EMPLOYEE CONCERNS

SPECIAL PROGRAM

VOLUME 2
ENGINEERING CATEGORY

SUBCATEGORY REPORT 21200
PIPE SUPPORT PROGRAM

UPDATED

TVA

NUCLEAR POWER

TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM

REPORT NUMBER: 21200

REPORT TYPE: SUBCATEGORY REPORT FOR ENGINEERING

REVISION NUMBER: 3

TITLE: PIPE SUPPORT PROGRAM

REASON FOR REVISION:

1. Revised to incorporate SRP and TAS comments, and CAPS.

2. Revised to incorporate additional SRP and TAS comments; added Attachment C (References).

3. Revised to incorporate SRP and TAS comments.

PREPARATION

PREPARED BY:

SIGNATURE — DATE 11/23/87

REVIEWS

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SIGNATURE — DATE 11-23-87

TAS:

SIGNATURE — DATE 11/30/87

CONCURRENCES

SIGNATURE	DATE		SIGNATURE*	DATE
		CEG-H:		11-30-87
		SRP:		12-3-87

APPROVED BY:

ECSP MANAGER — DATE 11/30/87

* SRP Secretary's signature denotes SRP concurrences are in files.

EXECUTIVE SUMMARY

This subcategory report summarizes and assesses the results of eight element evaluations prepared for the Engineering Subcategory 21200, Pipe Support Program. The element evaluations examine 26 issues related to TVA's four nuclear plants, Sequoyah, Watts Bar, Browns Ferry, and Bellefonte. The issues were derived from a total of six employee concerns which cited perceived deficiencies in the Pipe Support Program, and were mainly related to design documentation and as-built verification problems.

Of the 26 issues evaluated, 20 were found to require no corrective action. Corrective action plans have been established by TVA for the remaining six issues, and the evaluation team has concurred with each.

Of the six issues requiring corrective action, four are to resolve peripheral findings identified during the evaluations. The remaining two corrective actions were initiated by TVA before Employee Concern Task Group (ECTG) evaluation.

The causes for the negative findings are diverse, with no single category of cause dominating. The corrective actions for this subcategory that were judged to be significant are to correct potential and actual interferences between piping and adjacent plant features designed by different groups at Watts Bar; ensure that all required stress analyses have been performed at Watts Bar; correct deficiencies of Bellefonte IE Bulletin 79-14 program procedural documents and void procedures CEB EP 21.30 and BLEP-08; correct the insufficient clearance of a Browns Ferry drywell purge system piping support to accommodate piping thermal movement; and provide a dedicated work force to complete the Browns Ferry 79-14 effort.

The corrective action requiring recreation of the numerous missing or destroyed pipe support calculations is judged to be significant even though no safety-related problem has been identified because it reflects a breakdown in TVA's engineering and QA programs. Although the missing calculations problem has been addressed in detail in element evaluation 212.1 for Watts Bar only, it is known that Sequoyah has experienced similar document retention problems and is currently regenerating and issuing pipe support calculations. Browns Ferry and Bellefonte have not been evaluated specifically for this issue. However, the TVA essential calculation program discussed in subcategory 24600 will identify and resolve problems regarding missing calculations for Bellefonte or Browns Ferry.

With the exception of potential interference of piping with other plant features on Watts Bar and Bellefonte's 79-14 program, TVA's Pipe Support Program procedures were found to be generally adequate. In addition, problems associated with missing or destroyed Watts Bar calculations and the omission of one stress analysis on Watts Bar arose partly from a lack of monitoring the thoroughness of implementation of the procedures. The evaluation team believes that the failure to fully implement procedures would have been identified and corrected by an effective design review process and through a more aggressive QA audit program.

The TVA Corporate Nuclear Performance Plan describes corrective actions for improving the design control process. It includes organizational changes to clarify technical responsibilities for monitoring and controlling technical performance. The changes, when properly implemented, should improve the TVA pipe support program. The discipline branch chiefs are to schedule and perform technical reviews on major systems throughout the design effort. In addition, an organization known as Engineering Assurance has been established, and is responsible for technical audits and providing feedback to engineering management on technical performance.

The causes identified and other evaluation results are being reexamined from a wider perspective in the Engineering category evaluation.

Preface

This subcategory report is one of a series of reports prepared for the Employee Concerns Special Program (ECSP) of the Tennessee Valley Authority (TVA). The ECSP and the organization which carried out the program, the Employee Concerns Task Group (ECTG), were established by TVA's Manager of Nuclear Power to evaluate and report on those Office of Nuclear Power (ONP) employee concerns filed before February 1, 1986. Concerns filed after that date are handled by the ongoing ONP Employee Concerns Program (ECP).

The ECSP addressed over 5800 employee concerns. Each of the concerns was a formal, written description of a circumstance or circumstances that an employee thought was unsafe, unjust, inefficient, or inappropriate. The mission of the Employee Concerns Special Program was to thoroughly investigate all issues presented in the concerns and to report the results of those investigations in a form accessible to ONP employees, the NRC, and the general public. The results of these investigations are communicated by four levels of ECSP reports: element, subcategory, category, and final.

Element reports, the lowest reporting level, will be published only for those concerns directly affecting the restart of Sequoyah Nuclear Plant's reactor unit 2. An element consists of one or more closely related issues. An issue is a potential problem identified by ECTG during the evaluation process as having been raised in one or more concerns. For efficient handling, what appeared to be similar concerns were grouped into elements early in the program, but issue definitions emerged from the evaluation process itself. Consequently, some elements did include only one issue, but often the ECTG evaluation found more than one issue per element.

Subcategory reports summarize the evaluation of a number of elements. However, the subcategory report does more than collect element level evaluations. The subcategory level overview of element findings leads to an integration of information that cannot take place at the element level. This integration of information reveals the extent to which problems overlap more than one element and will therefore require corrective action for underlying causes not fully apparent at the element level.

To make the subcategory reports easier to understand, three items have been placed at the front of each report: a preface, a glossary of the terminology unique to ECSP reports, and a list of acronyms.

Additionally, at the end of each subcategory report will be a Subcategory Summary Table that includes the concern numbers; identifies other subcategories that share a concern; designates nuclear safety-related, safety significant, or non-safety related concerns; designates generic applicability; and briefly states each concern.

Either the Subcategory Summary Table or another attachment or a combination of the two will enable the reader to find the report section or sections in which the issue raised by the concern is evaluated.

The subcategories are themselves summarized in a series of eight category reports. Each category report reviews the major findings and collective significance of the subcategory reports in one of the following areas:

- management and personnel relations
- industrial safety
- construction
- material control
- operations
- quality assurance/quality control
- welding
- engineering

A separate report on employee concerns dealing with specific contentions of intimidation, harassment, and wrongdoing will be released by the TVA Office of the Inspector General.

Just as the subcategory reports integrate the information collected at the element level, the category reports integrate the information assembled in all the subcategory reports within the category, addressing particularly the underlying causes of those problems that run across more than one subcategory.

A final report will integrate and assess the information collected by all of the lower level reports prepared for the ECSP, including the Inspector General's report.

For more detail on the methods by which ECTG employee concerns were evaluated and reported, consult the Tennessee Valley Authority Employee Concerns Task Group Program Manual. The Manual spells out the program's objectives, scope, organization, and responsibilities. It also specifies the procedures that were followed in the investigation, reporting, and closeout of the issues raised by employee concerns.

ECSP GLOSSARY OF REPORT TERMS*

classification of evaluated issues the evaluation of an issue leads to one of the following determinations:

Class A: Issue cannot be verified as factual

Class B: Issue is factually accurate, but what is described is not a problem (i.e., not a condition requiring corrective action)

Class C: Issue is factual and identifies a problem, but corrective action for the problem was initiated before the evaluation of the issue was undertaken

Class D: Issue is factual and presents a problem for which corrective action has been, or is being, taken as a result of an evaluation

Class E: A problem, requiring corrective action, which was not identified by an employee concern, but was revealed during the ECTG evaluation of an issue raised by an employee concern.

collective significance an analysis which determines the importance and consequences of the findings in a particular ECSP report by putting those findings in the proper perspective.

concern (see "employee concern")

corrective action steps taken to fix specific deficiencies or discrepancies revealed by a negative finding and, when necessary, to correct causes in order to prevent recurrence.

criterion (plural: criteria) a basis for defining a performance, behavior, or quality which ONP imposes on itself (see also "requirement").

element or element report an optional level of ECSP report, below the subcategory level, that deals with one or more issues.

employee concern a formal, written description of a circumstance or circumstances that an employee thinks unsafe, unjust, inefficient or inappropriate; usually documented on a K-form or a form equivalent to the K-form.

evaluator(s) the individual(s) assigned the responsibility to assess a specific grouping of employee concerns.

findings includes both statements of fact and the judgments made about those facts during the evaluation process; negative findings require corrective action.

issue a potential problem, as interpreted by the ECTG during the evaluation process, raised in one or more concerns.

K-form (see "employee concern")

requirement a standard of performance, behavior, or quality on which an evaluation judgment or decision may be based.

root cause the underlying reason for a problem.

*Terms essential to the program but which require detailed definition have been defined in the ECTG Procedure Manual (e.g., generic, specific, nuclear safety-related, unreviewed safety-significant question).

Acronyms

AI	Administrative Instruction
AISC	American Institute of Steel Construction
ALARA	As Low As Reasonably Achievable
ANS	American Nuclear Society
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
BFN	Browns Ferry Nuclear Plant
BLN	Bellefonte Nuclear Plant
CAQ	Condition Adverse to Quality
CAR	Corrective Action Report
CATD	Corrective Action Tracking Document
CCTS	Corporate Commitment Tracking System
CEG-H	Category Evaluation Group Head
CFR	Code of Federal Regulations
CI	Concerned Individual
CMTR	Certified Material Test Report
COC	Certificate of Conformance/Compliance
DCR	Design Change Request
DNC	Division of Nuclear Construction (see also NU CON)

DNE	Division of Nuclear Engineering
DNQA	Division of Nuclear Quality Assurance
DNT	Division of Nuclear Training
DOE	Department of Energy
DPO	Division Personnel Officer
DR	Discrepancy Report or Deviation Report
ECN	Engineering Change Notice
ECP	Employee Concerns Program
ECP-SR	Employee Concerns Program-Site Representative
ECSP	Employee Concerns Special Program
ECTG	Employee Concerns Task Group
EEOC	Equal Employment Opportunity Commission
EQ	Environmental Qualification
EMRT	Emergency Medical Response Team
EN DES	Engineering Design
ERT	Employee Response Team or Emergency Response Team
FCR	Field Change Request
FSAR	Final Safety Analysis Report
FY	Fiscal Year
GET	General Employee Training
HCI	Hazard Control Instruction
HVAC	Heating, Ventilating, Air Conditioning
II	Installation Instruction
INPO	Institute of Nuclear Power Operations
IRN	Inspection Rejection Notice

L/R	Labor Relations Staff
M&AI	Modifications and Additions Instruction
MI	Maintenance Instruction
MSPB	Merit Systems Protection Board
MT	Magnetic Particle Testing
NCR	Nonconforming Condition Report
NDE	Nondestructive Examination
NPP	Nuclear Performance Plan
NPS	Non-plant Specific or Nuclear Procedures System
NQAM	Nuclear Quality Assurance Manual
NRC	Nuclear Regulatory Commission
NSB	Nuclear Services Branch
NSRS	Nuclear Safety Review Staff
NU CON	Division of Nuclear Construction (obsolete abbreviation, see DNC)
NUMARC	Nuclear Utility Management and Resources Committee
OSHA	Occupational Safety and Health Administration (or Act)
ONP	Office of Nuclear Power
OWCP	Office of Workers Compensation Program
PHR	Personal History Record
PT	Liquid Penetrant Testing
QA	Quality Assurance
QAP	Quality Assurance Procedures
QC	Quality Control
QCI	Quality Control Instruction

QCP	Quality Control Procedure
QTC	Quality Technology Company
RIF	Reduction in Force
RT	Radiographic Testing
SQN	Sequoyah Nuclear Plant
SI	Surveillance Instruction
SOP	Standard Operating Procedure
SRP	Senior Review Panel
SWEC	Stone and Webster Engineering Corporation
TAS	Technical Assistance Staff
T&L	Trades and Labor
TVA	Tennessee Valley Authority
TVTLC	Tennessee Valley Trades and Labor Council
UT	Ultrasonic Testing
VT	Visual Testing
WBECSP	Watts Bar Employee Concern Special Program
WBN	Watts Bar Nuclear Plant
WR	Work Request or Work Rules
WP	Workplans

CONTENTS

TABLES

1. INTRODUCTION

This subcategory report summarizes and assesses the results of the Employee Concerns Special Program (ECSP) element evaluations prepared under Engineering Subcategory 21200, Pipe Support Program. This subcategory covers those concerns related to the execution of the pipe support design documentation, and installation and as-built verification activities, but does not include those concerns related to technical aspects involving pipe supports. These technical aspects of pipe supports are covered in subcategory reports 22000, 22100, and 25500. In addition, several programmatic aspects related to this subcategory (particularly corrective actions) are covered in Subcategory Report 24600 and are cross-referenced in this report wherever appropriate.

The employee concerns provide the basis for the element evaluations and are listed by element number in Attachment A. The plant location where the concern was originally identified and the applicability of the concern to other TVA nuclear plants are also identified.

The evaluations are summarized in the balance of this report as follows:

- Section 2 -- summarizes, by element, the issues stated or implied in the employee concerns and the determination of generic applicability
- Section 3 -- outlines the process followed for the element and subcategory evaluations
- Section 4 -- summarizes, by element, the findings and identifies the negative findings that must be resolved
- Section 5 -- highlights the corrective actions required for resolution of the negative findings cited in Section 4 and relates them to element and to plant site
- Section 6 -- identifies causes of the negative findings
- Section 7 -- assesses the significance of the negative findings
- Attachment A -- lists, by element, each employee concern evaluated in the subcategory. The concern number is given, along with notation of any other element or category with which the concern is shared; the plant sites to which it could be applicable are noted; and the concern is quoted as received by TVA, and is characterized as safety related, not safety related, or safety significant
- Attachment B -- contains a summary of the element-level evaluations. Each issue is listed, by element number and plant, opposite its corresponding findings and corrective actions. The

reader may trace a concern from Attachment A to an issue in Attachment B by using the element number and applicable plant. The reader may relate a corrective action description in Attachment B to causes and significance in Table 3 by using the CATD number which appears in Attachment B in parentheses at the end of the corrective action description.

The term "Peripheral finding" in the issue column refers to a finding that occurred during the course of evaluating a concern but did not stem directly from an employee concern. These are classified as "E" in Tables 1 and 2 of this report

- Attachment C -- lists the references cited in the text

2. SUMMARY OF ISSUES/GENERIC APPLICABILITY

The employee concerns listed in Attachment A for each element and plant have been examined and the potential problems raised by the six concerns have been identified as 26 separate issues. Evaluation of these issues was done in eight elements.

The 26 issues evaluated under this subcategory, grouped by element, are summarized in the following subsections. The rationale given for the determination of their generic applicability is based upon of the results of these evaluations and current knowledge of these issues.

2.1 Retention of Calculation Records - Element 212.1

TVA Office of Engineering (OE) management is unaware of mandatory American National Standards Institute (ANSI) requirements pertaining to document retention, as evidenced by the destruction of pipe support calculations prepared by EDS Nuclear, Inc. (EDS), as well as other difficulties associated with calculation retrievability and their degree of completeness.

The specific concern was evaluated only for WBN, and it was found that management was aware of ANSI requirements. There was no basis to evaluate the specific concern for any other plant since it pertains to management awareness of mandatory ANSI requirements.

2.2 NRC Bulletin 79-14, ABR Program - Element 212.2

The TVA program for implementing and documenting its 79-14 as-built reconciliation (ABR) program is inadequate; the containment spray piping system does not agree with as-builts, and was inappropriately analyzed by the alternate analysis method rather than a rigorous analysis method.

This issue was evaluated for all four plants.

2.3 Design Features in Pipe Hanger Program - Element 212.3

The large number of field change requests (FCRs) required to facilitate pipe support construction indicates that inadequacies in the design process exist, particularly with regard to work performed by Impell contract personnel.

This issue was not evaluated for SQN and BFN because construction of these plants was completed long before the concern was first documented at WBN. Because the concern is directly related to FCR/construction phase activities, it is applicable only to, and was evaluated for, those plants (WBN and BLN) where construction is not yet completed.

2.4 Frequently Changing Hangers - Element 212.4

Design changes to pipe supports (hangers) are excessive and are made for no apparent reason. Some are changed back to original design.

This issue was evaluated only for the plant at which the concern originated (WBN) because the concern statement describes a detailed, site-specific condition. In addition, because the concern was found not to be valid, no similar evaluation of other plants was deemed necessary.

2.5 Summary of Subcategory Issues

The issue summaries above deal with perceived deficiencies in the pipe support program. More specifically, one element is concerned with document retention (212.1), one deals with the adequacy of the as-built reconciliation program (212.2), and the remaining two pertain to perceived design inadequacies reflected by the change control process (212.3 and 212.4).

Each issue evaluated within the element evaluations is stated fully in Attachment B, which also lists corresponding findings and corrective actions that are discussed in Sections 4 and 5 of this report.

3. EVALUATION PROCESS

This subcategory report is based on the information contained in the applicable element evaluations prepared to address the specific employee concerns related to the issues broadly defined in Section 2. The evaluation process is given below.

3.1 Element Evaluation Process

The following steps were taken to prepare element evaluations.

3.1.1 Retention of Calculation Records - Element 212.1 (WBN only)

a. Reviewed the applicable ANSI N45.2.9-1974 (Ref. 17) document retention requirements for lifetime quality assurance records.

b. Reviewed 10 CFR 50 Quality Assurance criteria (Ref. 16) to determine the prescribed division of document retention responsibility between the applicant (TVA) and contractors (such as EDS).

c. Reviewed applicable portions of the WBN FSAR and TVA document retention procedures (Refs. 18, 19, and 20) to ensure that the above ANSI and 10 CFR 50 requirements are adequately addressed.

d. Reviewed the personal services contract between TVA and EDS (Ref. 21) to determine if the 10 CFR 50 division of responsibility requirements regarding document retention were properly addressed.

e. Held discussion with TVA EN DES personnel, as required.

f. Evaluated a demonstration of TVA's microfilming system during a visit to the Knoxville office.

g. Reviewed a sample of 30 pipe support calculations (Ref. 22) to verify that a Records and Information Management System (RIMS) number exists for each.

h. Reviewed TVA's corrective action plan for CATD 212 01 WBN 01

3.1.2 NRC Bulletin 79-14, ABR Program - Element 212.2

a. Reviewed program for NRC IE Bulletin 79-14 inspections, identification, and resolution of discrepancies (all plants) (Refs. 1, 23 through 26, 38, 39 through 42, 49 through 56, and 71 through 74).

b. Reviewed a sample of discrepancies identified in the 79-14 program to verify the adequacy of resolution documentation (WBN, BFN, and SQN) (Refs. 27, 28, 29, 30, 44, and 57).

c. Defined the boundaries of the containment spray system by comparison by TVA with similar systems for SQN (Ref. 43) (BFN only).

d. Investigated containment spray piping for type of analysis performed; i.e., rigorous or alternate (all plants) (Refs. 2, 3, 31 through 34, 44, 58, 59, 60, 75, and 76).

e. Reviewed available containment spray system design and fabrication isometrics for configuration of pipe routing and weld locations (WBN, SQN, and BFN only). BLN construction was not complete; therefore, this step was not applicable (Refs. 35, 36, 37, 45, 46, 47, 48, and 61 through 70).

f. Reviewed TVA's corrective action plans for CATD 212 02 WBN 01, 212 02 BFN 01, and 212 02 BLN 01.

3.1.3 Design Features in Pipe Hanger Program - Element 212.3

a. Requested that TVA provide data related to the field change requests (FCRs) such as audit reports, meeting notes, sample drawings affected by FCRs, together with project processed FCRs, etc., to enable the evaluation team to assess the employee concern (WBN only).

b. Reviewed FCR statistics for Impell, Gilbert/Commonwealth Associates, and TVA-designed drawings, design review report, field change request study reports, meeting notes, and support drawings with FCRs (WBN only) (Refs. 77 through 87).

c. Reviewed various memoranda regarding the TVA constructibility inspection group "OASES" program (Refs. 88 and 89) (WBN only).

d. Selected, at random, a total of 75 supports: 15 for each design entity - Impell, Grinnell, Gilbert/Commonwealth, TVA Civil Design Group (jobsite), and TVC Civil Design Group (Knoxville) - involved in the design of BLN pipe supports. This selection was made from BLN Pipe Hanger Information System, PGM Z42091. TVA was requested to provide pipe support drawings that are affected by FCRs, support modification requests (SMRs), nonconformance reports (NCRs), etc., together with copies of approved FCRs, SMRs, NCRs, etc. (BLN only) (Ref. 90).

e. The evaluation team reviewed FCRs, SMRs, and NCRs referenced above in light of the design deficiencies as reported by the concerned individual. The reasons for the drawing changes were grouped into categories to facilitate arriving at conclusions regarding the validity of the concern. The categories were Interference, Material Substitution, Tolerance, Drafting/Documentation, Welding, Stress Analysis, and Original Design Assumption (WBN and BLN).

3.1.4 Frequently Changing Hangers - Element 212.4 (WBN only)

a. Reviewed spring support design requirements (Refs. 96 and 97).

b. Selected a sample of pipe support drawings to verify the reasons for their revisions (Ref. 98).

c. Reviewed applicable procedures that allow changes to be made to pipe support designs (Refs. 91 through 95).

3.2 Subcategory Evaluation Process

The following steps were taken to prepare subcategory evaluations.

a. Tabulated issues, findings, and corrective actions from the element evaluations in a plant-by-plant arrangement (see Attachment B).

b. Prepared Tables 1, 2, and 3 to permit comparison and identification of common and unique issues, findings, and corrective actions among the four plants.

c. Classified the findings and corrective actions from the element evaluations using the ECSP definitions.

d. On the basis of ECSP guidelines, analyzed the collective significance and causes of the findings from the element evaluations.

e. Evaluated defined corrective actions to determine if additional actions are required as a result of causes found in step d.

f. Provided additional judgment or information that may not be apparent at the element level.

4. FINDINGS

The findings from each of the eight element evaluations for this subcategory are contained in Attachment B. The findings are listed by element number and by plant.

The following subsections are a discussion of those findings.

4.1 Retention of Calculation Records - Element 212.1

For Watts Bar, the TVA procedures, FSAR, and microfilming process were found to be adequate in addressing the document retention requirements of ANSI N45.2.9-1974, thus indicating a high level of awareness of these requirements on the part of TVA OE management.

The peripheral finding involving the inadvertent destruction of Watts Bar pipe support calculation records prepared by EDS Nuclear, Inc. (EDS) was a result of breakdowns in communication between TVA and EDS, as well as between the TVA contract administration engineer and the TVA Civil Engineering Branch Chief. TVA committed to recreate all destroyed or missing calculations.

Because this situation is known to be a problem at SQN, and because there is no known reason to exclude BFN or BLN from this review, the issue of missing or destroyed calculations should be addressed at the other three plants.

As SQN is currently regenerating calculations, no further ECTG evaluation is necessary, because the necessary corrective action has already been identified.

The status of pipe support calculations at BFN and BLN is not known. However, any missing calculations will be identified through the implementation of the essential calculation program, which is tracked by the CATDs listed in Table 3 of Subcategory Report 24600. Therefore, no further evaluation or corrective action is required for this issue.

4.2 NRC Bulletin 79-14, ABR Program - Element 212.2

For Watts Bar, both phases of the 79-14 program were found to be adequate. Discrepancies noted during these two phases were well documented, with no major generic problems identified other than the potential interference of piping with other plant features. The as-constructed piping configuration for the WBN containment spray system agrees with the as-designed configuration, including pipe support types and locations, as well as fitting welds. With one exception, the containment spray piping was analyzed by either rigorous or alternate methods as appropriate in accordance with the analysis method applicability criteria. TVA was unable to provide evidence that the 8-inch overflow piping from the refueling water storage tank had been analyzed by either method. TVA committed to perform this analysis and review other systems to ensure completeness of the stress analyses.

For Browns Ferry, only Phase I of the three-phase 79-14 program is complete. The NRC issued notices of violations as a result of several inspections and audits. In addition, the Nuclear Safety Review Staff (NSRS) has noted that discrepancy tracking, scheduling, planning, and quality assurance (QA) involvement were not satisfactory during Phase I (Ref. 15). The NSRS findings, as stated in the report, included:

- Issuance of support drawings or modifications without formal issuance of isometrics or load tables
- Inappropriate emphasis (bordering on employee intimidation) by TVA management on avoiding hardware modifications, regardless of analytical results
- Lack of basic technical training of piping analysts

- Use of unqualified checkers
- Failure of Quality Assurance (QA) to perform audits and surveillance of identified problem areas within piping analysis sections

Resolution of discrepancies discovered during Phase I was found to be adequately documented. One support for the drywell purge system piping was identified during Phase I as having a potential interference problem. However, EN DES in Knoxville was never informed. Although rigorous analysis of Browns Ferry drywell spray headers was not originally required, this piping will be rigorously analyzed under Phase II of the 79-14 program because of a change in piping classification for this system. The as-constructed configuration of the two Browns Ferry drywell spray headers matches the as-designed configuration with minor deviations. Because of a lack of available information, a similar verification for the spray header in the torus could not be made. This verification will be included in the Long-Term Torus Integrity Program.

For Sequoyah unit 1, the 79-14 program for pipe supports is adequate in its current form as a result of substantial improvements made by TVA. The 79-14 program for Sequoyah unit 2 was found to be adequately performed. Resolution of discrepancies for the Sequoyah 79-14 program is properly documented, and calculations have been performed where required. Within reasonable tolerance, the as-constructed piping configuration and associated field welds for the Sequoyah containment spray system agree with the as-designed configuration, including pipe support types and locations. Most of the Sequoyah containment spray piping was analyzed by the rigorous method. The small portion of this piping analyzed by the alternate method was eligible for that application.

For Bellefonte, the 79-14 program has not been implemented and is not required at its current stage of construction. However, a corrective action plan has been established to eliminate deficiencies in the applicable procedures.

4.3 Design Features in Pipe Hanger Program - Element 212.3

A study of FCR-related statistics for Watts Bar pipe support work did not indicate a significant difference in quality of work performed by Impell when compared with similar work performed by TVA and Gilbert/Commonwealth. FCR statistics cannot be used as the sole criterion for judging the quality of design work; various factors beyond the control of the design originator may contribute to a high number of FCRs. An informal constructibility group, referred to by TVA as OASES, made a positive impact on reducing the number of FCRs and improving the quality of design for WBN unit 2. The FCRs and SMRs for Bellefonte did not indicate a significant lack of checking or other problems. These changes are part of a normal design and installation process.

4.4 Frequently Changing Hangers - Element 212.4

Twenty-eight randomly selected pipe supports (with revisions) from several Watts Bar safety-related systems were reviewed by the evaluation team. All revisions were found to have valid reasons and, in the majority of cases, were necessitated by either FCRs or ECNs.

4.5 Summary of Subcategory Findings

The findings are summarized in Table 1. Class A and B findings indicate there is no problem and that corrective action is not required. Class C, D, and E findings require corrective actions.

Of the 26 findings identified by a classification in Table 1, 20 require no corrective action and two had corrective action initiated before ECTG evaluations. Four peripheral findings uncovered during the ECTG evaluation require corrective action. Findings are summarized by classification in Table 2.

Where more than one finding/corrective action is identified in Table 1 for a single finding (e.g., element 212.2, Finding f), Table 2 counts only the single classification which has the greater impact on the Employee Concerns Program. Therefore, Table 2 identifies only one finding/corrective action for each issue evaluated.

5. CORRECTIVE ACTIONS

Table 1 identifies six findings that require corrective action. The detailed corrective action descriptions are provided in Attachment B. A condensation of this information by element, with the applicable plant identified in parentheses, follows:

- 212.1, Retention of Calculation Records - Per SCRWBNCEB8531 R1:
  - Review all WBN calculations for basic completeness.
  - Ensure that all WBN calculations are in the Records and Information Management System (RIMS).
  - Prepare, issue, and document calculations for all missing and incomplete calculation packages and those not meeting requirements of the two actions above. (WBN)
- 212.2, NRC Bulletin 79-14, ABR Program
  - Implement a program to correct all potential interferences between piping and adjacent plant features for unit 1. A WBN procedure was scheduled to be issued on July 9, 1987 which should prevent recurrence in both units. (WBN)

- Initiate piping stress analysis and pipe support design work for the 8-inch overflow piping coming from the refueling water storage tank (applicable to both units). Also review other seismic Category I system drawings to ensure that stress analyses have been performed. (WBN)

- Revise current procedure CEB 80-76, and void procedures CEB EP21.30 and BLEP-08 and replace them with new ones. (BLN)

- Remove the affected unit 2 pipe support (H87 at elevation 629 feet 9 inches) and a similar unit 3 pipe support. (BFN)

- Provide a dedicated work force to complete the 79-14 effort. A task performance contract has been let to effect a timely completion. (BFN)

These corrective actions are also summarized in Table 3, along with their corresponding finding/corrective action classifications. The table shows the plant or plants to which a corrective action is applicable, in the Corrective Action Tracking Document (CATD) column, where the applicable plant is identified by the CATD number.

From the Finding/Corrective Action Classification column of Table 3, it can be seen that the six corrective actions identified involve the regeneration and documentation of destroyed or missing calculations, the implementation of a program to correct potential interferences coupled with the issuance of a new procedure, piping stress analysis for a system that was previously overlooked, and completion of Browns Ferry's 79-14 program, and one involves a pipe support with a thermal interference problem. An additional corrective action plan will eliminate procedural deficiencies in Bellefonte's 79-14 program. Finally, with respect to corrective actions, Table 3 shows that, of the four elements in this subcategory, two (212.3 and 212.4) require no corrective action. The element requiring the largest number of corrective actions is 212.2, NRC Bulletin 79-14 ABR Program, which has five.

All four corrective action plans issued by TVA, covering a total of six corrective actions, were found to be acceptable by the evaluation team to resolve the findings.

Additional corrective actions required to resolve the QA-related aspects of the problems outlined in this Pipe Support Program subcategory are established in Subcategory Report 24600. Those programmatic corrective actions that pertain to this Pipe Support Program subcategory are summarized as follows:

- o 205.1, Calculation Preparation, Updating, and Records Retention Requirements - The TVA Essential Calculation Program (ECP) takes the first step in correcting past deficiencies.. Calculations are being

reviewed for unverified assumptions, reasonable method/approach, etc., and are monitored in calculation logs in accordance with engineering procedures. Each engineering discipline is to provide a detailed schedule for the post-restart, long-term completion of the ECP (all plants).

- 205.3, Calculation Record Retention - A lower-tier procedure will be written to supplement the nuclear engineering procedures (NEP) that control calculation records (all plants).

  This procedure will be a site-specific engineering project administrative instruction that will address the following topics in more detail.

  - Collection, filing, and storage requirements for completed or approved calculations
  - Schedule requirements for the routine microfilming of approved calculations
  - Definition of a final calculation

The Corporate Nuclear Performance Plan (CNPP) points out that the responsibility of engineering for each nuclear plant has now been assigned to a project engineer who ensures that technical direction provided by the chief discipline engineers is followed for project work. The project engineer is also responsible for assuring that design changes are reviewed and approved by engineering personnel for compliance with technical specifications and other regulatory requirements and commitments.

It was also noted in the CNPP that TVA's nuclear QA activities were not performed under a consistent set of programs and procedures, and that TVA's nuclear QA groups did not report to a high level of management within TVA, thereby diminishing the visibility and importance of these activities to management. TVA has since reorganized the reporting relationships so that all quality assurance and quality control functions now report to the Director of Nuclear Quality Assurance who reports to the Manager of Nuclear Power.

The discipline branch chiefs are responsible for conducting technical reviews of the design parameters of the major plant systems to evaluate the quality, technical accuracy and adequacy, and the economy of the products and services for which they are responsible. These reviews are scheduled by the branch chief when an area in the design nears completion and before it is approved for use.

The CNPP also discusses the establishment of an Engineering Assurance (EA) organization. It is the responsibility of EA to assure that the Nuclear Quality Assurance Program is applied to TVA nuclear engineering and design

activities. The various functions performed by EA include conducting program audits at regular intervals, conducting in-depth technical audits, and reviewing and approving documents used to procure engineering services from the QA point of view.

The reorganization outlined in the CNPP, coupled with the corrective actions for the negative findings within this Pipe Support Program subcategory, should rectify the problems related to management of the design process and related QA activities, and should prevent the possibility of recurrence.

6. CAUSES

Table 3 also identifies the causes of each problem requiring corrective action. The most important cause of the corrective actions for the Bellefonte and Browns Ferry 79-14 programs is identified using the judgment of the evaluation team. For the other corrective actions, it was felt that the problem was the result of a combination of causes, each of which should be identified.

For element 212.1, the required corrective action is broad-based in its overall scope. Because this element covers calculations that were destroyed, misidentified in the Records and Information Management System (RIMS), or otherwise acknowledged to be incomplete, the evaluation team indicated in Table 3 that three of the 17 possible causes contributed to the overall problem. The immediate causes of this problem are "Inadequate Communication" and "Lack of Management Attention." "Inadequate Q-Training," while not the immediate cause, is equally important. The three causes are further described below:

Causes for element 212.1 as indicated in Table 3 are:

- "Inadequate Communication" - TVA authorized the disposal of the EDS-originated calculations on the basis of the erroneous assumption that TVA would have continued access to EDS' microfilmed records. The problem was compounded by the apparent misunderstanding between the TVA Civil Branch chief and a TVA contract administration engineer that TVA already had copies of the essential calculation documents in its possession.

- "Lack of Management Attention" - In addition to the incidents of inadequate communication mentioned above, the personal services contract awarded by TVA to EDS was inadequate in that it included no provision for allowing continued TVA access to EDS's microfilmed records, nor did it provide for regularly scheduled turnover of completed calculations to TVA for processing and lifetime storage. Without such provisions, the intent of ANSI N45.2.9-1974 requirements could not be achieved. In addition, TVA management's failure to question the lack of periodic, detailed QA audits of EDS during the life of the contract may be inconsistent with the intent of 10 CFR 50 licensing requirements. These problems occurred even though TVA management was aware of the ANSI document retention requirements.

- "Inadequate Q-Training" - Section XVIII of 10 CFR 50 Appendix B states that it is QA's responsibility to conduct periodic audits to verify compliance with and the effectiveness of all aspects of the quality assurance program. TVA could have exercised greater control over the calculation retention issue by scheduling more frequent audits to ensure that documented calculations existed as required and were being prepared, retained, and turned over to TVA according to ANSI N45.2.9-1974 requirements. Additional training of personnel, supervisors, branch chiefs, and managers regarding document retention requirements and audits to verify implementation of these requirements would also have been beneficial.

For element 212.2, the most important cause for the first corrective action, which is associated with potential interferences between piping and adjacent plant features at Watts Bar, is "Inadequate Procedures." These potential interferences were the most frequent discrepancy found in the Watts Bar 79-14 inspection program and can be attributed to the fact that existing procedures lacked the proper controls to prevent such problems. The other two causes ("Lack of Design Detail" and "Insufficient Verification Documentation") cited in Table 3 for this corrective action are largely the result of "Inadequate Procedures."

The second Watts Bar corrective action for element 212.2 deals with the omission of piping stress analysis and pipe support design work for an 8-inch pipe. The evaluation team has concluded that this problem primarily reflects a breakdown of TVA's engineering program, in which Engineering failed to assure that all work included in its scope of responsibility was completed.

The third corrective action for element 212.2 pertains to a Browns Ferry pipe support with inadequate clearance for accommodating a design basis accident pipe movement. TVA has issued a corrective action plan to remove this support. The evaluation team believes that TVA field personnel should have informed EN DES (DNE) in Knoxville of this discovery. Since this was not done, the evaluation team has cited "Inadequate Communication" as an important cause, in addition to three other causes.

The fourth corrective action required for element 212.2 pertains to dedicating a work force responsible for completing Browns Ferry's 79-14 program. The delayed completion resulted from the many problems encountered in the implementation and scheduling of this program, due to manpower limitations and the low priority given to the effort.

The fifth corrective action required for element 212.2 pertains to elimination of procedural deficiencies in Bellefonte's 79-14 program. "Inadequate Procedures" is the only cause cited for this element on Bellefonte.

Causes for element 212.2 as indicated in Table 3 are:

- "Inadequate Procedures" - The problem of potential interferences between piping and adjacent plant features at Watts Bar necessitated the development of a new procedure that transcends the activities of individual design groups in order to cover those interference problems that were not detected during the design process. The BLN procedures were not complete and are to be revised and updated before implementation.

- "Inadequate Communication" - During a 79-14 inspection walkdown performed by TVA at Browns Ferry, it was noted that a drywell purge system pipe support had pipe clearances that were inadequate to accommodate a Design Basis Accident pipe movement. It was later discovered that no design drawing existed for that support, thus preventing further investigation of the possible discrepancy. In spite of this, the individuals responsible for the 79-14 activity failed to inform the engineering organization in Knoxville of this important finding.

- "Untimely Resolution of Issues" - This cause also was cited for the same incident of inadequate communication mentioned above.

- "Inadequate Calculations" - The stress analysis of an 8-inch overflow piping system coming from a refueling water storage tank at Watts Bar was never performed.

- "Inadequate As-built Reconciliation" - The erroneous omission of stress analysis for the 8-inch overflow piping at Watts Bar was discovered by the evaluation team during preparation of element evaluation 212.2. Also, the Browns Ferry pipe support with insufficient pipe clearance (discussed above in the Inadequate Communication section) was never brought to the attention of the Knoxville engineering organization. The BFN 79-14 program is not yet completed.

- "Lack of Design Detail" - Potential interferences between piping and adjacent plant features at Watts Bar were not completely accounted for during the design process.

- "Insufficient Verification Documentation" - Watts Bar piping design and analysis documentation was insufficient to audit the adequacy of design and installation because potential interferences between piping and adjacent plant features were not completely accounted for. Also, no stress analysis documentation exists for the aforementioned 8-inch overflow piping system at Watts Bar.

- "Engineering Error" - The originator of the previously mentioned Browns Ferry drywell purge system pipe support design failed to consider the Design Basis Accident pipe movement.

In summary, the three causes related to missing and destroyed calculations are all within the "management effectiveness" portion of Table 3. The distribution of causes for the TVA 79-14 program shows a total of four within the "management effectiveness" portion, seven within "design process effectiveness," and one within "technical adequacy."

7. COLLECTIVE SIGNIFICANCE

The six concerns expressed in this subcategory resulted in four issues requiring six corrective actions. Four corrective actions of the total of six were for peripheral findings uncovered during the ECTG evaluation.

The Pipe Support Program of TVA was found to be generally adequate in terms of its established procedures. With two exceptions (potential interference of piping with other plant features at Watts Bar, where a new procedure was issued, and Bellefonte's 79-14 program, where minor procedural deficiencies need to be eliminated), the evaluation team did not find any instances in which the problems associated with the concerns in this subcategory could have been prevented or minimized by enhancements to the procedures.

With few exceptions, the pipe support program was found to be technically adequate. However, the five findings associated with the 79-14 program in element 212.2 are judged to be significant by the evaluation team. The two findings associated with piping interferences at Watts Bar and the pipe support with insufficient clearance at Browns Ferry that might have resulted in stress allowables being exceeded are judged to be significant. The third finding judged to be significant deals with the 8-inch refueling water piping at Watts Bar for which no stress analysis or support design work was performed. Although this error is an inadvertent omission of required analysis, it raises the possibility that other piping systems of a similar nature might also have been overlooked. The corrective action plan for CATD 212 02 WBN 01 requires review of other safety-related systems to resolve this question.

The fourth and fifth findings judged to be potentially significant involve elimination of procedural deficiencies associated with Bellefonte's 79-14 program, and completion of Browns Ferry's 79-14 program.

The remaining corrective action discussed in this subcategory report is judged not to be safety significant by the evaluation team. The question of missing and destroyed calculations has been addressed by a sampling program that demonstrated the adequacy of the affected pipe supports. However, even though no safety-related problem has been identified as such, the violations of document retention requirements are significant because they reflect a breakdown in TVA's Engineering and QA programs.

In conclusion, although all but one of the specific issues were found to be invalid, four of the six findings noted within this subcategory as requiring corrective action were related to peripheral findings uncovered during ECTG evaluation, with corrective action being required for each. The remaining two issues, which were found to be valid, are the only ones that were specific to the element (Bellefonte and Browns Ferry 79-14 program inadequacies).

The evaluation of four elements grouped within this pipe support program subcategory did not lead to any collective significance in the overall sense, although the effectiveness of both management and supervision at the design group level should be questioned. On the other hand, the observed procedural deficiencies are fairly typical to any nuclear project's 79-14 program, particularly in view of the multiphase aspects that are essential to assure a thorough as-built review.

The problems associated with the missing and destroyed calculations were attributed primarily to poor communication and lack of attention to the proper implementation of document retention requirements by Engineering and management personnel. The key to a successful pipe support program from a management point of view is the assignment to design group lead positions of individuals who fully appreciate the need for coordination and thorough documentation, as well as two-way communication with field (or office) counterparts, vendors, and the discipline chief's office. It is obvious that the best procedures possible cannot guarantee a successful engineering effort, unless the engineering supervision performs its role effectively.

In addition, there was a breakdown in the QA program caused by not conducting a more aggressive audit program to ensure that all aspects of the documentation retention requirements with respect to vendors were being satisified. While it is not the responsibility of QA to duplicate the Engineering organization's efforts, management must require that periodic QA audit reports be issued on an established schedule and must carefully review the results of these reports to ensure the effectiveness of the audits. Within the limited scope of the Pipe Support Program subcategory, the

evaluation team does not consider it appropriate to analyze the QA breakdowns any further, other than to state the observed occurrence. The important question of the interface between management and QA, and the extent of individual responsibilities in preventing such problems, are addressed in Subcategory Report 24600.

In addition to QA audits, the Civil Engineering Branch Chief's office should conduct its own periodic technical audits and reviews. These will provide the needed assurance that the design work is adequate from an engineering point of view.

These observations pertaining to the proper roles of management and QA (including the discipline chief engineers) are also discussed in TVA's Corporate Nuclear Performance Plan (CNPP).

The results of this subcategory evaluation are being combined with the other subcategory evaluations and reassessed for the Engineering category in a single report.

TABLE 1

CLASSIFICATION OF FINDINGS AND CORRECTIVE ACTIONS

	Element	Issue/ Finding**	Finding/Corrective Action Class* SQN	WBN	BFN	BLN
212.1	Retention of Calculation Records	a	-	A	-	-
		b	-	E3	-	-
212.2	NRC Bulletin 79-14, ABR Program	a	A	A	C6	C2
		b	A	A	A	A
		c	A	A	A	A
		d	A	A	A	A
		e	-	E5	-	-
		f	-	E1 E2	E1	-
212.3	Design Features in Pipe Hanger Program	a	-	A	-	A
		b	-	A	-	-
		c	-	A	-	-
212.4	Frequently Changing Hangers	a	-	A	-	-

*Classification of Findings and Corrective Actions

A. Issue not valid. No corrective action required.
B. Issue valid but consequences acceptable. No corrective action required.
C. Issue valid. Corrective action initiated before ECTG evaluation.
D. Issue valid. Corrective action taken as a result of ECTG evaluation.
E. Peripheral issue uncovered during ECTG evaluation. Corrective action required.

1. Hardware
2. Procedure
3. Documentation
4. Training
5. Analysis
6. Evaluation
7. Other

**Defined in Attachment B.

TABLE 2

FINDINGS SUMMARY

		Plant				
	Classification of Findings	SQN	WBN	BFN	BLN	Total
A.	Issue not valid. No corrective action required.	4	9	3	4	20
B.	Issue valid but consequences acceptable. No corrective action required.	0	0	0	0	0
C.	Issue valid. Corrective action initiated before ECTG evaluation.	0	0	1	1	2
D.	Issue valid. Corrective action taken as a result of ECTG evaluation.	0	0	0	0	0
E.	Peripheral issue uncovered during ECTG evaluation. Corrective action required.	0	3	1	0	4
	Total	4	12	5	5	26

ELEM	FINDING/ CORRECTIVE ACTION CLASS.**	CORRECTIVE ACTION	CATD	CAUSES OF NEGATIVE FINDINGS * — MANAGEMENT EFFECTIVENESS							DESIGN PROCESS EFFECTIVENESS							TECHNICAL ADEQUACY			Significance of Corrective Actions*		
				1 Fragmented Organization	2 Inadequate Q-trng	3 Inadequate Procedures	4 Procedures Not Followed	5 Inadequate Communication	6 Untimely Res of Issues	7 Lack of Mgt Atten	8 Inadequate Design Bases	9 Inadequate Calcs	10 Inadequate As-blt Reconcil.	11 Lack of Design Detail	12 Engrg Judgmt not Documented	13 Design Crit/ Commit Not Met	14 Insuf. Verif Documentation	15 Stds Not Followed	16 Engrg Error	17 Vendor Error	D	M	H
212.1	E3	Per SCRWBNCEB8531 R1: 1) Review all calculations for basic completeness 2) Ensure that all calculations are in Records and Information Management System (RIMS) 3) Prepare, issue, and document calculations for all missing and incomplete calculation packages and those not meeting requirements of 1 and 2 above.	WBN 01		X			X		X											A	P	P
212.2	E1 E2	Implement a program to correct all potential interferences between piping and adjacent plant features for unit 1. WBN procedure WBEP-EP 43.20 RO will be issued on 07/09/87 which should prevent recurrence in both units.	WBN 01			X								X			X				P	P	P
	E5	Initiate piping stress analysis and pipe support design work for the 8-inch overflow piping coming from the refueling water storage tank (applicable to both units). Also review other seismic Category I system drawings to ensure that stress analyses have been performed.	WBN 01									X	X				X				A		P

* Defined in the Glossary Supplement.

** Defined in Table 1.

ELEM	FINDING/ CORRECTIVE ACTION CLASS.**	CORRECTIVE ACTION	CATU	CAUSES OF NEGATIVE FINDINGS *																	Significance of Corrective Actions*		
				MANAGEMENT EFFECTIVENESS							DESIGN PROCESS EFFECTIVENESS							TECHNICAL ADEQUACY					
				1 Fragmented Organization	2 Inadequate Utilization	3 Inadequate Procedures	4 Procedures Not Followed	5 Inadequate Communication	6 Untimely Res of Issues	7 Lack of Mgt Atten	8 Inadequate Design Bases	9 Inadequate Calcs	10 Inadequate As-blt Reconcil.	11 Lack of Design Detail	12 Engrg Judgmt not Documented	13 Design Crit/ Commit Not Met	14 Insuf. Verif Documentation	15 Stds Not Followed	16 Engrg Error	17 Vendor Error	D	M	H
	E1	The proposed corrective action is to delete the subject unit 2 support H87 and support H33 in unit 3.	BFN 01					X	X				X						X		A	P	A
	C6	Provide a dedicated workforce to complete the 79-14 effort. A task performance contract has been let to effect a timely completion.	BFN 01										X								P	P	P
	C2	Current procedure CEB 80-76 will be revised and procedures CEB EP 21.30 and BLEP-08 will be voided and will be replaced with new procedures.	BLN 01			X															P		
			Totals		1	2		2	1	1		1	3	1			2		1				

* Defined in the Glossary Supplement.

** Defined in Table 1.

GLOSSARY SUPPLEMENT
FOR THE ENGINEERING CATEGORY

Causes of Negative Findings - the causes for findings that require corrective action are categorized as follows:

1. Fragmented organization - Lines of authority, responsibility, and accountability were not clearly defined.

2. Inadequate quality (Q) training - Personnel were not fully trained in the procedures established for design process control and in the maintenance of design documents, including audits.

3. Inadequate procedures - Design and modification control methods and procedures were deficient in establishing requirements and did not ensure an effective design control program in some areas.

4. Procedures not followed - Existing procedures controlling the design process were not fully adhered to.

5. Inadequate communications - Communication, coordination, and cooperation were not fully effective in supplying needed information within plants, between plants and organizations (e.g., Engineering, Construction, Licensing, and Operations), and between interorganizational disciplines and departments.

6. Untimely resolution of issues - Problems were not resolved in a timely manner, and their resolution was not aggressively pursued.

7. Lack of management attention - There was a lack of management attention in ensuring that programs required for an effective design process were established and implemented.

8. Inadequate design bases - Design bases were lacking, vague, or incomplete for design execution and verification and for design change evaluation.

9. Inadequate calculations - Design calculations were incomplete, used incorrect input or assumptions, or otherwise failed to fully demonstrate compliance with design requirements or support design output documents.

10. Inadequate as-built reconciliation - Reconciliation of design and licensing documents with plant as-built condition was lacking or incomplete.

11. Lack of design detail - Detail in design output documents was insufficient to ensure compliance with design requirements.

12. Failure to document engineering judgments - Documentation justifying engineering judgments used in the design process was lacking or incomplete.

13. Design criteria/commitments not met - Design criteria or licensing commitments were not met.

14. Insufficient verification documentation - Documentation (Q) was insufficient to audit the adequacy of design and installation.

15. Standards not followed - Code or industry standards and practices were not complied with.

16. Engineering error - There were errors or oversights in the assumptions, methodology, or judgments used in the design process.

17. Vendor error - Vendor design or supplied items were deficient for the intended purpose.

Classification of Corrective Actions - corrective actions are classified as belonging to one or more of the following groups:

1. Hardware - physical plant changes

2. Procedure - changed or generated a procedure

3. Documentation - affected QA records

4. Training - required personnel education

5. Analysis - required design calculations, etc., to resolve

6. Evaluation - initial corrective action plan indicated a need to evaluate the issue before a definitive plan could be established. Therefore, all hardware, procedure, etc., changes are not yet known

7. Other - items not listed above

Peripheral Finding (Issue) - A negative finding that does not result directly from an employee concern but that was uncovered during the process of evaluating an employee concern. By definition, peripheral findings (issues) require corrective action.

Significance of Corrective Actions - The evaluation team's judgment as to the significance of the corrective actions listed in Table 3 is indicated in the last three columns of the table. Significance is rated in accordance with the type or types of changes that may be expected to result from the corrective action. Changes are categorized as:

- Documentation change (D) - This is a change to any design input or output document (e.g., drawing, specification, calculation, or procedure) that does not result in a significant reduction in design margin.

- Change in design margin (M) - This is a change in design interpretation (minimum requirement vs actual capability) that results in a significant (outside normal limits of expected accuracy) change in the design margin. All designs include margins to allow for error and unforeseeable events. Changes in design margins are a normal and acceptable part of the design and construction process as long as the final design margins satisfy regulatory requirements and applicable codes and standards.

- Change of hardware (H) - This is a physical change to an existing plant structure or component that results from a change in the design basis, or that is required to correct an initially inadequate design or design error.

If the change resulting from the corrective action is judged to be significant, either an "A" for actual or "P" for potential is entered into the appropriate column of Table 3. Actual is distinguished from potential because corrective actions are not complete and, consequently, the scope of required changes may not be known. Corrective actions are judged to be significant if the resultant changes affect the overall quality, performance, or margin of a safety-related structure, system, or component.

ATTACHMENT A

EMPLOYEE CONCERNS
FOR SUBCATEGORY 21200

Attachment A -- lists, by element, each employee concern evaluated in the subcategory. The concern's number is given, along with notation of any other element or category with which the concern is shared; the plant sites to which it could be applicable are noted; and the concern is quoted as received by TVA, and characterized as safety related, not safety related, or safety significant.

ELEMENT	CONCERN NUMBER	PLANT LOCATION	APPLICABILITY SQN	WBN	BFN	BLN	CONCERN DESCRIPTION*
212.1	IN-85-110-004 (shared with 20500)	WBN		X			"Lack of awareness by TVA OE Management (names given) of requirements to document the load carrying capabilities of pipe supports for future reference. TVA Management ignorant of requirements of ANSI N45.2.9 for retention of design calculations as permanent plant records." (SR)
212.2	IN-85-027-001	WBN	X	X	X	X	"TVA program for implementing NRC Bulletin 79-14 inadequate. Design calculation documentation is lacking." (SR)
	SQN-86-002-02	SQN	X	X	X	X	"During the exit interview, the CI stated that containment spray line piping drawings and weld map do not agree with the as-builts. Alternate analysis was used instead of rigorous analysis, drawings were not corrected." (SS)
212.3	IN-85-153-002	WBN		X		X	"Design features in pipe hanger design are not complete, checked, or researched. TVA has contracted two engineering firms to walk down areas prior to designing pipe hangers. Contrary to this, CI stated that a large percentage of design documents at WBN are inadequately checked and researched. This inadequacy is evidenced by the large number of FCR's required to facilitate construction of the items. Specific concerns expressed over the quality of Impell contract personnel work on hangers in system 62, 63 and 72. Construction Department concern." (SR)
	IN-85-867-002			X			Large number of FCR's are generated due to lack of thorough final constructability inspection. (NO)
212.4	IN-85-754-002	WBN		X			"Frequently changing hangers for no apparent reason which causes a severe waste of material and money. Concern is generic to Units 1 & 2. As an example: a spring hanger size 11 is selected for a certain hanger, six months later it will be changed to size 12 and a year later to size 14, and following year it will go back to size 11 again." (NO)

* SR/NO/SS indicates safety related, not safety related, or safety significant per determination criteria in the ECTG Program manual and applied by TVA before evaluations.

ATTACHMENT B

SUMMARY OF ISSUES, FINDINGS, AND
CORRECTIVE ACTIONS FOR
SUBCATEGORY 21200

Attachment B -- contains a summary of the element-level evaluations. Each issue is listed, by element number and plant, opposite its corresponding findings and corrective actions. The reader may trace a concern from Attachment A to an issue in Attachment B by using the element number and applicable plant. The reader may relate a corrective action description in Attachment B to causes and significance in Table 3 by using the CATD number which appears in Attachment B in parentheses at the end of the corrective action description.

The term "Peripheral finding" in the issue column refers to a finding that occurred during the course of evaluating a concern but did not stem directly from an employee concern. These are classified as "E" in Tables 1 and 2 of this report.

Issues	Findings	Corrective Actions
********** Element 212.1 - Retention of Calculation Records **********		
SQN (N/A) WBN	SQN (N/A) WBN	SQN (N/A) WBN
a. TVA OE Management is unaware of the mandatory ANSI requirements for documentation and retention of design calculations as permanent plant records.	a. The evaluation team compared TVA's applicable procedures (EN DES-EP 1.14, EP 3.03, EP 5.14, and OEP-16) and FSAR (Section 17-2) against the requirements of ANSI N45.2.9-1974, and determined that they provide sufficient guidance to cover these requirements. The team noted, however, that none of the procedures or applicable portions of the FSAR included a representative listing of typical examples of lifetime quality assurance records. Nevertheless, the degree of completeness of the procedures and FSAR is a positive indication of TVA OE management's high level of awareness of ANSI requirements in this regard. In addition, a sample of 30 calculations was reviewed to ascertain that each one has a Management and Engineering Data System (MEDS) number, thus signifying that all calculations within the sample were processed for microfilming by the originating organization.	a. None required.
b. The following issue was discovered during the evaluation team's investigation of the stated concern: Pipe support calculations prepared by EDS Nuclear, Inc. and later destroyed by TVA fall within the category of Lifetime Quality Assurance Records, as described in Section 2.2.1 of ANSI N45.2.9-1974. This destruction of calculations is an illustration of TVA management's lack of awareness of these ANSI requirements.	b. TVA Management was aware of the ANSI requirements and did consider the pipe support calculations prepared by EDS to be essential Lifetime Quality Assurance Records, but failed to verify that they had the originals, copies, or microfilms in their possession, prior to authorizing their destruction by EDS. The evaluation team has concluded that the inadvertent destruction of some of these calculations was an isolated incident, caused primarily by breakdowns in communications between TVA and EDS, as well as between the TVA contract administration engineer and the TVA Civil Engineering Branch Chief. TVA's commitment to recreate the destroyed and missing calculations is outlined in its Nonconformance Report (NCR) WBN CEB 8418, R1, and Significant Condition Report (SCR) WBN CEB 8531, R1.	b. Nonconformance Report (NCR) WBNCEB8418 R1 addressed the destroyed EDS calculations for both units. This NCR action was completed by November 30, 1984 (memorandum from R. O. Barnett to J. C. Standifer, CEB 841130 003) and determined that all Unit 2 supports will be reviewed by TVA as a part of that unit's design process. Thus, acceptability of these supports will be ensured. Significant Condition Report (SCR) SCRWBNCEB8531 R1 was issued on January 14, 1986 to take corrective action for all missing pipe supports, in addition to the destroyed EDS calculations, for Unit 1. This corrective action is as follows:

Issues	Findings	Corrective Actions
Element 212.1 - WBN (Continued)		1. Review all calculations for basic completeness. 2. Ensure that all calculations are in Records and Information Management System (RIMS). 3. Prepare, issue, and document calculations for all missing and incomplete calculation packages and those not meeting requirements of 1. and 2. above. The above corrective action will be implemented by the Hanger and Analysis Update Program and will be completed prior to Unit 1 fuel load. The above TVA commitment is per its corrective action plan (CAP) (TCAB-212, 02/25/87). (CATD 212 01 WBN 01) The evaluation team concurs with this CAP.
Element 212.1 - BFN	BFN	BFN
(N/A)	(N/A)	(N/A)
BLN	BLN	BLN
(N/A)	(N/A)	(N/A)

Issues	Findings	Corrective Actions
********** Element 212.2 - NRC Bulletin 79-14, ASR Program **********		
SQN	SQN	SQN
a. TVA program for implementing NRC IE Bulletin 79-14 is inadequate.	a. Unit 1. TVA's initial response to the NRC regarding compliance with IE Bulletin 79-14 for SQN was that the ongoing design and verification program meets the requirements of the bulletin (TVA letter to NRC, 09/07/79 [A27 790907 010]. The NRC, however, cited cases of inadequately inspected pipe supports (NRC letter to TVA, 05/21/80 [A02 800523 010]). To make these inspections satisfactory, TVA implemented additional plant-approved procedures, such as MI-6.17, MI-6.17A, and MI-6.17C, that required additional walkdowns and inspections, which satisfied NRC requirements. The Quality Assurance survey (Ref. 101) performed in February 1986 for Unit 1 IE Bulletin 79-14 program identified further discrepancies. The survey found that a large number of supports were not inspected because they were inaccessible and that inspections were performed without using plant-approved procedures. Two corrective action reports, SQNCAR 8602009 (02/27/86) and SQNCAR 8606034 (06/11/86), have been issued as a result of the QA survey. TVA has undertaken a pipe support enhancement program (Ref. 1) to resolve these corrective action reports. Unit 2. Phase I. The Phase I program consisted of inspecting all rigorously analyzed safety-related piping (inside and outside containment) and alternately analyzed safety-related piping 2-1/2 inches and larger in diameter (inside and outside containment) for ERCW, CCS, WDS, CVCS, SFPCS, and FPS piping systems, according to procedures SQN-80-04 and SQN-80-09 (Refs. 53 and 54).	a. None required.

Issues	Findings	Corrective Actions
Element 212.2 - SQN (Continued)		
	Phase II. The Phase II program was an audit to verify the effectiveness of the Phase I program in assuring compliance with IE Bulletin 79-14 requirements (Refs. 55 and 56). It consisted of, on a sample basis, 100 percent measured inspection of the items (discussed above) covered under the Phase I program. The inspection program was limited to rigorously analyzed seismic Category I piping regardless of size. A total of nine piping isometrics from different systems, such as main steam, feedwater, safety injection, etc., were selected for this program. The inspection was conducted by an independent inspection team (from Teledyne) not involved in the Phase I program. The Phase II program was basically a means to identify and correct any programmatic deficiencies in TVA's Phase I program. The evaluation team and the NRC have concluded that this program has been adequately performed per the respective procedures (Refs. 99 and 100).	
b. Design calculations that address the resolution of 79-14 program discrepancies lack proper documentation.	b. Resolution of discrepancies for the NRC IE Bulletin 79-14 program is properly documented, and calculations have been performed where required.	b. None required.
c. Containment spray piping does not reflect "as-constructed" configuration in terms of routing as well as weld locations.	c. The as-constructed piping configuration for the containment spray system agrees with the as-designed configuration including pipe support types and locations within the acceptance tolerance established by TVA for the SQN 79-14 program. The field welds are appropriately shown in the as-constructed drawings.	c. None required.
d. Containment spray piping was analyzed using Alternate Analysis method instead of Rigorous Analysis method.	d. Most of the containment spray piping is analyzed by Rigorous Analysis method. The small portion of it that is analyzed by Alternate Analysis method is eligible for that application.	d. None required.

Issues	Findings	Corrective Actions
Element 212.2 - WBN a. The TVA program for implementing NRC Inspection and Enforcement (IE) Bulletin 79-14 is inadequate.	WBN a. TVA's approach to implementing the NRC IE Bulletin 79-14 program consisted of two phases, namely, Phase I and Phase II. The Phase I program (performed per procedure EN DES-SEP 82-13) required inspection of all rigorously analyzed seismic Category I piping regardless of size and all seismic Category I alternately analyzed piping 2-1/2 inches in diameter and larger. Visual inspections were performed for piping routing, presence of concentrated masses (valves), fittings, welded attachments, and branch lines; pipe support types, locations, orientation, component sizes and setting. In addition, clearances adjacent to the pipe, within the pipe supports, and within the penetrations were measured. The Phase II program (performed per procedure EN DES-SEP 82-25) was an audit of the Phase I program to verify its effectiveness in ensuring compliance with the NRC IE Bulletin 79-14. This program consisted of 100 percent measured inspection of a representative sample of piping isometrics and associated pipe supports for all the aspects covered under the Phase I program. This inspection was performed by an independent team (from Teledyne) not associated with the Phase I program. TVA's similar Phase I/Phase II approach to implementing the NRC IE Bulletin 79-14 on Sequoyah Unit 2 was found adequate by the NRC. (This is acknowledged in NRC letters to TVA dated 07/16/81 and 10/08/81, reports 50-328/81-27 [RIMS A02 810717 003] and 50-327/81-32 [RIMS A02 811019 014], respectively.)	WBN a. None required.

Issues	Findings	Corrective Actions
Element 212.2 - WBN (Continued)		
b. Design calculations that address the resolution of 79-14 program discrepancies lack proper documentation.	b. A total of 10,766 discrepancies was recorded as a result of the Phase I program inspection (CEB 84-04). A total of 1,038 piping discrepancies and 220 pipe support discrepancies resulted in modification work that consisted of notching insulation or structural steel, relocating conduits and instrument lines, making repairs to pipe supports, and rerouting approximately 13 segments of piping. Initially, all discrepancies were evaluated individually. Discrepancies whose resolution resulted in an isometric drawing change were then evaluated for their cumulative effects on the piping analysis. In addition, an input check was performed for all insulation weights and physical valve data used in the piping analysis to verify that the latest available information was used. As a result of the Phase I program discrepancy resolution, 225 analysis isometrics and approximately 1,200 pipe support drawings were corrected to reflect the "as-constructed" configurations, and seven piping analysis problems were reanalyzed. The discrepancies found during the Phase I program inspection were properly documented and forwarded to the appropriate groups for their resolutions. The resolutions of these discrepancies was adequately documented and the engineering judgments were stated on the resolution form. These judgments were reasonable.	b. None required.

Issues	Findings	Corrective Actions
Element 212.2 - WBN (Continued)		
	The Phase II program inspection of nine piping isometrics and associated pipe supports resulted in 579 deviations (CEB 83-31). Sixty-seven of the 579 deviations were classified by TVA as Phase II discrepancies. The remaining deviations were either acceptable per TVA criteria or they were already identified by Phase I inspection. None of the 67 discrepancies was such that there was a definite potential for loss of pressure boundary; 66 were insignificant and one was significant. The one significant discrepancy was a localized stress problem due to a welded lug attachment. The Phase II discrepancies and their resolutions were documented. On the basis of the results of the Phase II program inspection described above, no major generic problems with the piping systems were identified. The discrepancies in the area of support location and pipe geometry (the two aspects visually verified in Phase I program) were insignificant and did not impact the final analyses.	
c. Containment spray piping drawings do not reflect "as-constructed" configuration in terms of routing and weld locations.	c. The containment spray system consists of two containment spray headers and two residual heat removal (RHR) spray headers. The evaluation team reviewed the two containment spray headers and associated piping inside and outside containment to check the overall piping configuration and pipe support types and locations. The piping configuration was verified by comparing the geometry and overall lengths of a reasonable sample of design isometrics with their as-constructed isometric counterparts. Pipe support locations and types were verified by comparing the as-constructed support detail drawings to the design isometrics (three supports per isometric).	c. None required.

Issues	Findings	Corrective Actions
Element 212.2 - WBN (Continued)		
	The results indicate that within acceptable tolerance, the as-constructed piping configuration for the containment spray system agrees with the as-designed configuration, including pipe support types and locations. There is one Unit 2 design isometric (47W437-204, Revision 13) that is not identical to its corresponding as-constructed isometric. The design isometric is a mirror image (opposite hand) of the as-constructed isometric. The design isometric shows Unit 1 piping configuration; however, note 24 of the drawing states that this isometric is opposite hand for Unit 2. Thus, the as-constructed isometric and pipe support drawings are in agreement. The issue of opposite hand drawings is addressed in WBN Element 204.4. In addition, the as-constructed piping isometrics were reviewed for the presence of field welds as the CI's reference to "weld map" was interpreted to mean the location of such welds. Because field weld locations are not shown on the design isometrics, the only field welds that can be verified for locations are welds for fittings (elbows, tees, etc.). These welds were verified by comparing their locations in the as-constructed isometrics with a fitting shown in the design isometrics. The field welds were found to be appropriately shown on the as-constructed isometrics.	
d. Containment spray piping was analyzed using the Alternate Analysis method instead of the Rigorous Analysis method.	d. Using TVA's computer list of rigorous analyses, the evaluation team was able to determine which portions of the containment spray system were analyzed by the Rigorous Analysis method. It was found that the majority of the system was rigorously analyzed. The other portions (primarily 1-inch and 3/4-inch drain lines and test vents) were found to be analyzed by the Alternate Analysis method. These portions of the piping system meet the applicability criteria (Refs. 2 and 3) for using the Alternate Analysis method.	d. None required.

Issues	Findings	Corrective Actions
Element 212.2 - WBN (Continued)		
e. Peripheral finding.	e. All piping shown on the containment spray system flow diagram (drawing 47W812-1, Revision 21) was verified as being appropriately analyzed by the Rigorous or Alternate Analysis methods with one exception. The evaluation team was unable to find any evidence that the 8-inch overflow piping coming from the refueling water storage tank had been analyzed. (Refer to TVA/Bechtel telecon IOM 712, dated 02/27/87.)	e. An analysis will be performed on the 8-inch overflow piping coming from the Refueling Water Storage Tank. Supports will be designed and installed as required by the completed pipe stress analysis. This work will be performed under CAQR WBP870647 for Unit 1 and CAQR WBP870648 for Unit 2. The physical piping drawings for other safety-related systems will be reviewed to ensure that an analysis has been specified for all category I piping. If as a result of this investigation, similar situations are found to exist, these will also be corrected and the necessary actions will be implemented to prevent future recurrence. (CATD 212 02 WBN 01) The evaluation team concurs with this CAP.
f. Peripheral finding.	f. Potential interference of piping with plant features was the most prevailing finding as a result of the Phase II program inspection.	f. Under the Hanger and Analysis Update Program (HAAUP), TVA will implement a program to correct all potential interferences between piping and adjacent plant features for Unit 1. Watts Bar procedure WBEP-EP 43.20, R0 was issued on July 9, 1987, which should prevent recurrence of this problem for future work on both units. In addition, implementation of the NRC IE Bulletin 79-14 program for Unit 2, should identify and resolve any existing interference problems for Unit 2. (CATD 212 02 WBN 01) The evaluation team concurs with this CAP.

Issues	Findings	Corrective Actions
Element 212.2 - BFN	BFN	BFN
a. The TVA program for implemeting NRC IE Bulletin 79-14 is inadequate.	a. TVA's program for implementing IEB 79-14 for Browns Ferry (Ref. 4 through 7) consists of three phases. Phase I is for 100 percent inspections and initial resolution of discrepancies, Phase II is for performing analyses to meet code compliance, and Phase III is for performing modifications as a result of Phase II analyses. This three-phase approach and the procedures under which this program is performed are adequate. A sample review of work performed under Phase I shows that it is generally adequate with some discrepancies, which may have resulted from frequent delays and interruptions of this program, and lack of programmatic and technical auditing. However, TVA has issued policy memorandum PM 86-10 (Ref. 102) to require program and technical audits under Engineering Assurance (EA). Phase I work is essentially complete, but the majority of the Phase II work has not yet begun. This shows a potential for further delays. NRC had several routine inspections at BFN in which the TVA IEB 79-14 program was audited. Notices of violations were issued as a result of some of these audits (Refs. 8 through 14). The NSRS investigation of the BFN IEB 79-14 program (Ref. 15) identified the lack of adequate tracking of discrepancies, ineffective scheduling and control, lack of an overall plan to provide final response to this bulletin, and lack of QA involvement in this program. The current BFN procedures (Refs. 6 and 7) address the final closure of this program.	a. TVA has implemented a plan to provide a dedicated work force to complete the 79-14 effort. A task performance contract has been let to effect a timely completion. (CATD 212 02 BFN 01) The evaluation team concurs with this CAP.

Issues	Findings	Corrective Actions
Element 212.2 - BFN (Continued)		
b. Design calculations that address the resolution of 79-14 program discrepancies lack proper documentation.	b. The resolution of discrepancies is adequately documented as evidenced by a review of a sample of discrepancy resolutions. The type of resolution (i.e., by engineering judgment or by analysis) is clearly stated. If engineering judgment is used, it is described.	b. None required.
c. Containment spray piping was analyzed using alternate analysis method instead of rigorous analysis method.	c. Rigorous analysis was not required because the two drywell spray headers were originally designed to Class M piping specifications. Because of the change in piping classification, this piping will be rigorously analysed under Phase II of the IEB 79-14 program. The spray header inside the torus was rigorously analyzed under the Long Term Torus Integrity Program (LTTIP).	c. None required.
d. Containment spray piping does not reflect "as-constructed" configuration in terms of routing and weld locations.	d. The documentation from Phase I inspection walkdown shows that the as-constructed configuration of the two drywell spray headers matches the as-designed configuration with minor deviations. Because of a lack of available information, the evaluation team was unable to compare the as-constructed configuration of the spray header in the torus with the as-designed configuration. However, since the two drywell spray headers are covered under the IEB 79-14 program and the spray header in the torus is covered under the LTTIP, which includes the IEB 79-14 requirements, the as-constructed configurations will be reconciled with the as-designed configurations.	d. See corrective action "a" above.

Issues	Findings	Corrective Actions
Element 212.2 - BFN (Continued)		
f. Peripheral finding.	f. The Phase I inspection walkdown for drywell purge system piping support H-87 shows potential for interference between the pipe and the support framing. The support was not evaluated for this potential interference probably because of lack of available design information, nor was relevant information forwarded to EN DES (UNE) Knoxville for evaluation. Phase II of this program is intended to ensure code compliance as well as proper calculation documentation for all piping systems in the scope of IEB 79-14.	f. Differential movement between the primary containment wall and the drywell steel liner due to a LOCA was not a consideration of Phase I. However, the Phase II portion of the program will take this into account. This support scheme is unique because of a load-carrying structure (H87) in the immediate proximity of the drywell penetration. This is not the typical situation. In fact, this was an additional support installed by construction forces and was not called for on the original design drawings. The 79-14 program, Phase I, requires that all supports be inspected. Additional or missing supports identified in Phase I are evaluated for effects on the piping analysis. Furthermore, the additional supports receive a detailed inspection and technical evaluation. Evaluation will be done in Phase II of IEB 79-14 program. For description of the action required as a result of this condition, see the following proposed corrective action plan for CATD No. 218 13 BFN 01: In the event of a LOCA, the unit 2 support (H87 at elevation 629'-9") will fail, and the adjacent rod hanger (H89) will be subjected to compression. The unit 3 suport (H33) will fail, and the adjacent rod hanger (H32) will be subjected to compression. The piping has been evaluated under 79-14 with supports H87 and H33 removed from the analysis and is still qualified for interim operation. In order to prevent support failure, the corrective action will be to remove support H87 in unit 2 and support H33 in unit 3. The evaluation team concurs with this CAP.

Issues	Findings	Corrective Actions
Element 212.2 - BLN	BLN	BLN
a. The TVA program for implementing NRC IE Bulletin 79-14 is inadequate.	a. The IE Bulletin 79-14 program has not been implemented on Bellefonte and is not required at this stage of construction. The procedures for the IE Bulletin 79-14 program are generally adequate except as noted below. 1. Acceptance tolerances for items not included in specification G-43 have not been included in the current procedures. 2. BLN Procedure CEB 80-76 is to be updated prior to implementation of the program. 3. Procedures CEB EP 21.30 and BLEP-08 have been or will be voided and replaced with revised and updated procedures developed by an outside contractor. 4. No procedure for Phase II has been referenced for Bellefonte. 5. The scope of calculations for any alternately analyzed piping that is to be verified in the IE Bulletin 79-14 program has not been developed. The similar Phase I/Phase II approach to implementing the NRC IE Bulletin 79-14 program on Sequoyah unit 2 was found adequate by the NRC. (This is acknowledged in NRC letters to TVA dated 07/16/81 and 10/08/81, Reports 50-327/81-27 and 50-327/81-32, respectively.)	a. CEB-EP 21.30, "Reviewing Revisions to Piping Sysem Drawings for Possible Rigorous Analysis," has been voided by Revision 2 of this document, as of January 5, 1987. BLEP-08 "Verification of As-Constructed Input Information for Non-Rigorous Seismic Analysis of Safety-Related Piping Systems," was issued to replace BLP EP 44.78. Both of the above documents are referenced in Civil Enginering Branch Report CEB 80-67, "Bellefonte Nuclear Plant Unit 1 and 2 Program Plan for IE Bulletin 79-14." The present Bellefonte Project Plan is to produce an Engineering Project Procedure BEI 10.1-8 "Plant Configuration Verification and Walkdowns," Revision A. This procedure BEI 10.1-8 will be issued and training complete by November 30, 1987; also this procedure will replace CEB-EP 21.30 and supersede BLEP-08. Bellefonte Project Construction Specification No. N4C-913, "Support and Installation of Piping Systems in Category I Structures" is a plant specific document used in conjunction with G-43 to assure that the pipe is installed in such a manner to validate the analyses of the piping systems. N4C-913 addresses "Sleeve Clearance Reg.," "Support Clearance Reg.," "Dead Load I(L)B Tolerances," "Thread Locking devices," "Valve Operator Orientation," and "Piping Components Clearance Requirements." Civil Engineering Branch Report CEB 80-76 will be revised and will reference the new documents and will give a more detailed program for Phase II. In addition, it will address all tolerances required to evaluate the as-built configuration relative to the stress

Issues	Findings	Corrective Actions
Element 212.2 - BLN (Continued)		
		analysis calculation. This revision and issue will be completed prior to the start of the IE Bulletin 79-14 Program which will be completed prior to the preoperational testing. (CATD 212 02 BLN 01) The evaluation team concurs with this CAP.
b. Design calculations that address the resolution of 79-14 program discrepancies lack proper documentation.	b. No design calculations to resolve discrepancies identified by the IE Bulletin 79-14 program have been generated as the program has not been implemented.	b. None required.
c. Containment spray piping was analyzed using alternate analysis method instead of rigorous analysis method.	c. The containment spray (NS) system is rigorously analyzed with the exception of small portions of piping which are alternately analyzed or qualified by CEB 81-56 (Ref. 103). The TVA applicability requirements for use of the alternate analysis method according to CEB 76-11 (Ref. 104) and CEB 81-56 are met.	c. None required.
d. Containment spray piping does not reflect "as-constructed" configuration in terms of routing and weld locations.	d. Installation of the containment spray system (Reactor Building spray [NS] system) is not complete for BLN units 1 and 2. The as-designed configuraiton will be reconciled with the as-constructed under IE Bulletin 79-14.	d. None required.

Issues	Findings	Corrective Actions
********** Element 212.3 - Design Features in Pipe Hanger Program **********		
SQN	SQN	SQN
(N/A)	(N/A)	(N/A)
WBN	WBN	WBN
a. A large percentage of pipe support design documents at WBN are inadequately checked or researched, as evidenced by the large number of field change requests (FCRs) required to facilitate the construction of pipe supports, despite prior walkdown.	a. FCR statistics cannot be used as the sole criterion for judging the quality of design work; various factors beyond the control of the design originator, such as field changes, changes made by other disciplines, interferences with reinforcing bar, etc., may contribute to a high number of FCRs. Furthermore, a relatively large number of FCRs may be a positive indication of close coordination between Engineering and Construction.	a. None required.
b. Of specific concern is the poor quality of work performed by Impell contract personnel on pipe supports in systems 62, 63, and 72.	b. The evaluation team requested TVA to compile statistical FCR data for pipe supports designed by TVA, Impell, and Gilbert/Commonwealth. This statistical data includes the three systems (62, 63, and 72) cited in the statement of concern. The overall percentages of FCRs for TVA, Gilbert/Commonwealth, and Impell designs were 51, 58, and 64 percent, respectively. This statistical evaluation indicates that Impell designs have more FCRs written against them, compared with the designs of TVA and Gilbert/Commonwealth. However, any qualitative evaluation of Impell's design work must consider the following:	b. None required.

Issues	Findings	Corrective Actions

Element 212.3 - WBN (Continued)

- Although Impell and the other two organizations performed walkdowns before preparing their designs, the aforementioned FCR percentages appear to be in the same order of magnitude for all three organizations.

- Impell was responsible for 60 percent of the total number of support designs within the three systems cited by the concerned individual. This could be an indication of Impell's increased exposure to areas of the plant in which congestion could be a negative contributing factor, as far as FCRs are concerned. An accurate assessment of Impell's overall degree of difficulty (in comparison with that of TVA or Gilbert/Commonwealth) cannot be easily made.

- The evaluation team determined an overall average time lag of over 3 months from the issue date of Impell's last "pre-FCR" design revision to the issue date of the FCR. This time lag between "finalized" design and actual installation is beyond the control of the design originator, and could also contribute to a high number of FCRs, due to changing field conditions.

- TVA has taken steps to exercise tighter control of design quality to minimize the number of FCRs. This is in accordance with the WBN Hanger Review Team Report (Ref. 105). This report was published following completion of a 01/85 FCR root-cause study by Office of Construction. The report recommended establishing an FCR rate goal of 20 percent; increasing Engineering emphasis on checking field dimensions and welding accessibility; providing lists of available structural shapes and sizes to pipe support designers; having crafts install more carefully per design drawings; not revising drawing because of G-32 (General Construction Specification of Bolt Anchors Set in Hardened Concrete) violations and cutting and welding of struts.

Issues	Findings	Corrective Actions
Element 212.3 - WBN (Continued)		
c. The lack of a thorough final constructibility inspection has resulted in a large number of FCRs.	c. Though not formal, the constructibility group (UASES) was functional for WBN unit 2. UASES had performed walkdowns and identified, before issuing the pipe support drawings, all recognizable interferences which had a positive impact on reducing the number of FCRs as well as improving the quality of design.	c. None required.
Element 212.3 - BFN	BFN	BFN
(N/A)	(N/A)	(N/A)
BLN	BLN	BLN
a. A large percentage of pipe supports are inadequately checked or researched, as evidenced by the large number of field change requests (FCRs) required to facilitate the construction of pipe supports.	a. FCR statistics cannot be used as the sole criterion for judging the quality of design work; various factors beyond the control of the design originator, such as field changes, changes by other disciplines, interference with reinforcing bar, etc., may contribute to a high number of FCRs. Furthermore, a relatively large number of FCRs may be a positive indication of a close coordination between Engineering and Construction. The review of the sample of FCRs and SMRs reviewed (Ref. 90) showed that supports designed by Grinnell have more FCRs or SMRs than other project design participants. Six of these drawings (five Grinnell and one Gilbert/Commonwealth) were affected by design-related FCRs or SMRs. Out of six drawings, two were modified because of inadequate checking, and four were modified because of differences between assumed design and field actual conditions. Fourteen drawings had non-design-related FCRs or SMRs. Seven were Grinnell, two were TVA, and five were TVC. The number of design-related FCRs and SMRs showed a minimal number (two) resulted from the concern of inadequate checking, which is not significant.	a. None required.

Issues	Findings	Corrective Actions
********** Element 212.4 - Frequently Changing Hangers **********		
SQN	SQN	SQN
(N/A)	(N/A)	(N/A)
WBN	WBN	WBN
a. Design changes to pipe supports (hangers) are excessive and are made for no apparent reason. Some hangers are changed back to their original design later.	a. The evaluation team reviewed 28 (Ref. 98) randomly selected pipe supports (with revisions) from several safety-related systems. The range of the pipe support drawing revisions was from one to ten. In the majority of cases, the changes observed were due to field change requests (FCRs) and engineering change notices (ECNs), and all revisions had valid reasons. In one case, the evaluation team observed that a pipe support was changed from a rigid type support to a spring type support. However, no instance was found where a pipe support was revised back to its previous or original design, as is stated in the employee concern. TVA's response (Ref. 100) (prepared by Sherman R. Martin) to this concern also indicated that the revisions to pipe support designs were the result of FCRs, ECNs, and Nonconformance Reports (NCRs). The reasons for generating these documents were reanalysis of piping systems, interference in the field, utilization of material available, and piping systems not installed as per design drawings.	a. None required.
BFN	BFN	BFN
(N/A)	(N/A)	(N/A)
BLN	BLN	BLN
(N/A)	(N/A)	(N/A)

ATTACHMENT C

REFERENCES

1. Special Maintenance Instruction SMI-1-317-24, "Pipe Supports Enhancement Inspections EDS Isometric Drawings for Inside Containment and Supports Previously Identified as Inaccessible" Unit 1, Rev. 0, [no RIMS number], (05/02/86)

2. WB-DC-40-31.3, "Detailed Design Criteria for the Assignment of Responsibility for Analyses, Support, and Fabrication of Piping Systems," [ESB 841012 201], (09/25/75); Rev. 2, (10/04/84)

3. WB-DC-40-31.7, "Detailed Design Criteria for the Analysis of Category I and I(L) Piping Systems," [B42 860129 501], (01/30/76); Rev. 7, (01/21/86)

4. EN DES-SEP 81-02, "Implementation of NRC OIE Bulletin 79-14 for Browns Ferry Nuclear Plant," Rev. 0, [CEB 811221 014], (12/21/81)

5. BFEP-PI 85-01 "Implementation of NRC-OIE Bulletins 79-02/79-14," [B22 870129 301], Rev. 0; (01/06/86), Rev. 1, (01/28/87)

6. BFEP-PI-86-05, "NRC-OIE Bulletin 79-02/79-14 Program Document for Browns Ferry Nuclear Plant," [B22 860805 11], Rev. 0, (07/29/86)

7. BFEP-PI-86-06, "Implementation of NRC-OIE Bulletin 79-14 Phase II Verification for Browns Ferry Nuclear Plant," Rev. 0, [B22 870129 302], (01/28/87)

8. NRC letter to TVA, "Routine Safety Inspection at Browns Ferry Nuclear Plant," [NEB 810728 675], (07/22/81)

9. NRC letter to TVA, "Routine Safety Inspection at Browns Ferry Nuclear Plant," [NEB 810824 664], (08/18/81)

10. NRC letter to TVA, "Routine Safety Inspection at Browns Ferry Nuclear Plant," [A02 811203 002], (12/01/81)

11. NRC letter to TVA, "Routine Safety Inspection at Browns Ferry," [NEB 820420 611], (04/20/82)

12. NRC letter to TVA, "Routine Safety Inspection at Browns Ferry," [A02 830721 009], (07/19/83)

13. NRC letter to TVA, "Notice of Violation," [NEB 800109 265], (01/02/80)

14. NRC letter to TVA, "Notice of Violation," [L44 850502 142], (04/26/85)

15. NSRS Report I-84-33-BFN, "Investigation of Browns Ferry Nuclear Plant Piping and Support Design," [Q01 850607 051], (06/07/85)

16. Title 10 of the Code of Federal Regulations, Part 50 (10 CFR 50), Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants"

17. ANSI N45.2.9-1974, "Requirements for Collection, Storage, and Maintenance of Quality Assurance Records for Nuclear Power Plants"

18. TVA Topical Report TR75-1A, Section 17.2, "TVA Quality Assurance Program Applicable to Station Operations," (TTB1), R8, (no revision date indicated)

19. TVA Division of Engineering Design (EN DES) Engineering Procedures Manual:

    EP 1.14, R10 "Engineering Records - Retention and Storage," (05/13/83)

    EP 3.03, R8 "Design Calculations," (04/24/84)

    EP 5.14, R4 "Vendor Documents - Handling and Disposition," (03/28/85)

20. TVA Office of Engineering (OE) Procedures Manual:

    OEP-16, R0, "Design Records Control," (04/28/85)

21. TVA Personal Services Contract No. TV-42499A with EDS Nuclear, Inc., (RFI 092), [no RIMS number], (approved by TVA 08/05/75)

22. Calculations reviewed to verify that RIMS number exists (sample includes Bergen-Paterson, TVA, and EDS):

    47A054-25/R0 (TVA)
    47A056-66/R0 (TVA)
    47A056-7/R0 (TVA)
    47A056-11/R0 (TVA)
    47A056-5/R0 (TVA)
    47A056-16/R0 (TVA)
    1-03A-586/R0 (EDS)
    1-62A-328/R0 (EDS)
    47A920-38-3/R0/R1 (TVA)
    47A450-3-19/R0 (TVA)
    47A051-14/R0 (TVA)
    47A051-2, 20/R0 (TVA)
    67-1ERCW-R212/R2 (B-P)
    1-01A-309/R2 (EDS)
    47A450-21-128/R2 (TVA)

47A435-10-2/R3 (TVA)
1-63-320/R1 (EDS)
1-68-131/R2 (EDS)
1-70-005/R0 (EDS)
1-87-68/R3 (EDS)
2-70-804/R0 (EDS) Unit 2
47A060-77-5/R1 (TVA)
47A437-3-1/R3 (TVA)
47A427-8-38/R1 (TVA)
47A437-4-62/R1 (TVA)
63-1515-V132/R0 (B-P)
47A450-4-17/R0 (TVA)
47A464-4-2/R0 (TVA)
47A060-70-27/R2 (TVA)
47A060-3-23/R1 (TVA)

23. EN DES-SEP 82-13, "Special Engineering Procedure for Program for NRC-IE Bulletin 79-14, Phase 1 Inspections at Watts Bar Nuclear Plant, Unit 1," TTB 2, [B41 50702 004], (11/27/82); R4, (12/22/83)

24. EN DES-SEP 82-25, "Special Engineering Procedure for Program for NRC-IE Bulletin 79-14 Phase II Inspections at Watts Bar Nuclear Plant Unit 1," TTB 2, [CEB 830921 018], (08/19/83); R1, (09/21/83)

25. Civil Engineering Branch Report CEB 84-04, "Watts Bar Nuclear Plant - Unit 1 Report on NRC-OIE, Bulletin 79-14 Phase I Inspection/Evaluation Program," TTB 2, [CEB 840713 00?], (03/06/84); R1, (07/13/84)

26. Civil Engineering Branch Report CEB 83-31, "NRC-OIE Bulletin 79-14 Phase II Inspection Summary Report," TTB 2, [CEB 840402 012], (11/15/83); R1, (04/02/84)

27. 79-14 Phase I Inspection Package (with inspection results) - Computer ID No. 1R68-47W465-206, (RFI 133), (04/13/83)

28. 79-14 Phase II Inspection Package (with inspection results) - Computer ID No. 1T68-47W465-206, TTB 068, (09/01/83)

29. Calculation Packages, TTB 022, TTB 068:

- 0600200-09-09/R11, dated 05/13/85
- N3-67-24A/R5, dated 01/28/86
- N3-26-06A/R4, dated 03/25/85
- 0600200-13-02/R14, dated 05/17/86
- 0600200-04-04/R6, dated 03/15/84

30. 79-14 Phase I Inspection Package (for alternately analyzed piping) - Computer ID No. 1A78-47W454-4, TTB 068, (07/28/82)

31. WBN Computer Listing of Rigorous Analysis Stress Calculations for the Containment Spray System, TTB 237-2

32. Pipe Data (size, temperature, pressure) for Alternately Analyzed Containment Spray System Piping; TTB 237-2

33. Computer Input Data for Rigorous Piping Stress Analysis for the Containment Spray System, TTB 237-2

34. WBN Flow Diagram for the Containment Spray System, Drawing 47W812-1, TTB 237-2, R21, (12/22/86)

35. Containment Spray System (Rigorously Analyzed) Piping Isometrics, TTB 254-9:

47W432-200/R17
47W432-205/R14
47W432-206/R15

47W435-206/R10
47W435-207/R9
47W435-208/R5
47W435-210/R8

36. Containment Spray System (Alternately Analyzed) Piping Isometrics, TTB 254-9:

H437-7-1/R0
H437-7-2/R0
H437-7-4/R0
H437-7-11/R2
H437-7-12/R2
H437-7-13/R2
H437-7-26/R5

37. Containment Spray System (Rigorously Analyzed) Piping Isometrics and Support Drawings Subjected to Rigorous Analysis, (RFI WBN-162), TTB 237-2, TTB 246-11, and TTB 252-9:

Stress Analysis	TVA Design Isometric	Dravo Fabrication isometric	Pipe Support Drawing	Support Revision
N3-72-1A (Unit 1)	47W437-201/R18	E2879-IC-60/R4	72-1-CS-R31	4
	47W437-202/R9	E2879-IC-63/R4	72-1-CS-R32	903
	47W437-203/R17	E2879-IC-66/R3	72-1-CS-R33	5
			72-1-CS-R34	906
			72-1-CS-R35	1
			72-1-CS-R36	2
			72-1-CS-R37	0
			72-1-CS-R38	902
			72-1-CS-R43	1
			72-1-CS-R45	2

Stress Analysis	TVA Design Isometric	Dravo Fabrication isometric	Pipe Support Drawing	Support Revision
			72-1-CS-R46	902
			72-1-CS-R47	5
			72-1-CS-R48	903
			72-1-CS-R49	903
			72-1-CS-R50	903
			72-1-CS-R51	2
			72-1-CS-R92	1
			72-1-CS-R99	1
			72-1-CS-R100	902
			72-1-CS-V138	1
			47A437-5-25	1
N3-72-2A (Unit 1)	47W437-200/R8	E2879-IC-58/R4	72-1-CS-R17	904
			72-1-CS-R146	905
			72-1-CS-R149	0
N3-72-7A (Unit 1)	47W437-209/R0	E2879-IC-60/R4		
		E2879-IC-61/R3	72-1CS-R110	2
		E2879-IC-63/R4	72-1CS-R111	3
		E2879-IC-64/R3	72-1CS-R112	4
N3-72-8A (Unit 1)	47W437-210/R0	E2879-IC-62/R1	47A437-5-19	4
			47A437-5-20	4
			47A437-5-21	3
N3-72-3A (Unit 2)	47W437-204/R13	E2882-IC-38/R3	47A437-5-41	3
		E2882-IC-39/R2	47A437-5-42	3
		E2882-IC-40/R2	47A437-5-43	3
		E2882-IC-41/R5		
		E2882-IC-42/R2		
N3-72-4A (Unit 2)	47W437-205/R4	E2882-IC-33/R3	72-2CS-R32	1
	47W437-207/R1	E2882-IC-41/R5	72-2CS-R33	1
	47W437-208/R1	E2882-IC-44/R2	72-2CS-R34	1
			72-2CS-R35	901
			72-2CS-R36	1
			72-2CS-R42	1
			72-2CS-R50	2
			72-2CS-R61	0
			72-2CS-R67	903
			72-2CS-R68	1
			72-2CS-R146	904
			72-2CS-R150	901

Stress Analysis	TVA Design Isometric	Dravo Fabrication isometric	Pipe Support Drawing	Support Revision
N3-72-5A (Unit 2)	47W437-206/R0	E2882-IC-36/R4	72-2CS-R146	904
			72-2CS-V148	902
			72-2CS-R149	901
			72-2CS-R150	901
N3-72-6A (Unit 2)	47W437-204/R13	E2882-IC-38/R3	72-2CS-R109	901
		E2882-IC-39/R2	72-2CS-R110	903
		E2882-IC-40/R2	72-2CS-R111	901
		E2882-IC-41/R5	72-2CS-R120	901
		E2882-IC-42/R2	47A437-4-101	2

38. Standard Practice/Instruction MMI-99, Units 1, 2, 3 "Instructions for the Implementation of NRC IE Bulletin 79-14," Final issue (11/15/85, (RFI 1140), Initial Issue, (08/20/79), (RFI 1230)

39. TVA letter to NRC, "OIE Bulletin 79-14 - Browns Ferry Nuclear Plants Units 1, 2, and 3 - Response to Item #2 and Revised Response to Item #1 of the Bulletin," (RFI 1015, TTB 192), [A27 790831 021], (08/31/79)

40. General Construction Specification G-43, "Support and Installation of Piping Systems in Category I Structures," (TTB 2), [B42 850712 505], R0, (08/20/76), R8, (08/08/85)

41. Memo from R. H. Dunham, Manager of Engineering Design to Those List, "Program to Resolve NRC IE Bulletin 79-14," (RFI 1172), [CEB 791004 018], (10/04/79)

42. Memo from R. H. Dunham, Manager of Engineering Design to Those Listed, "Program to Resolve NRC IE Bulletin 79-14 - Supplement," (RFI 1188), [CEB 791219 003], (12/19/79)

43. Telecon between TVA and Bechtel, IOM 833, (03/31/87)

44.

System	Discrepancy Number	Unit	Description of Discrepancy
CRDSH	080780-01	3	Piping and support Configuration deviation
EECW	830-02	1	No axial restraining by a restraint
EECW	042815	1	Piping configuration deviation
EECW	101180-01	2	Seismic supports will fail under design load
HPCI	81901	1	Incomplete hanger installation
HPCI	1027-1	3	Damaged (failed) pipe support

System	Discrepancy Number	Unit	Description of Discrepancy
HPCI	101480-04	2	Pipe whip restraint acts as vertical restraint
MS	220-07	1	Spring hammer with insufficient travel
RBCCW	523-02	1	Piping and support configuration deviation
RBCCW	091580-02	2	Piping configuration deviation
RCIC	121980-05	3	Piping configuration deviation
RCIC	1217-06	1	Additional restraints and deleted gravity supports.
RCW	052086-02	2	Missing pipe supports
RHR	325-01	1	Snubber ineffective
RHR	121780-72	3	Piping configuration deviation
RWCU	093080-04	2	Missing pipe supports
RWCU	121080-03	3	Missing pipe supports
FW	092980-02	2	Piping configuration deviation
CS	1213-04	1	Pipe support weld not per design
FPC	201-01	3	Spring hanger bottomed out

45. Pittsburg-Des Moines Steel Company Erection Drawings:

Unit 1	Unit 2	Unit 3
E55, Rev. A	E55, issued 11/08/68	E55, Rev. C2
E56, Rev. F1	E56, Rev. C	E56, Rev. B4
E57, Rev. D3	E57, Rev. C2	E57, Rev. B4
	E32, Rev. C1	

46. MMI 99 Data Cover Sheet and Drawing Configuration Checklist for Unit 2 Drywell Spray Header System," [no RIMS number], (09/28/80)

47. Civil Engineering Branch Report CEB-84-20, "Stress Intensification Factors for Browns Ferry, Sequoyah, Watts Bar, Bellefonte," (TTB-259-6), [CEB 840906 002], (09/06/84)

48. Drawing 47W452-224, "N1-274-3R Isometric Torus Analyses of RHR System Pen X-210 A and B, X-211 A and B," R1, (04/26/84)

49. Maintenance Instruction MI-6.17, "Instructions for the Implementation of NRC IE Bulletin 79-14," Rev. 2 (05/13/80), Rev. 0, (RFI 516), [no RIMS number], (04/29/80)

50. Maintenance Instruction MI-6.17A, "Instructions for the Implementation of Isometric Walkdown," Rev. 3, (01/02/81), (RFI 631), Rev. 0, [no RIMS number], (07/08/80)

51. Maintenance Instruction MI-6.17C, "Procedure for the Implementation of NRC IE Bulletin 79-14 Requirements for Unit 1 Alternately Analyzed Safety Related Piping, 2-1/2 Diameter and Larger," Rev. 1, (RFI 631), (08/20/82, Rev. 0, [no RIMS number], (01/12/82)

52. Maintenance Instruction MI-6.18, "Instructions for Review of Isometric Walkdown Discrepancies, Technical Specification Application and Initiation of EN DES Recommended Corrective Action," (sampling program, i.e., Bulletin 79-14), Rev. 0, (RFI 631), [no RIMS number], (07/21/80)

53. Inspection of Piping and Supports - Isometric Walkdown Procedure No. SQN-80-04, SQN Unit 2, Phase I, (RFI 732), [SWP 801024 001], (10/20/80)

54. Walkdown Inspection Procedure SQN-80-09 for Alternately Analyzed Piping, (RFI 732), [SWP 801024 001], (10/20/80)

55. Inspection Procedure Phase II, SQN Unit 2, "Procedure for the Implementation of NRC-OIE Bulletin 79-14," Rev. 1, (RFI 531), [CEB 810225 005], (03/06/81), Rev. 0, (02/20/81)

56. Procedure for the Implementation of NRC-OIE Bulletin 79-14, "Discrepancy Evaluation Criteria Phase II," Rev. 2, (RFI 732), [CEB 810225 005], (05/21/81), Rev. 0, (02/20/81)

57. RFI SQN-663, (10/28/86)

58. Flow Diagram, Drawing 47W812-1, Rev. 12, (RFI 698), [no RIMS number], (06/11/85)

59. CEB 76-5, Alternate analysis criteria of Watts Bar Nuclear Plant, R3, [CEB 830613 026], (06/13/83) (Binder 36A)

60. CEB 80-5, Alternate analysis criteria of Sequoyah Nuclear Plant, R1, (RFI 559), [no RIMS number], (06/24/75)

61. Design isometric drawings by EDS Nuclear (now Impell), (RFI 698), [no RIMS number]:

    0600102-01-01, Rev. 913
    0600102-01-02, Rev. 914
    0600102-01-03, Rev. 911
    0600102-01-04, Rev. 911

62. TVA - SQN isometric drawings [no RIMS number], drawings reviewed at jobsite:

    47K406-57, Rev. 5
    47K406-58, Rev. 3
    47K435-50, Rev. 5

47K435-51, Rev. 3
47K435-53, Rev. 6
47K437-50, Rev. 4
47K437-51, Rev. 5
47K437-52, Rev. 3
47K437-53, Rev. 3
47K437-54, Rev. 2
47K437-55, Rev. 1

63. As-constructed drawings by National Valve and Manufacturing Co., TVA Contract 71C33-92615, (RFI 698), [no RIMS number]:

A-7479, Rev. 2
A-7481, Rev. F2
A-7482, Rev. F4C
A-7483, Rev. R2
A-7485, Rev. F4B
A-7204, Rev. 5
A-7206, Rev. 3
A-7207, Rev. 5
A-7208, Rev. 3
A-7210, Rev. 6

64. As-designed support detail drawings by Chicago Bridge & Iron Company for the problem 0600104-01-01, (RFI 606), [no RIMS number]:

CB&I 69-5545-74, Rev. 901
CB&I 69-5545-75, Rev. 906
CB&I 69-5545-87, Rev. 903
CB&I 69-5546-309 Rev. 1
CB&I 69-5545-310 Rev. 2
CB&I 69-5545-311 Rev. 2
CB&I 69-5545-312 Rev. 1
CB&I 69-5545-305 Rev. 4
CB&I 69-5545-307 Rev. 1
CB&I 69-5545-308 Rev. 2
CB&I 69-5545-313 Rev. 1
CB&I 69-5545-314 Rev. 2

65. As-constructed and/or as-designed support detail drawings by Basic Engineers for the problem 0600104-01-01, (RFI 606), [no RIMS number]:

DWG.	REV.	DWG.	REV.	DWG.#	REV.
1-H21-1	2	1-H21-7	4	1-H21-30	1
1-H21-2	2	1-H21-14	4	1-H21-31	2
1-H21-3	2	1-H21-15	4	1-H21-32	1
1-H21-4	2	1-H21-16	4	1-H21-33	1
1-H21-5	6	1-H21-17	5		
1-H21-6	3	1-H21-18	7		

66. As constructed and/or as-designed support detail drawings by Basic Engineers for the problem #N2-72-01A, (RFI 532), [no RIMS number]:

DWG.	REV.	DWG.	REV.	DWG.	REV.
2-H21-409	1	2-H21-412	3	2-H21-415	1
2-H21-410	1	2-H21-413	1		
2-H21-411	4	2-H21-414	1		

67. As-constructed and/or as-designed support detail drawings by Basic Engineers for the problem #N2-72-03A, (RFI 604), [no RIMS number]:

DWG.	REV.	DWG.	REV.	DWG.	REV.
2-H21-416	903	2-H21-424	1	2-H21-432	1
2-H21-417	1	2-H21-425	1	2-H21-433	1
2-H21-418	2	2-H21-426	1	2-H21-434	1
2-H21-419	1	2-H21-427	1	2-H21-435	1
2-H21-420	2	2-H21-428	1	2-H21-436	1
2-H21-421	2	2-H21-429	1	2-H21-437	1
2-H21-422	2	2-H21-430	1	2-H21-438	1
2-H21-423	3	2-H21-431	2	2-H21-439	2

68. EDS piping analysis calculation 0600104-01-01 (inside containment), (RFI 698), [no RIMS number], (10/19/79)

69. TVA piping analysis calculation N2-72-01A (outside containment), (RFI 532), [no RIMS number], (06/06/81)

70. TVA piping analysis calculation N2-72-03A (outside containment), (RFI 604), [no RIMS number], (04/24/80)

71. Civil Engineering Branch Report CEB 80-76, "Bellefonte Nuclear Plant Units 1 and 2 Program Plan for IE Bulletin 79-14," no revision, (RFI 1515, TTB 314), [CEB 820114 027], (08/19/81)

72. Civil Engineering Branch Report CEB-EP 21.30, "Reviewing Revisions to Piping System Drawings for Possible Rigorous Reanalysis - Verifying that Rigorous Analysis or Reanalysis is Applicable to As-Constructed Configuration," TTB 420-3, [B42 851113 500], R2, (11/13/85)

73. Engineering Procedure BLEP-08, "Verification of As-Constructed Input Information for Non-Rigorous Seismic Analyses of Safety-Related Piping Systems," TTB 420-3, [B42 850411 500], R1, (04/24/85)

74. General Construction Specification G-43, "Support and Installation of Piping Systems in Category I Structures," (TTB 2), [B42 850712 505], R0, (08/20/76), R8, (08/08/85)

75. Design Criteria Diagram Reactor Building Spray System 32BW0615-NS-01, TTB 341-3, R16 (10/19/85)

76. Piping Isometric Drawings, TTB 341-3, TTB 368-3, and TTB 383-4

1AW1416-NS-A2 R1	1RW1415-NS-K2 R0
1AW1416-NS-A3 R0	1RW2415-NS-K1 R1
1AW2416-NS-A1 R0	1RW2415-NS-K2 R1
1AW0416-NS-C1 R4	1AW1416-NS-L1 R0
1AW0416-NS-D1 R5	1AW1416-NS-M1 R0
1AW0416-NS-E1 R4	1AW2416-NS-M1 R0
1RW1415-NS-F1 R1	1AW1412-ND-A1 R6
1RW1415-NS-F2 R1	1AW2412-ND-A1 R8
1RW2415-NS-F1 R1	1AW1412-ND-A2 R1
1RW2415-NS-F2 R1	1AW2412-ND-A2 R1
1RW1415-NS-K1 R1	1AW0416-NS-A2 R3

77. WB-DC-40-31.3, "Detailed Design Criteria for the Assignment of Responsibility for Analysis, Support, and Fabrication of Piping Systems," [ESB 841012 201], (10/04/84)

78. Engineering Procedure EN DES-EP 4.02, R16, "Engineering Change Notices (ECNs) Before Licensing - Handling," [ESB 840719 206], (07/23/84)

79. Engineering Procedure EN DES-EP 4.03, R11, "Field Change Requests Initiated by Construction," [ECB 841203 502], (11/21/84)

80. Field Change Requests (FCRs) and associated drawings:

Affected Drawing Number, Revision	FCR Number	System Number	RIMS Number
47A406-2-35, R3	H-13324	62	C24 850410 313
47A406-12-60, R2	H-13652	62	C24 850618 305
62-2CVC-R54, R2	H-13835	62	C24 850528 338
2-63-490, R902	H-13884	63	C24 850523 342
2-62A-281, R902	H-13924	62	C24 850528 343
2-63-020, R902	H-14315	63	B26 850910 069
2-62A-713, R902	H-14584	62	B26 850916 111
2-63-250, R903	H-13673	63	C24 850624 300
2-62A-364, R903	H-13621	62	N/A
2-63-016, R902	H-13586	63	C24 850618 303
62-2CVC-R214, R903	H-13664	62	C24 850523 330
62-2CVC-R117, R903	H-13608	62	C24 850604 317
62-2CVC-R217, R903	H-13607	62	C24 850416 329

Affected Drawing Number, Revision	FCR Number	System Number	RIMS Number
62-2CVC-R45, R904	H-13594	62	N/A
2-63-309, R903	H-13529	63	C24 850614 313
47A435-14-56, R902	H-13379	63	C24 850405 347
62-2CVC-R175, R902	H-13349	62	C24 850318 419
2-63-350, R903	H-13277	63	C24 850325 300
62-2CVC-R248, R902	H-13266	62	C24 850606 320
2-63-352, R902	H-13184	63	C24 850308 331

81. Watts Bar Nuclear Plant - Piping Analysis and Hanger Design Meeting Notes, [C24 850327 600], (03/26/85)

82. Watts Bar Nuclear Plant - Piping Analysis and Hanger Design Meeting Notes, [C24 850409 600], (04/09/85)

83. Watts Bar Nuclear Plant - Piping Analysis and Hanger Design Meeting Notes, [C24 850508 601], (05/07/85)

84. Watts Bar Nuclear Plant - Piping Analysis and Hanger Design Meeting Notes, [C24 850522 600], (05/22/85)

85. Watts Bar Nuclear Plant - Piping Analysis and Hanger Design Meeting Notes, [C24 850723 600], (07/23/85)

86. Memo, from V. R. Defender (CEB) to CEB files, subject: WBN - Design review of unit 2 pipe support calculations, [B41 850509 005], (05/09/85)

87. Number of FCRs and Support Designs for Systems 01, 03, 62, 63, 72, and 74 for Impell, TVA and Gilbert/Commonwealth, (RFI 047), (05/06/86)

88. Constructibility Program (OASES) IOM 1723, (08/17/87)

89. Watts Bar Nuclear Plant - Space Reservation for Support, [C24 850328 006 and C24 850430 005], (03/28/85) and (04/30/85)

90. Field Change Requests (FCRs), Support Modification Requests (SMRs), Nonconformance Reports (NCRs), etc.

FCR/SMR/NCR Number	Affected Drawing Number, Revision	RIMS Number	Date
FCR C-0144	1KC-MPHG-1702, R0	C20 850522 902	04/03/85
FCR C-1261	1RF-MPHG-4133F, R1	None	09/11/85
FCR C-1889	1VC-MPHG-0005F, R1	None	03/05/86
FCR H-4180	1RF-MPHG-3395, R0	BLN 831025 610	10/20/83
FCR H-3454	1WD-MPHG-0086, R1	BLN 830331 587	03/28/83

FCR/SMR/NCR Number	Affected Drawing Number, Revision	RIMS Number	Date
FCR H-1553	ORF-MPHG-5833, R0	BLN 860417 306	11/26/85
FCR H-1185	ONM-MPHG-0459, R1	BLN 810901 588	08/26/81
FCR H-1206	ONM-MPHG-0459, R1	BLN 810910 598	08/31/81
FCR H-742	2RK-MPHG-0128, R4	BLN 810410 596	04/06/81
FCR C-0082	2RK-MPHG-0128, R6	C20 850425 904	03/28/85
NCR-3555	1WD-MPHG-0086, R2	BLN 841205 107	12/03/84
SMR-15898	2NK-MPHG-1643, R0	None	05/25/84
SMR-881	1CA-MPHG-0050-1, R0	None	08/16/78
SMR-1924	1CA-MPHG-0050-2, R1	None	02/14/84
SMR-12436	2ND-MPHG-0065, R2	None	07/09/82
SMR-10490	2CF-MPHG-0285, R0	None	12/19/81
SMR-6823	1KE-MPHG-0781, R2	None	01/26/81
SMR-6412	1KE-MPHG-0781, R1	None	11/05/80
SMR-12775	1NL-MPHG-0136, R1	None	08/30/82
SMR-8978	ONM-MPHG-0903, R0	None	08/28/81
SMR-6522	1RK-MPHG-0013, R2	None	12/15/80
SMR-1098	1RK-MPHG-0013, R0	None	09/27/78
SMR-7996	2VE-MPHG-4018, R2	None	06/04/81
SMR-563	2VE-MPHG-4018, R0	None	06/20/78
SMR-1290	2VE-MPHG-4018, R1	None	11/01/78
SMR-12893	2VE-MPHG-4018, R4	None	09/22/82
SMR-6887	1WD-MPHG-0006, R2	None	02/05/81
SMR-7236	1WD-MPHG-0006, R3	None	03/16/81
SMR-1908	1WD-MPHG-0006, R0	None	02/24/79
SMR-14886	1WD-MPHG-0006, R6	None	09/07/83
SMR-12765	1WD-MPHG-0006, R5	None	08/20/82
SMR-7956	1WD-MPHG-0006, R4	None	06/02/81
SMR-14347	2RK-MPHG-0079, R3	None	06/03/83
BNC-8091	2RK-MPHG-0079, R2	MEB 821119 158	11/22/82

91. ngineering Procedures EN DES-EP 4.02 for engineering change notices ECNs) before licensing - handling (TTB-2), (ESB 840719 206), R16, 07/23/84), R0, (09/04/73)

92. ngineering Procedures EN DES-ED 4.03, for field change requests (FCRs) equested by construction, (TTB-2) [ECB 84 1203 502), R11, (11/21/84), R0 09/28/73)

93. ffice of Engineering (OEP) - 11 for change control, (TTB-2), [no RIMS umber], R0, (04/26/85)

94. Watts Bar Engineering Project (WBEP) EP 43.03, for Field Change Requests, (TTB-2) [no RIMS number], R0, (09/27/85)

95. WBEP-EP 43.02, for Engineering Change Notices, (TTB-2), [no RIMS number], R0, (09/27/85)

96. American National Standard ANSI/MSS SP-58, 1975 Edition

97. Pipe Support Design Manual, Volume 3, Section 7.8, (TTB-2), [no RIMS number], R2 (06/12/85)

98. Pipe support drawings:

67-1ERCW-R212/903	47A437-4-62/1	47A465-2-38/1
1-10A-309/907	63-1515-V132/1	47A060-70-27/3
47A450-21-128/3	1-63-404/904	47A060-3-23/2
47A437-3-1/3	1-74-11/907	47A437-2-22/1
47A427-8-38/1	47A540-4-17/1	2-70-804/901
47A464-4-2/2	47A060-77-5/1	47A060-26-42/1
47A060-62-27/2	67A400-1/3	47A400-12/2
1-63-349/906	47A060-74-21/1	1-63-347/901
1-01A-380/910	47A400-21/4	
47A400-6-266/2	47A400-6-248/3	

99. NRC letter to TVA, Subject: Report No. 50-328/81-27 (NRC inspection of Unit 2 IE Bulletin 79-14 program completion), (RFI 735), [A02 810717 003], (07/16/81)

100. NRC letter to TVA, Subject: Report Nos. 50/327/81-32 and 50-328/81-42 (Closure of IE Bulletin 79-14 for Unit 2), (RFI 735), [A02 811019 014], (10/18/81)

101. Compliance visits, Audits, and Inspections - Inplant Survey Check List 21-86-S-005, 79-14 Hanger Review Program, (RFI 551), [no RIMS number], (02/28/86)

102. Memo from W. C. Drotleff, Director of Nuclear Engineering, and R. B. Kelley, Director of Nuclear Quality Assurance, to Those Listed, "Policy Memo PM 86-10 (DNE) - Engineering Assurance Charter and Responsibilities," (RFI 1285), [B01 860702 002], (07/03/86)

103. Civil Engineering Branch Report CEB 81-56 (BLN), "Qualification of Small Line Attachments to ASME Class 2 and 3 Piping," TTB 368-2, [CEB 840202 003], (02/02/84)

104. Civil Engineering Branch Report CEB 76-11 (BLN), "Bellefonte Nuclear Plant Alternate Criteria for Piping Analysis and Support," TTB 327-5, [CEB 840106 027], (11/78), R2, (01/02/84)

105. Memorandum with attachment from WBN FCR Hanger Review Team to D. B. Bowen and R. A. Pedde, [CO2 850319 101], (03/19/85); attachment: FCR study by Office of Construction (01/85)

106. Memo from Guenter Wadewitz to W. H. Thompson, WBN - Request for Investigation/Evaluation, (TTB-2), (RFI WBN-343), [no RIMS number], (11/06/85)