ASME Section III and a few of the workplans did not have the required Authorized Nuclear Inspector (ANI) review for material acceptance.

The pressure tests will be reperformed in accordance with ASME Section III and applicable work plans will be forwarded to the ANI for material acceptance review. All work will be in compliance with ASME Section III or exceptions will be submitted to the NRC for review and concurrence.

4. Code of Record

NA-1140 of ASME Section III addresses the use of later editions and addenda of the Code that are less restrictive than the Code of Record (1971 Edition through Summer 1973 Addenda for WBN). TVA's original interpretation of this requirement was inappropriate in that necessary governing documents were not revised and concurrence was not obtained for cases where less restrictive editions/addenda were utilized.

TVA reviewed 21 welding and welding related specifications to determine where less restrictive editions/addenda were utilized. Twenty-one areas were identified that were less restrictive than the Code of Record.

Each area was evaluated and justification provided. The results of the evaluations and the justifications were forwarded to the NRC in August 1987.

5. Welds on Vendor-Supplied Equipment

At the request of the NRC (reference 2), vendor welds were added to the scope of TVA's weld evaluation. This evaluation was assigned to WBN NQA (reference 3) to complete. Vendors were selected by using QIs compiled by the WP. Deviant conditions were evaluated by NE. A report was submitted to NRC in late March 1989 which provides results, recommendations, and corrective actions resulting from the evaluations.

	Vendor	Quality Indicator	Status
1)	York Electro	WDB 871191	As a result of the dynamic analysis performed on a sample of the vendor panels, NE has determined that the vendor welds provided meet design specification requirements.
2)	PDM	NCR 1725	Approximately 40 percent of the radiograph/weld sectors for units 1 and 2 Refueling Water Storage Tanks have been reviewed with an unacceptable rejection rate by TVA inspectors. This examination sample was expanded to include the primary makeup water storage tanks (2) also fabricated by PDM. Corrective action is being developed to address vendor welds determined to be unacceptable and to review the remaining radiographs. Unacceptable welds will be repaired to meet ASME requirements. R1
3)	Bergen Patterson	E.C. IN-85-127-001	Previous corrective actions adequately addressed vendor deficiencies - no reinspection required.

4)	Broad Line	NCR 1168	100 percent of the vendor welds have been reexamined. Defects were found and technique deficiencies were detected. Radiographs are currently being reevaluated to the AWS building code criteria.	R1
5)	W Valve Operators	NCR 6454	Previous corrective actions adequately addressed vendor deficiencies - no reinspection required	

	Vendor	Status	
6)	Radiation Monitoring	Previous corrective action adequately addressed scope of vendor deficiencies - no reinspection required.	
7)	Dravo	Reinspection complete. Only minor surface conditions were identified during the visual weld reinspections of the vendor welds. The CAQRs will track corrective actions to completion.	R1
8)	Masoneilan	Reinspection complete. The undersized welds identified have been determined by NE calculation to be acceptable. The CAQRs were closed with a use-as-is disposition.	
9)	CBI	Previous corrective actions adequately addressed vendor deficiencies.	
10)	Tube Turn	Previous corrective actions adequately addressed vendor deficiencies.	
11)	WRD-NTD	Previous corrective actions adequately addressed vendor deficiencies.	
12)	Stearn Rogers	Previous corrective actions adequately addressed vendor deficiencies.	
13)	Yuba	Previous corrective actions adequately addressed vendor deficiencies.	
14)	W Accumulator Tanks	Previous corrective actions adequately addressed vendor deficiencies.	
15)	Opeilaka Tank	Previous corrective actions adequately addressed vendor deficiencies.	
16)	Julieus Mock	Previous corrective actions adequately addressed vendor deficiencies.	

6. During the Nondestructive Examination (NDE) Level II and Level 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. (Two welds were identified to have two different types of discrepancies.)

Of the about 2650 WBN unit 1 and common (to unit 2) ASME Section III piping welds requiring radiographic testing, approximately 2080 welds were radiographed, interpreted as acceptable during construction, and independently rereviewed and accepted. The remaining approximately 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 identifying radiographic identification discrepancies. R1

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.

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 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 unidentified radiographs is not necessary. R1

7. The NRC identified a concern (390/86-21-05) relating to verification of fillet weld adequacy. The concern specifically involved the fitup requirements of the American Welding Society (AWS) Structural Welding Code-Steel (AWS D1.1).

   Both DOE/WEP and the WP evaluated this concern. The DOE/WEP evaluation concluded that "verification of fit-up for structural steel is not a safety-significant issue at WBNP-1" (reference 5). The WP concluded that even though the program changed somewhat throughout the period of structural welding, the minimum requirements of AWS D1.1 were met (reference 13). Revision of applicable procedures and training of personnel involved with fitups have enhanced the program.

ENCLOSURE 2

For the Watts Bar Nuclear Plant, TVA commits to:

- The Nuclear Engineering (NE) program review was based on determination of the welding-related commitments from the FSAR and other licensing documents.

- The Nuclear Engineering (NE) program review was based on the determination that the welding-related commitments were properly reflected in the design output documents.

- The Nuclear Engineering (NE) program review was based on analysis of quality indicators and employee concerns applicable to NE for indications of programmatic deficiencies.

- The Nuclear Engineering (NE) program review was based on determination of the adequacy of the NE program to produce documents that correctly reflect the technical requirements required by the welding commitments.

- The Nuclear Construction (NC) program review was based on a review of the construction site-implementing procedures to determine if they correctly incorporate and convey all of the necessary welding requirements.

- The Nuclear Construction (NC) program review was based on evaluation of weld repair and weld cutout rates of safety-related pipe welds.

- The Nuclear Construction (NC) program review was based on analysis of the quality indicators and employee concerns applicable to NC for indications of programmatic deficiencies.

- The Nuclear Operations (NO) program review was based on a review of the NO site-implementing procedures to determine if they correctly incorporate and convey all the necessary welding requirements.

- The Nuclear Operations (NO) program review was based on analysis of quality indicators and employee concerns applicable to NO for indications of programmatic deficiencies.

- The Phase I program resulted in several general and programmatic recommendations for improving the WBN welding program including recommendations for training and revisions to engineering specifications. A complete list of these preliminary recommendations will be included in the Phase I report.

- Phase II was an in-depth review of the implementation of the welding program at WBN. The principal elements of this phase of the evaluation were a physical reinspection of the welded structures and components in the plant; detailed evaluation of the welding-related ECs identified through the WBN ECSP; and a review and analysis of welding-related quality indicators (QIs).

For the Watts Bar Nuclear Plant, TVA commits to:

- Results of the TVA EC evaluation will be included in the ECSP WBN Subcategory Report 50400 and TVA Welding Category Report 50000. (This commitment relates only to Watts Bar welding-related employee concerns evaluated by TVA ECSP.)

- The TVA Phase II report was forwarded to NRC in early April, 1989.

- Phase III is an evaluation, integration, and upgrading of welding-related programs and procedures to ensure that future welding activities at TVA, including those at WBN, are conducted in accordance with licensing requirements.

- NQA will perform an evaluation of the effectiveness of these program modifications. Further corrective actions will be implemented if deemed necessary by the evaluation.

- Each TVA nuclear organization associated with welding has and/or is making applicable revisions to its individual program to establish a single, unified program that can be implemented for initial construction, modification, and maintenance activities within the particular organization's area of responsibility. The Welding Program Coordination Team (WBCT) will review the summation of these parts to ensure an effective overall program for TVA.

- In addition to the Weld Program (WP) review, NE is conducting a comprehensive review of licensing and regulatory commitments relating to welding. Based on the review results, a series of new specifications will be prepared to delineate these requirements.

- Engineering requirements of G-29 shall be incorporated into the new NE welding specifications, as applicable.

- Nuclear Construction (NC) is currently developing an integrated program for the control of field welding and related processes.

- Proficiency testing and examinations will be added to the program for certification of contractor personnel performing quality inspections and examinations.

- Nuclear Quality Assurance (NQA) is currently implementing a plan, which when complete will (as with NC) provide a single, unified welding program for NQA.

For the Watts Bar Nuclear Plant, TVA commits to:

- A structural brace of the monorail assembly was not installed though shown as being installed on the as-constructed drawing. The missing brace was installed. The WP considers this matter to be a configuration control issue rather than a welding issue. TVA will include this issue among others being evaluated for significance, root cause analysis, and recurrence control.

- All shear lugs on safety-related systems will be addressed. At present, all ASME Section III, Class 1, lugs have been determined to be acceptable by ultrasonic examination. Lugs on ASME Section III, Class 2 and Class 3 code piping, where full penetration welds were specified on the design drawings, will be reanalyzed using ASME Code Case N-318 to determine the required size for fillet welds or partial penetration welds. For lugs found not to have a reinforcing fillet weld, the required minimum penetration will be established.

- TVA performed static load testing on two panels that were determined to exhibit the least amount of effective weld. The static tests demonstrated that the existing unit 1 panels meet long-term service qualification requirements with a significant margin. Therefore, only the two panels that were tested will be replaced.

- At the request of NRC, a review of the WBN audit program for the period of 1974 through 1986 was conducted by a joint team of TVA and DOE/WEP personnel. The review was completed, and a report was issued by NQA. The results of this review and applicable recommendations are included in the TVA Phase II report,

- WP will compare the conclusions of these NCRs with DOE/WBP unit 1 conclusions and will document the results of the comparison in the WP final report. (NOTE: The affected NCRs are listed on page 24 of the CAP.

- The pressure tests will be reperformed in accordance with ASME Section III and applicable work plans will be forwarded to the ANI for material acceptance review. All work will be in compliance with ASME Section III or exceptions will be submitted to the NRC for review and concurrence.

- The NQA evaluation (TVA weld evaluation) is scoped and in process with an estimated completion date of 3/30/89, including all NE evaluations.

- A report was submitted to NRC in late March 1989 which provides results, recommendations, and corrective actions resulting from the evaluations.

For the Watts Bar Nuclear Plant, TVA commits to:

- Employee Response Team Investigation Report IN-85-851-001 identified discrepancies in several welds on one of the main steam impingement sleeves located outside of the unit 1 Auxiliary Building. The slugged girth weld discrepancy was confirmed and resolved by NCR W-325-P; however, the WP has been unable to locate evidence that the remaining discrepancies have been addressed. TVA will investigate the remaining discrepancies as part of the overall WBN welding evaluation.

- The assessment of other weld connections of fabricated members has not been completed. TVA is currently developing a recommendation for these connections.

- Recommendations of the WP Phase I, Phase II, and Final Reports will be evaluated by the applicable line organization(s) and implemented as appropriate. Results of the WP Phase I, Phase II, and Final Report recommendations will be evaluated by NQA to determine their effectivity. R1