EIGHTH AND FINAL ANNUAL REPORT
OF THE
EMPLOYEE CONCERNS SPECIAL PROGRAM
CORRECTIVE ACTION IMPLEMENTATION

CALENDAR YEAR 1995

TENNESSEE VALLEY AUTHORITY
NUCLEAR

MARCH 1996

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EXECUTIVE SUMMARY

This report is the Eighth and Final Annual Report of the Employee Concerns Special Program (ECSP). The ECSP investigations resulted in the development of 1,591 Corrective Action Tracking Documents (CATDs). Between January 1, 1995 and March 15, 1996, the ECSP closed the remaining 413 CATDs. All 1,591 CATDs have now been closed, either by completion of corrective actions or by transfer of the actions to licensing commitments in accordance with the Nuclear Regulatory Commission (NRC) approved ECSP processes.

During this period, there were 340 deviations to approved Corrective Action Plans (CAPs). Of these, 47 were Level IIa, 43 were Level IIb, and 250 were Level III CAP deviations.

Based on these activities, and with the submittal of this report, TVA considers the ECSP to be closed.

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1.0 INTRODUCTION

Between January 1, 1995 and March 15, 1996, the ECSP closed the remaining 413 Corrective Action Tracking Documents (CATDs). No Level I deviations were requested or approved during this period. In summary, for the period from January 1, 1995 through March 15, 1996, a total of 340 CATD deviations to Corrective Action Plans (CAPs) were approved (47 Level IIa, 43 Level IIb, and 250 Level III).

A special report was submitted on August 30, 1995, containing information describing CATD CAP deviations approved in support of Watts Bar Nuclear Plant (WBN) Unit 1 startup during the period January 1, 1995 through August 15, 1995. The special report documented 42 approved WBN-specific CAP deviations and 16 approved nonplant specific (NPS) CATD CAP deviations. This Eighth and Final Annual Report does not include the details regarding the approved CATD CAP deviations described in the special report submitted on August 30, 1995. This report (Eighth Annual and Final Report) documents the remaining CATD CAP deviations which were not previously reported, but were approved between January 1, 1995 and March 15, 1996. This report documents 21 Level IIa deviations, 11 Level IIb deviations, and 250 Level III deviations.

Section 2.0 of this report provides background information on the ECSP. Section 3.0 contains the status of the ECSP and a summary of the status of CATDs that have been implemented and verified complete through March 15, 1996. Section 4.0 of this report summarizes the nature of and technical justification for the Level IIa and IIb CAP deviations identified and approved during the reporting period, and lists identified Level III CAP deviations.

2.0 BACKGROUND

In July 1988, TVA committed to the NRC to provide an annual report of deviations from the ECSP CAPs. These CAPs were developed as part of encompassing CATDs to correct and/or resolve deficiencies or problems arising from the investigation of employee

concerns addressed by the ECSP. The employee concerns included in the scope of the ECSP were those collected or otherwise identified before February 1986, and generally dealt with TVA's nuclear program activities between 1980 and 1985.

This is the tenth report (eight annuals and two supplementals) submitted in accordance with a commitment made by TVA to the NRC in July 1988. A synopsis of the events leading to this commitment is provided below.

In 1985, TVA established the ECSP to evaluate approximately 6,000 employee concerns that had originated primarily at Watts Bar Nuclear Plant (WBN). The major findings, actions, and conclusions resulting from the nearly two years of ECSP evaluations were documented in a series of reports. The last of these reports was submitted to the NRC on February 6, 1989.

On March 11, 1988, the NRC forwarded to TVA its preliminary Safety Evaluations of the ECSP reports relating to Sequoyah Nuclear Plant (SQN). One of these Safety Evaluations dealt with engineering issues of a programmatic nature, primarily organizational and/or procedural problems in the engineering design process. In this particular Safety Evaluation, the NRC made the following statement: "Any additional program changes should be submitted for staff review and should not be implemented prior to review and approval by the staff."

In a letter dated July 6, 1988, from Mr. R. L. Gridley, TVA's Director of Nuclear Licensing and Regulatory Affairs, TVA provided the NRC with comments on the preliminary SQN Safety Evaluations.

In response to the previously quoted statement, TVA committed to submitting to the NRC for review, prior to implementation, any deviation to a CAP commitment that significantly deviates from the original intent of the CAP (Level I). For those CAP deviations not considered to implement such changes (Levels II and III), TVA would notify the NRC in an annual report of all approved deviations to CAPs implemented during the reporting period.

On July 9, 1992, the NRC accepted changes proposed by TVA to the CATD closure process contingent upon the issuance of procedural changes. Nuclear Power Standard STD-1.2, Revision 2, "Concerns Resolution" was issued January 29, 1993 with the changes effective March 30, 1993. Changes are summarized as follows:

1. The Level II CAP deviation definition was refined into Level IIa and IIb. Level IIa deviations must be approved by the Senior Management Review Group as was previously required for Level II deviations. Level IIb deviations must be approved by the Manager, Concerns Resolution Staff.

2. For Sequoyah, Bellefonte, Browns Ferry Nuclear Plants, and Nonplant Specific (NPS) CATDs which are not WBN specific, CATDs may be closed when the remaining open CAP actions have been properly identified as Nuclear Licensing commitments in accordance with STD-1.2 requirements. Nuclear Licensing and Regulatory Affairs (NLRA) then tracks to completion the remaining corrective actions using the existing NLRA commitment tracking process. The NLRA commitment tracking process, defined by Nuclear Power Standard STD-4.3, "Managing and Tracking NRC Commitments" was revised on April 30, 1993 to address CATD-related commitments. This process is applicable to WBN U2 following the full power operating licensing of U1.

Effective after March 30, 1993:

Level IIa CAP Deviation - A proposed change to a previously approved Quality-Related (QR) CAP whose implementation would (1) affect multiple plants; or (2) affect a programmatic area of weakness; or (3) deviate from the techniques or methods established by commitments previously made that are outside of normal engineering practices or affect the results; or (4) involve organizational changes that prohibit the implementation of the CAP.

Level IIb CAP Deviation - A proposed change to a previously approved (1) QR CAP whose implementation would deviate from techniques or methods established by the commitments previously made that are not outside of normal engineering practices and do not affect the results; or (2) QR CAP which involves organizational changes that do not prohibit the implementation of the CAP; or (3) Nonquality-related (NQR) CAP whose implementation would affect multiple plants, affect a programmatic area of weakness, deviate from techniques or methods established by the commitments previously made, or involve organizational changes that prohibit the implementation of the CAP.

Level III Deviation - Any other changes to a previously approved CAP that is not classified as Level I, Level IIa or Level IIb
(Note: The Level I and Level III CAP deviation definitions were not changed. The Level II wording was adjusted to expand "Level II" to "Level IIa or Level IIb.")

3.0 PROGRAM STATUS AND RELATED ACTIONS

3.1 Closure of Employee Concerns Special Program (ECSP)

In 1985, TVA established the ECSP to evaluate approximately 6,000 employee concerns that had originated primarily at WBN. Plans for the completion of activities to resolve employees' concerns using the ECSP were initially described in TVA's submittal from H. G. Parris to W. J. Derricks memorandum dated November 20, 1985. The November 1985 submittal was superseded by a submittal from S. A. White to Victor Stello, Jr., dated May 2, 1986. The NRC issued a Safety Evaluation Report, NUREG-1232, on July 28, 1987, which approved the ECSP. Under the ECSP, the actions required to resolve the employees' concerns were included in CAPs and were documented in CATDs. In TVA's submittal from R. L. Gridley to the NRC dated February 6, 1989, the completion of all evaluations and reports was docketed leaving open only the completion of the CAP actions documented in the CATDs that remained open at the time of the February 6, 1989 submittal. An improved closure process for CATDs was documented in a submittal from M. J. Burzynski to the NRC dated March 2, 1992. The improved process documented in this submittal allowed certain CATDs to be closed by transferring the corrective actions into licensing commitments. This submittal also docketed again the completion of all of TVA's efforts associated with the ECSP with the exception of the completion of actions that remained open at the time of the February 6, 1989 submittal. The NRC's response approving the March 2, 1992, submittal was sent to TVA from J. R. Johnson to M. O. Medford dated July 9, 1992. The CATDs which document these remaining open actions have now been closed, either by completion of the corrective actions or by tranfer to licensing commitments. With the closure of the last of the CATDs, TVA completed all activities relating to the ECSP. Based on completion of the committed activities, and with the submittal of this annual and final report, TVA considers the ECSP to be closed.

Additionally, TVA has inventoried the CATD closure packages and is microfilming them for long-term storage and/or retrieval. TVA has also, in coordination with the NRC, initiated actions to disposition the original employee concerns documentation taken and retained by Thero Special Services (formally Quality Technology Corporation).

3.2 Program Statistics

As of March 15, 1996, 1,591 CATDs have been submitted for closure by the line organization, independently verified, and closed.

During the period January 1, 1995 and March 15, 1996, the ECSP closed 413 CATDs and processed 340 CAP deviations.

Table 1
CAP Deviations - January 1, 1995-March 15, 1996

SITE	Deviation Level I	IIa	IIb	III
Bellefonte	0	0	0	2
Browns Ferry	0	11	3	56
Nonplant Specific [1]	0	15	11	60
Sequoyah	0	3	3	7
Watts Bar [1]	0	18	26	125
Total [1]	0	47	43	250

Table 2
CATD Status

SITE	TOTAL	CLOSED[2]	REMAINING OPEN
Bellefonte	193	9	0
Browns Ferry	359	86	0
Nonplant Specific	169	53	0
Sequoyah	335	8	0
Watts Bar	535	257	0
Total	1,591	413	0

NOTES:
1) This report documents 6 Level IIa, 4 Level IIb, and 60 Level III CAP deviations for NPS CATDs; and 1 Level IIa, 1 Level IIb, and 125 Level III CAP deviations for WBN CATDs. The August 30, 1995 Supplemental Report for WBN U1 documented the remaining 58 CAP deviations for WBN and NPS CATDs.
2) CATDs closed January 1, 1995-March 15, 1996

4.0 CAP DEVIATIONS

This section presents a description of Level IIa and IIb CAP deviations approved during the reporting period and not reported in the special report submitted to the NRC on August 30, 1995. The original CAP or that portion of the CAP being changed is identified, the CAP revision is described, and a summary of the technical justification supporting the approved CAP deviations is presented. Those CATDs having Level III CAP deviations are identified but not described.

In this report, the "Previously Approved CAPs" and the "Revised CAPs" are quoted verbatim from the latest approved versions.

4.1 Sequoyah Nuclear Plant (SQN)

During this reporting period, there were 3 approved Level IIa CAP deviations, 3 Level IIb CAP deviations, and 7 Level III CAP deviations for SQN CATDs.

4.1.1 Level IIa and IIb CAP Deviations

CATD 22301-SQN-01 (LEVEL IIa DEVIATION) - UNAUTHORIZED UNISTRUT CLAMPS

CATD 22301-SQN-01 documents the issue "SQN response to WBN-SCR 6084-S dated 12/13/85 identifying 17 types of unauthorized Unistrut clamps is being reviewed by TVA."

Previously Approved CAP

1. Determine if any of the 17 clamp types were procured at SQN for use on instrument tubing.
2. If clamps were procured, determine likelihood of their usage as instrument line supports, and further action (if any) required.

Revised CAP

1. Determine if any of the 17 clamp types were procured at SQN for use on instrument tubing.
2. If clamps were procured, determine likelihood of their usage as instrument line supports, and further action (if any) required. See note below.

NOTE: The CAP corrective actions have not changed. The justification has been revised due to QA rejection of closure submittal - ref memo, L. Poage to R. L. Newby (SO8 941215 815).

Technical Justification

WBN NCR 6084 R0, initiated 5/23/85 (C24850606100 - tab 11 of CATD package) states that Unistrut P2911 clamps were used at WBN on seismic supports for 1/2" instrument lines. It indicated that P2911 clamps are fabricated similar to Unistrut P1111 clamps, and the two could mistakenly be interchanged unless the part numbers were checked. The

NCR was distributed to other plants for generic evaluation (B41851024003). Attachment B of the NCR included a list of 17 unauthorized clamp types (including P2911) to be evaluated. Later, WBN SCR 6084-S R0 dated 12/13/85 (W860822K0252) was issued on the same subject. It stated that the condition might result each time a drawing was issued which specified the use of any of the 17 clamp types.

At SQN, SCR SQNCEB8612 was written to broadly address concerns regarding the proper specification and usage of clamps for pipe, conduit, and instrument line supports, and their proper bolt tightening. The SCR scope included Unistrut and B-E pipe clamps. Attachment A (tab 12) of the Employee concern package includes a 12/15/86 response from R. W. Olson to M. R. Harding (S02861215937). This memo documents that Construction purchase contract records were searched, and of the 17 clamp types, six had been procured: P1115, P1117, P1118, P1119, P1121, and P1123. An examination of the WBN clamp listing shows, however, that the P1117, P1118 and P1119 clamps referred to by Olson actually have a "B" suffix (i.e., P1117B, P1118B and P1119B). The "B" suffix indicates a configuration where the clamp halves are joined by a tap screw, with no nut. Thus, the P1117, P1118 and P1119 clamps reported as found at SQN are clamps which are qualified in DS-C1.2.6. Therefore, of the 17 clamps found at WBN, only numbers P1115, P1121, and P1123 were procured at SQN.

Most tubing at SQN is 1/2" in diameter or less. Due to the large tubing size of the P1115, P1121, and P1123 clamps, none is likely to have been used as an instrument line tubing support. The P1115 (1-1/2" nominal, 1.900" inside dia.) pipe/conduit clamp most closely approximates the size of a tubing clamp (P2037, 1-7/8" diameter). The current pipe/tubing support standard, DS-C1.2.6, authorizes use of the P1115 clamp, and provides allowable loads qualified by testing. Conversely, the P2037 tubing clamp is not included in DS-C1.2.6, which supports tubing up to 2-3/8" diameter. This reinforces the earlier statement herein that the use of large tubing sizes at SQN is unlikely. In any event, should a P1115 clamp have been used on tubing, it is fully tested and qualified for piping loads, which exceed any loading which tubing would experience. The slight diametrical difference would not affect the clamp's effectiveness (1.875" vs 1.900").

The P1121 (4" nominal, 4.500" inside dia.) pipe/conduit clamp provided by Unistrut can also be used as a tubing clamp, and is qualified by DS-C1.2.6. Even though the use of 4-1/2" tubing at SQN is doubtful, this clamp is fully acceptable for both piping and tubing.

Unistrut Catalog Number 11 provides a tubing clamp (P2066, 5-1/2" inside diameter), approximately equal in diameter to the P1123 (5" nominal, 5.563" inside diameter)

pipe/conduit clamp which was procured at SQN. However, as evidenced by Design Standard DS-C1.2.6, qualified clamps for tubing are only provided for up to a maximum tubing size of 2-3/8", reinforcing the position that very large tubing is unlikely to have been used at SQN. Even if used on tubing, the capacity of this pipe clamp exceeds the loads which a correspondingly sized tube can develop.

Historically, the Olson memo had previously concluded that the "likelihood of Unistrut clamps concerned on NCR6084 being used in the field is very remote." In addition, R1 to the Final Element Report (T25 870121 948, page 9 of 16) concluded that concerns "regarding the use of unauthorized clamps is not valid for SQN Seismic Category I and I(L) instrument line supports."

In conclusion, there is no predicted adverse impact on the qualification of tubing where a P1115 tubing clamp may have been used. The P1121 clamp is fully qualified for both tubing and piping. The P1123 clamp exceeds the range of tubing sizes used at SQN, as evidenced by DS-C1.2.6.

CATD 23801-SQN-01 (LEVEL IIa DEVIATION) - ACCURATE CONDUIT FILL INFORMATION NOT READILY AVAILABLE

CATD 23801-SQN-01 documents the issue that accurate conduit fill information is not readily available nor is the actual fill readily determined. Therefore, compliance with FSAR commitment for conduit fill is not verifiable.

Previously Approved CAP

A review will be performed of the practices and procedures utilized in routing, installing, and abandoning cables in conduit during SQN's design, construction, and modification phases up to the present day. The purpose of this review will be to determine the root cause of any discrepancy, if such a discrepancy exists, and to bound the resulting extent of the problem. The review will address the practices and procedures relating to all conduits in seismic structures, and any known occurrences, which arise during this review, of inaccuracies in the number or type of cables indicated in the conduit schedule will be specifically examined. This review is a prerequisite to any further action as, at present, no specific discrepancies in the conduit schedule have been identified. The services of an independent third party have been obtained to provide a plan and specifications prior to restart to conduct a full systematic review.

The completion of the long term program after unit 2 restart is prudent for several reasons. As noted above, no specific problems with conduit overfill have been identified. While no inspections have been performed specifically to address this issue, there have been field inspections performed for other purposes which support the accuracy of the current design data. For example, a field inspection was performed on the 16 worst case conduits selected for sidewall bearing pressure issue and the inspection confirmed the correct number of cables in all 16 vertical runs. The routing of cables in conduit is done manually and does not utilize the computer program which routes the cables on tray. Therefore, the conduit fill is not impacted by the computer errors described in Employee Concern 238.03 for tray overfill. Since the design of the conduit supports contain safety margin based on maximum allowable fill, even if overfill had occurred, the overfill would have to be significant to violate the seismic design. Again, there is no documented evidence that this has occurred.

TVA conducted extensive testing on cables to assure that sidewall bearing pressure was not a valid concern. In addition, tests will be performed to establish that issues raised on support of cables in vertical conduits, pullbys, and jamming are properly addressed before unit 2 restart. These tests will establish the functional adequacy of the cables in conduits.

Revised CAP

1. Improve and verify TVA's CCRS program, with emphasis on conduit percentage fill calculation.

2. Confirm that the appropriate conduit standards and constraints have been made part of CCRS, as well as the cable data on diameters listed in DS-E12.1.13 and .14. There is an option on cable weights and diameters to use plant-specific data as compiled from individual cable contracts.

3. In a run of the updated CCRS master file, extract and list all conduits which contain cables with a letter or Roman numeral suffix (ID3). (These suffixes identify which circuits require Class 1E separation, and implicitly are those cables which constitute the Class 1E circuits).

4. Confirm that a fill percentage report is available for conduit and that exception reports are producible which list those with fill above the established standards.

5. Update the CCRS database with all new data discovered or developed during the above program, thereby resolving the concern.

6. Justify adequacy of potentially overfilled conduits with the results of the Long Term Cable Management Program (LTCMP) and the Sequoyah Cable Test Program (CTP).

Technical Justification

The original concern focused on the lack of documentation to establish the fill percentages of conduits, and therefore, the potential for noncompliance with FSAR commitments. The implications of such a deficiency is that cables may have been damaged during installation into a conduit that was near or over the National Electrical Code (NEC) recommended fill percentage.

The original CAP program outline to reconcile this CATD was prepared by UE&C. Some of these reconciliation steps dealt directly with obtaining the missing cable documentation, others addressed methods of resolving deviations from the established fill limits and the potential for cable damage caused by such deviations. Some of the corrective actions have been completed, and some now outdated and are not totally relevant to the resolution of this employee concern.

This CAP deviation request proposes to delete those steps of the original CAP that are no longer relevant and to address the remaining steps based on the current capabilities of Sequoyah's Consolidated Cable Routing System (CCRS) and the comprehensive evaluations performed to date of Sequoyah's cable system issues.

The objective of the revised Corrective Action Plan is to identify the safety-related conduits overfilled at Sequoyah, and to determine if their configuration would or has created a detectable condition adverse to quality.

The justification to rely on the remaining and substitute actions to ensure the functionality of Sequoyah's safety-related cables, is provided below.

Action 1 - COMPLETE

This action has been completed by the incorporation of the Consolidated Cable Routing System at Sequoyah, in conjunction with the formation of TVA's on-line Mark Number Database "ON-MARK." (RIMS #DO1 920821 003 AND DO1 930723 005) The consolidated computer cable routing system (CCRS) for Sequoyah has been developed and implemented. It is a routing and scheduling computer program, containing a validated depository of current and historical cable data, used as a design tool and construction aid for designers and installers of nuclear plant electrical cable. One operation the program allows a designer to perform is to determine overfill, overload, and blocked conditions (User's Manual page 1-2).

The ON-MARK database is a computerized system designed to track Mark Number information of current and obsolete cables used at all TVA nuclear plants. The main purpose of the ON-MARK database is to provide a single point of reference for cable parameters, including cable ODs. This data shall be used for the procurement, design and installation of cable/raceways at TVA nuclear facilities. Use of this data, along with the referenced Standard Specifications, will provide control of the critical cable parameters.

These two program enhancements resolve the first portion of the Employee Concern. Accurate conduit fill is now available and is automatically incorporated into the CCRS during the design/loading of all raceway systems.

Action 2 - COMPLETE

The original concern involved conduit overfills above those permitted in Electrical Design Standard DS-E-13.1.4, SQN Design Criterion SQN-DC-V-11.3 and the UFSAR Section 8.3.1.4.1. The early version of the computer cable routing program used unverified cable diameters. Revised diameters are now contained in the ON-MARK cable database, and must be used whenever cable routing designs are produced or revised.

Since Sequoyah has no pre-existing calculations to substantiate fill levels in the conduit system, resolution of this concern was highly dependent upon the development and implementation of the consolidated computer cable routing system (CCRS) for Sequoyah (WIS 910313 300). This system has been implemented and has been validated statistically by the Long Term Cable Management Program (LTCMP). The formal documentation for this validation is contained in Sequoyah Nuclear Plant Electrical Calculation SQN-CSS-037. The CCRS is now considered a QA validated depository and is the basis for future cable modifications and additions.

Action 3 and 4 - COMPLETE

This action was completed on February 15, 1995, under the job name "CONDLOAD J5825."

Action 5 - COMPLETE

This action has been completed for existing cables in the CCRS database, thus resolving this action as written. Note, CCRS/ON-MARK are "on-line" databases, which means that as new cable types are engineered and designed, they will be added on a continuing, "as-needed" basis.

In conclusion, there is a high degree of confidence that the Sequoyah Cable Routing System (SCRS) is adequate to represent the configuration of the subject conduits. The ON-MARK database establishes and controls weights and ODs for use in the design of conduit systems. The LTCMP statistically verified the adequacy of the data in the SCRS

as input for the purpose of screening and evaluation of conduit configurations. In addition, the SQN CTP tested over 1,000 conductors in-situ (many unshielded cables were in water filled conduits) and did not find any failures attributable to cable pulling activities. This would include any cables pulled into overfilled conduits.

Based on this extensive analysis, involving a representative worst case sample of conduits, the completed and NRC approved programs confirm that detrimental cable pulling practices (including overfill conduit conditions) were not pervasive during the design and installation of raceway systems at Sequoyah. It also confirms that for the most part, the Design Standards on conduit fill were followed.

The NRC has reviewed all these issues and the supporting calculations. Their response (A02 920601 004) to Medford dated May 28, 1992 and titled, "Cable Ampacity and Installation Issues" stated that after reviewing the submittals and conducting an audit of TVA's documentation at Sequoyah in 1991, the NRC staff has concluded that TVA has adequately resolved the cable ampacity and cable installation issues (cable pullbys, cable jamming, and vertical cable support). The adequacy of safety-related cables for restart has been documented by the successful completion of the cable test program (L44 871120 803) and NRC Safety Evaluation Report, Section 3.12 of NUREG-1232, Vol. 2 (A02 880527 022).

Therefore, we request that the original CAP be revised to eliminate the requirement to perform all the steps in UE&C's program outline. Future closure activities will be based on the above completed and approved work and the current cable tracking program in place.

Action 6

This new action constitutes evaluations, walkdowns, calculations, testing and the results of LTCMP and Sequoyah Cable Test Program. These previously completed programs provide ample evidence that the SQN cable pulling practices have not degraded the cables to a point where they will not perform their intended safety function.

LONG TERM CABLE MANAGEMENT PROGRAM

The LTCMP focused on the as-constructed configuration of the cable routing database. Signal tracing and comprehensive evaluations were performed to address Sequoyah cable routing system issues. Attributes such as cable ampacity, 1E cable separation, 10 CFR

50.49, 10 CFR 50 Appendix R, raceway overfill (weight) and other issues that could have been affected by misrouted cables were evaluated. These evaluation and conclusions have added additional credence to the CCRS program. Each of these attributes applicable to potential conduit overfill will be discussed in detail, as follows:

SIGNAL TRACING - The purpose of the signal tracing activities was to determine any discrepancies between actual cable installation and the cable routing program and to evaluate discrepancies to determine root cause. CCTS Item No. NCO-87-0324-035 (RIMS #L44 871110 812) QIR SQN90368 (RIMS #B37 901114 800) documents the results of Unit 2 Cable Signal Tracing. This signal tracing effort used a population of 59 randomly selected (by computer) cables (from a population of 4, 039 cables) that, when signal traced to establish their exact route, did not deviate from the prescribed route to the extent that they violated any of the five design bases, one of which was conduit overfill. Evaluation of the results revealed that noted deviations did not constitute a CAQ and were classified as minor cable routing anomalies or "Document Deviations" that were resolved via the design control process. Additionally, from the cable tracing results of this investigation, there is a 95 percent confidence that the routing of the remaining cables are also acceptable.

Cable Ampacity - As a result of deficiencies identified to TVA and later confirmed by TVA, the NRC was concerned about the adequacy of the electrical system design at Sequoyah. Because of this concern, one of the areas evaluated by the NRC in 1987 was raceway systems. Specifically, this included the evaluation of justification for use of TVA's ampacity tables and justification for TVA's ampacity tables as specifically applied to control level cable trays, grouped conduits, conduits with more than three cables and duct banks. TVA developed a sampling program to determine the cable adequacy with respect to ampacity ratings. TVA submitted the results of this program to the NRC on February 27, 1987. Based on its review of the TVA submittal and resolution of identified deficiencies, the NRC stated that program areas of cable ampacity had been adequately identified and that the proposed corrective actions were acceptable. Reference Safety Evaluation Report, NUREG-1232, Vol. 2, Supp. 1, dated January 1989 - pages 2-38.

Qualification of Seismic Support of Conduits - The installed conduit system has been qualified to meet the design basis requirements by a worst case sample program performed for CAQR SQT870626. TVA calculation SCG2S94046 (RIMS #B87 950210 007) demonstrates that the conclusions of that program are still valid. In addition, this calculation also demonstrates that the overloaded conduits meet the design basis requirements in SQN-DC-V-13.10.

SEQUOYAH CABLE TEST PROGRAM

The Sequoyah CTP involved walkdown inspections, evaluations, calculations and testing to resolve major cable installation issues at Sequoyah. Conduit fill, specifically, was not one of these issues. However, conduit fill was indirectly evaluated as a part of the following issues.

CABLE PULLBY - Conduit fill was indirectly evaluated as a part of the resolution of the issue of pullbys. This was due to industry recognition of the fact that the severity of a given pullby increases with increasing fill. As a result, in addition to the attributes of length of conduit, bend radius, number of bends, weight of cables, and coefficient of friction, one of the key screening factors was conduit fill. A total of 770 safety-related conduits were evaluated against these attributes at SQN during the revised analysis of cable pullby concerns in May 1991. A SQN electrical calculation established the "worst case" conduit configurations through a ranking process that considered all these factors. "Worst Case" was defined being more than 100% of the allowable calculated sidewall bearing pressure. Results of this evaluation revealed only one conduit (1PL4342A), of the "worst case" population of 18 conduits, was overfilled (40% allowable, 58% calculated). A summary of this analysis can be found in calculation SQN-CSS-033. (RIMS #B25 900319 002)

JAMMING DAMAGE - Evaluations of conduits containing three or four cables whose diameters when compared to those of the conduits could lead to jamming. EEB-CSTF-0008 (RIMS #B87 910510 001) identified the family of conduits in which the jam ratio was satisfied. SQN-CSS-035 (RIMS #B87 901005 001) identified the population of worst case jamming conduits.

VERTICAL CABLE SUPPORT - (SQN-CSS-034) - The predominant concern from supporting cables by 90-degree condulets (or TEE condulets) is the potential for cutting the insulation by the corner of the condulet or conductor creep to this edge. The static bearing pressure on the cables supported by such a condulet increases as the length of vertical conduit immediately below the condulet increases.

For the purposes of this evaluation, one of the criteria used to obtain representative worst case conduit and cables was that the conduit shall have a minimum of five cables and minimum fill of 20 percent. The intent of the minimum fill and number of cables

requirement was to obtain a conduit in which the cables lie on top of one another, thereby exerting more force on the lower cables.

Based on successful DC hipot in-situ testing of cables in the "worst case" populations of the above configurations, any detrimental affects of conduit overfill would have had ample opportunity to manifest themselves and become apparent.

CATD 23801-SQN-02 (LEVEL IIa DEVIATION - CONDUIT SUPPORT ADEQUACY AND CABLE AMPACITIES QUESTIONABLE

CATD 23801-SQN-02 documents the issue that conduit support adequacy is questionable as a result of the uncertainties regarding installed cable weight. In view of the uncertainties regarding conduit fills, cable ampacities must also be verified (ampacity is discussed in Sequoyah Element Report 240.0).

Previously Approved CAP

A review will be performed of the practices and procedures utilized in routing, installing, and abandoning cables in conduit during SQN's design, construction, and modification phases up to the present day. The purpose of this review will be to determine the root cause of any discrepancy, if such a discrepancy exists, and to bound the resulting extent of the problem. The review will address the practices and procedures relating to all conduits in seismic structures, and any known occurrences, which arise during this review, of inaccuracies in the number or type of cables indicated in the conduit schedule will be specifically examined. This review is a prerequisite to any further action as, at present, no specific discrepancies in the conduit schedule have been identified. The services of an independent third party have been obtained to provide a plan and specifications prior to restart to conduct a full systematic review.

The completion of the long term program after unit 2 restart is prudent for several reasons. As noted above, no specific problems with conduit overfill have been identified. While no inspections have been performed specifically to address this issue, there have been field inspections performed for other purposes which support the accuracy of the current design data. For example, a field inspection was performed on the 16 worst case conduits selected for sidewall bearing pressure issue and the inspection confirmed the correct number of cables in all 16 vertical runs. The routing of cables in conduit is done manually and does not utilize the computer program which routes the cables on tray. Therefore, the conduit fill is not impacted by the computer errors described in Employee Concern 238.03 for tray overfill. Since the design of the conduit supports contain safety margin based on maximum allowable fill, even if overfill had occurred, the overfill would have to be significant to violate the seismic design. Again, there is no documented evidence that this has occurred.

TVA conducted extensive testing on cables to assure that sidewall bearing pressure was not a valid concern. In addition, tests will be performed to establish that issues raised on support of cables in vertical conduits, pullbys, and jamming are properly addressed before unit 2 restart. These tests will establish the functional adequacy of the cables in conduits.

Revised CAP

1. Improve and verify TVA's CCRS program, with emphasis on cable weight calculation.

2. Confirm that the appropriate conduit standards and constraints have been made part of CCRS, including the latest data on cable weights.

3. Run the updated CCRS, extract and list all conduits which contain cables with a letter or Roman numeral suffix.

4. Confirm that cable weight data for these conduits, and that exception reports are available, with keys set for values used in conduit support design criteria.

5. Electrical Engineering will establish worst case conduit fill bounding conditions and request Civil Engineering evaluation to determine the adequcy of conduit supports in Category 1 structures.

Technical Justification

The original CAP program outline to reconcile this CATD was prepared by UE&C. Most of the reconciliation actions are similar to CATD 23801-SQN-01 and have been addressed as an extension of the work performed for CATD 23801-SQN-01. Other actions are no longer needed based on other analysis and evaluation performed.

The justification to rely on the remaining and substitute action to ensure the functionality of Sequoyah's safety-related conduit supports, is provided below.

Actions 1 & 2 - COMPLETE

This action has been completed by the incorporation of the Consolidated Cable Routing System at Sequoyah, in conjunction with the formation of TVA's on-line Mark Number Database "ON-MARK." (RIMS #DO1 920821 003 and DO1 930723 005).

The consolidated computer cable routing system (CCRS) for Sequoyah has been developed and implemented. It is a routing and scheduling computer program, containing a validated depository of current and historical cable data, used as a design tool and construction aid for designers and installers of nuclear plant electrical cable. One operation the program allows a designer to perform is to determine overfill, overload (weight), and blocked conditions (User's Manual page 1-2).

The ON-MARK database is a computerized system designed to track Mark Number information of current and obsolete cables used at all TVA nuclear plants. The main purpose of the ON-MARK database is to provide a single point of reference for cable parameters, including cable weights. This data shall be used for the procurement, design and installation of cable/raceways at TVA nuclear facilities. Use of this data, along with the referenced Standard Specifications, will provide control of the critical cable parameters.

These two program enhancements resolve the first portion of the Employee Concern. Accurate conduit fill is now available and is automatically incorporated into the CCRS during the design/loading of all raceway systems.

Actions 3 & 4 - COMPLETE

This action was completed on November 15, 1994, under the job name "CONDLOD2 J08999."

Action 5

Qualification of Seismic Support of Conduits - The installed conduit system has been qualified to meet the design basis requirements by a worst case sample program performed for CAQR SQT870626. Electrical Engineering established worst case conduit fill bounding conditions and requested Civil Engineering evaluation (B37 940321 003) to determine adequacy of conduit supports. TVA calculation SCG2S94046 (RIMS #B87 950210 007) demonstrates that the conclusions of that program are still valid. In addition, this calculation also demonstrates that the overloaded conduits meet the design basis requirements in SQN-DC-V-13.10.

Since the results of this evaluation are found acceptable, no further actions will be required and the remaining actions in the original CAP are not required.

Therefore, we request that the original CAP be revised to eliminate the requirement to perform all the steps in UE&C's program outline. Closure of this CATD will be based on past work done and civil Engineering's evaluation of a conduit cross sectional area bounding that which encompasses the SQN worst case conduit fill conditions.

CATD 40703 SQN-01 (LEVEL IIb DEVIATION) - CLARIFICATION OF FSAR AND ASSOCIATED DOCUMENTS

CATD 40703-SQN-01 documents the issue that the FSAR and associated documents do not clearly define the applicable code editions and addenda of ANSI B31.7 used in the fabrication, erection, installation, and use of Nuclear Class Piping Components.

Previously Approved CAP

The FSAR will be clarified. A SQN engineering requirements specification will be written under the master specification program to provide a baseline for the requirements. Other affected lower tier documents such as N76A10, N2M-865, etc., will be revised as appropriate to clearly reflect the applicable code requirements.

Problem Identification Report No. SQNNEB8638 has been issued to track this to completion.

Revised CAP

Same as Previously Approved CAP.

Technical Justification

Previously Approved CAP has not changed. The CAP was missing the required approval signature of the ECTG Manager.

CATD I-85-560-SQN-02-014 (LEVEL IIb DEVIATION) - NONCONFORMANCE EVALUATION FOR BOX ANCHOR WELDING

CATD I-85-560-SQN-02-014 documents the issue that because of the generic aspects associated with box anchor welding described in paragraphs III.B-3 and 4, a construction issued NCR 6264 dated August 24, 1985, for Watts Bar should be sent through design to the other plants for a generic review for applicability in accordance with Office of Engineering Procedure OEP-17 (ref. 9).

Previously Approved CAP

Revise drawings 478100 sheets 2 & 4 and specific ECNL6319 drawings so a butt weld as shown on the 478100 drawings will not extend to the pipe and result in the collar plate being welded to the pipe. The modification cognizant Engineer has processed FCRs to revise these drawings. WBN NCR 6264 was sent to SQN for potential generic condition evaluation from R. O. Barnett to those listed (B41851210004). The evaluation request and WBNNCR 6264 was transmitted to NUCPWR by memo from J.P. Vineyard to H. B. Rankin (B25851227024) for determination if the condition exists. Subsequently an operating experience report form was sent to OE via H. B. Rankin requesting a disposition. This was done on form SQA26 Attachment 3.

Revised CAP

Same as Previously Approved CAP.

Technical Justification

Previously Approved CAP has not changed. The CAP was missing the required approval signature of the ECTG Manager.

CATD WP-08-SQN-001 (LEVEL IIb DEVIATION) - AINTING REQUIREMENTS RELATED TO WELDS

CATD WP-08-SQN-001 documents the issue of "Painting Requirements Related to Welds" - completion of the protective coatings reinspection and resultant correction action under SQN-CAR-86-01-001. Reference WP-08-SQN, Revision 1.

Previously Approved CAP

Rusting conditions were found during implementation of the following Preventative Maintenance packages. PM-1474-364, PM-1434-364, PM-1435-364, PM-1439-364, PM-1438-364, PM-1519-364, PM-1520-364, PM-1521-364, PM-1436-364, PM-1437-364, PM-1473-364, PM-1518-364. These PM packages are being evaluated by DNE. All rusting conditions have been given a repair priority of 2. Priority 2 items are not required for restart. MR's and WR's will be generated on these items after DNE completes their review. The implementation of the PM program will ensure that all areas of containment will be inspected on a periodic basis. This will improve the basic conditions of coatings inside containment including welds.

Revised CAP

Same as Previously Approved CAP.

Technical Justification

Previously Approved CAP has not changed. The CAP was missing the required approval signature of the ECTG Manager.

4.1.2 Level III CAP Deviations

There are 7 Level III CAP deviations identified for the following SQN CATDs:

CATD	Deviations
11301-SQN-06	2
20501-SQN-02	4
22301-SQN-03	1

4.2 Browns Ferry Nuclear Plant (BFN)

During this reporting period, there were 11 approved Level IIa CAP deviations, 3 Level IIb CAP deviations, and 56 Level III CAP deviations for BFN CATDs.

4.2.1 Level IIa and IIb CAP Deviations

CATD 20106-BFN-01 (UNITS 1 AND 3 ONLY; LEVEL IIa DEVIATION) - NONIMPLEMENTATION OF TVA PROGRAM ELEMENTS

CATD 20106-BFN-01 documents the issue that the following TVA program elements have not been completely implemented for Browns Ferry:

a. Design Baseline and Verification Program
b. Design Basis Document
c. BFEP PI 86-17 C/R Database

Previously Approved CAP

a. The Design Baseline and Verification Program has been put into place at Browns Ferry. The program's scope is to ensure that the actual plant configuration is reflected on plant documents and conforms to the design basis requirements. The program is divided into two phases. The pre-restart phase (1) of the program includes systems and portions of systems required for safe shutdown. This phase is currently scheduled for completion before restart. The post-restart phase (2) will complete engineering documentation and evaluations, and describe the final functional configuration as a CCD. The change control and management review procedures used during phase (1) will be in effect during the post-restart phase. This phase will be completed before the next refuel outage.
b. The design basis document is part of the issue outputs of the Design Baseline and Verification Program. These documents are currently being produced and must be complete before restart.
c. The program elements of BFEP PI 86-17 have been implemented and the C/R data base does exist. Currently, the data base is the responsibility of MEB section of the Baseline group located in Knoxville (Richard Wilson, ext. 3086-K). There is a copy located in Site Licensing at the Browns Ferry site.

Revised CAP

a. The Design Baseline and Verification Program (DBVP) has been put into place at Browns Ferry. The program scope is to ensure that the actual plant configuration for systems and portions of systems required for safe shutdown is reflected on plant documents and is evaluated to conform to design basis requirements.
b. The design basis documents resulting from the DBVP program are as follows:
   Safe Shutdown Analysis (SSA)
   General Design Criteria (GDC)
   System Design Criteria (DC)
   System Requirements Calculations (SRCs)
   System Baseline Test Requirements Documents (BTRDs)
   System Baseline Calculations
   System Configuration Control Drawings (CCDs)
   These documents (or their revision) must be complete for safety related systems before restart of the respective unit.
c. The program elements of the original BFEP PI 86-17 for the consideration and evaluation of historical commitments or requirements will be implemented to a C/R database cutoff date of February 1, 1988. Beyond that date, credit exists for the utilization of the TROI (Tracking and Reporting of Open Items) System per SSP 4.3 in the incorporation of commitments in design basis documents.

Technical Justification

For Unit 2 recovery, the DBVP was divided into two phases, a pre-restart phase for those systems (or portions of systems) which were required for safe shutdown and a post-restart phase for the remainder of the safety-related systems. The Units 1 and 3 DBVP will consolidate the approach for DBVP comprehensive completion prior to the restart of the respective units.

This eliminates the need to delineate the break between the phases and was deemed acceptable by the NRC letter of November 21, 1991 (RIMs A02 911125 005). For Unit 2 recovery, an additional output document was the Design Basis Document (DBD) which simply contained an integrated summary listing of the DBVP documents and the important configuration drawings for each system. This document will not be produced for Unit 1/3 recovery since it provided no additional information beyond that contained in the above-mentioned programs/documents. Therefore, for the remaining Unit 1/3 recovery programs, completion of the respective DBVP programs and design basis documents will be confirmed for the respective Unit prior to restart. Final functional configuration on Units 1 and 3 will be through as-designed/as-constructed drawing scrubs, plus reconciliation of discrepancies within the System Baseline boundaries identified by walkdowns. Systems Evaluation Reports (SYSTERs) will not be created for Units 1 and 3 because they have been enveloped by the SPALS/POC process, which provides for systematic evaluation of systems to perform as designed.

During Unit 3 recovery, the commitments/requirements database utilized by the Unit 2 DBVP was updated and each C/R reviewed to determine the applicability of the historical commitments and requirements to Unit 3. Those identified have been confirmed in Unit 3 or Unit 2/3 design basis documents. During Unit 1 recovery, the C/Rs will be reviewed and evaluated for applicability to Unit 1 and confirmed or incorporated into the design basis documents. Utilization of the TROI system per SSP 4.3 results in the incorporation of new commitments in the Browns Ferry design bases.

CATD 21804-BFN-01 (UNITS 1, 2 AND 3; LEVEL IIb DEVIATION) - DOCUMENTATION FOR ALTERNATE ANALYSIS PIPING

CATD 21804-BFN-01 documents the issue that:

1. No drawings exist that show the locations and types of supports on "alternate analysis" piping less than 2-1/2 inches in diameter.
2. No calculations or other evidence exist that show that "alternate analysis" piping less than 2-1/2 inches in diameter is qualified to code requirements.
3. Piping once categorized as "alternate analysis" piping and later evaluated under the Long-Term Torus Integrity Program (LTTIP) may not all be qualified to Browns Ferry licensing commitments. This is because:
   a. the applicable detailed design criteria, BFN-50-D711, allows calculated overstresses due to thermal loading of up to 5 percent or increases of piping system operating temperature range of up to 5 percent to be accepted without further justifications,
   b. in one of six calculations examined, the "5 percent" exceptions to qualification requirements for thermal expansion, noted above, were extended, without authority, to other load cases as well,
   c. in another of the six calculations examined, a 1.3 percent overstress was accepted without sufficient written justification,
   d. the "5 percent" exceptions described in (a) above are not in agreement with the BFN "Torus Integrity Long-Term Program, Plant Unique Analysis Report" (App. A, 5.w) and,
   e. the detailed design criteria, BFN-50-D711, do not explicitly limit the acceptance of calculated overstresses to the "emergency" and "faulted" level service limits. In the first calculation referred to in (b) above, overstresses were intended to be accepted for "upset" level service limits.

Previously Approved CAP

A. Existing Seismic Class I Piping less than 2 1/2" and supports will be evaluated/qualified and documented per the corrective action required by SCRBFNCEB8520 R0; as follows:
   1. Revise Design Criteria BFN-50-712 to delete typical support details and to reference designed and checked supporting calculations or a new criteria as appropriate.
   2. Perform a walkdown and an evaluation of a comprehensive sample, (a statistically valid sample of 64 randomly selected Class I supports and

associated piping based on the Multiple Sampling Plan included in NCIG-02, Sampling Plan for Visual Reinspection of Welds) (Attachment E), to determine seismic qualification of existing Seismic Class I Piping less than 2 1/2" and supports. The acceptance criteria for the piping analysis will be in accordance with design criteria BFN-50-712 or BFN-50-707. The acceptance criteria for the pipe support design will be in accordance with design criteria BFN-50-724. The concrete expansion anchor inspection will be evaluated in accordance with the NRC OIE Bulletin 79-02. If any of the piping, supports, or expansion anchors do not meet the aforementioned criteria, an interim qualification criteria may be applied. For interim qualification the total support system need only be sufficient to assure that the pipe will perform its intended function for all required load cases. If the sample evaluation is found to be acceptable only if the interim qualification criteria is applied, the entire population will be considered to be interim qualified only and further evaluation will be required to achieve long-term acceptance. The interim and long term qualification will be reviewed and approved by the NRC.

3. If required by the sample, (as required by the Multiple Sampling Plan included in NCIG-02, Sampling Plan for Visual Reinspection of Welds) (Attachment E), perform a 100% walkdown/evaluation and qualification of all Seismic Class I piping less than 2 1/2" and supports. Interim qualification criteria stated in A2 may be applied, pending NRC approval.
4. Obtain a DCR from the plant to allow DNE to issue design documents required for modifications.

Existing Seismic Class II Piping less than 2 1/2" and supports will be evaluated/qualified and documented per the corrective action required by SCRBFNMEB8605 R0.

B. The BFN "Torus Integrity Long-Term Program, Plant Unique Analysis Report" (PUAR) will be revised to describe and provide justification for the current allowance of a 5% operating temperature increase without reanalysis or a 5% calculated thermal overstress. Revision 2 of the PUAR has been approved by NRC in May 1985. The justifications will be included in Revision 3 to the PUAR, which will be submitted to NRC for review and approval. The BFN-50-D711 criteria will be revised to make

clear that use of the 5% temperature increase or 5% calculated overstress is applicable for emergency and faulted secondary stress evaluations only.

C. LTTIP piping analysis will be reviewed to identify all cases of calculated overstress. For such cases the justification given in the calculation will be reviewed for adequacy. If the justification does not demonstrate that the piping actually meets allowable stresses (as stated in the PUAR and Design Criteria BFN-50-D711), or if there is no justification; then the calculation will be revised to demonstrate that the piping actually meets code allowables.

Revised CAP

A. Existing Seismic Class I Piping less than 2 1/2" and supports will be evaluated/qualified and documented per the corrective action required by SCRBFNCEB8520 R0; as follows:

1. Revise Design Criteria BFN-50-712 to delete typical support details and to reference designed and checked supporting calculations or a new criteria as appropriate.
2. Perform a walkdown and an evaluation of a comprehensive sample, (a statistically valid sample of 64 randomly selected Class I supports and associated piping based on the Multiple Sampling Plan included in NCIG-02, Sampling Plan for Visual Reinspection of Welds) to determine seismic qualification of existing Seismic Class I Piping less than 2 1/2" and supports. The acceptance criteria for the piping analysis will be in accordance with design criteria BFN-50-C-7103. The acceptance criteria for the pipe support design will be in accordance with design criteria BFN-50-C-7107. The concrete expansion anchor inspection will be evaluated in accordance with the NRC OIE Bulletin 79-02. If any of the piping, supports, or expansion anchors do not meet the aforementioned criteria, an interim qualification criteria may be applied. For interim qualification, the total support system need only be sufficient to assure that the pipe will perform its intended function for all required load cases. If the sample evaluation is found to be acceptable only if the interim qualification criteria is applied, the entire population will be considered to be interim qualified only and further evaluation will be required to achieve long-term acceptance. The interim and long term qualification will be reviewed and approved by the NRC.

3. If required by the sample, (as required by the Multiple Sampling Plan included in NCIG-02, Sampling Plan for Visual Reinspection of Welds), perform a 100% walkdown/evaluation and qualification of all Seismic Class I piping less than 2 1/2" and supports. Interim qualification criteria stated in A2 may be applied, pending NRC approval.
4. Obtain a DCR from the plant to allow NE to issue design documents required for modifications.

B. Existing Seismic Class II Piping less than 2 1/2" and supports will be evaluated/qualified and documented per the corrective action required by SCRBFNMEB8605 R0.

C. Design Criteria BFN-50-D711 has been superseded by BFN-50-C-7103. Design Criteria BFN-50-C-7103 will be revised to delete the allowance of 5% increase in temperature range, pipe stress, support loads and nozzle loads with no further analysis required and to delete the allowance of a 5% exceedence of code stress limits resulting from secondary loads. Secondary and primary stresses must meet the licensing basis.

D. LTTIP piping analysis will be reviewed to identify all cases of calculated overstress. Pipe stress analysis, support loads and nozzle loads will be reviewed where loading changes have occurred and were automatically written off because the change was less than or equal to 5%. For such cases, the justification given in the calculation will be reviewed for adequacy. If the justification does not demonstrate that the component actually meets allowable stresses (as stated in the PUAR and Design Criteria), or if there is no justification; then appropriate calculations will be revised to demonstrate that the component actually meets code allowables.

Technical Justification

The approved CAP for CATD 21804-BFN-01 states that the BFN Torus Integrity Long-Term Program, Plant Unique Analysis Report (PUAR) will be revised to describe and provide justification for the current allowance of a 5% operating temperature increase without reanalysis or a 5% calculated thermal overstress. This revision would be submitted to the Nuclear Regulatory Commission (NRC) for review.

Since the approved CAP is a violation of our licensing basis, it is very likely that the NRC would not approve such a change. This revision to the CAP is proposed to eliminate exceptions to previous licensing commitments. The PUAR will not be revised, but Design Criteria BFN-50-C-7103 (which supersedes BFN-50-D711) will be revised to eliminate the allowance of a 5% overstress and will eliminate 5% temperature change without engineering evaluation. All piping stress analysis problems will be required to meet the code allowables, and to evaluate temperature changes. In addition to the changes described above, outdated design criteria numbers have been revised to the current criteria numbers.

CATD 22205-BFN-01 (UNITS 1, 3 AND UNIT 2 POST RESTART; LEVEL IIa DEVIATION) - STEEL END PLATES AND MIXED-BOLT AND WELDED CONNECTIONS

CATD 22205-BFN-01 documents the issue that a) BFN units 1, 2, and 3 have steel end plates with mixed-bolted and welded-connections. Related calculations are inadequate to justify the installed connections; b) Note 15 of drawing 45A800-2 does not require engineering approval; c) SCR BFNCEB8621 does not assure that all such as-built supports will be addressed by drawing review alone; nor does it propose program for each unit of BFN; and d) The SCR does not address undercut anchors.

Previously Approved CAP

The following corrective action plan items "a" through "d" correspond to the same designation items identified in the Problem Description section of this CATD.

a) The surface mounted base plates in a.. afety related structures at BFN which have one or more concrete anchors replaced with weld to an underlying embedded plate will be qualified as being acceptable, based on calculations which will comply with policy memo PM 86-17 or be modified as required. To accomplish this, the design drawings will be reviewed to determine where installation of base plates with weld replacing concrete anchors has been allowed. All drawings under section "a" will be verified to correspond to plant installation. Since design drawings are not available for many of the various structural features at BFN, field walkdown will be performed as necessary to establish the as built configuration and perform engineering evaluation to document acceptability of the installed features. Any results of previous evaluation activities used as a part of this corrective action will satisfy above commitments and have retrievable documentation. The approach will vary depending on the availability of design information. Since 1980 approximately 500 safety related piping supports associated with the Long Term Torus Integrity Program (LTTIP) for each unit at BFN have been analyzed and support drawings generated or revised. Using the Special Mechanical Maintenance Instruction (SMMI) 14.4.1.3-L, BFN will verify that the as built support configuration agrees with the design drawing. The BFN DNE civil group will perform the Calculation Verification Program for all the support drawings and calculations issued since 1980, including all the torus attached piping supports, to determine which drawings allow replacement of concrete

anchors with weld to an embedded plate. The support calculations will be revised for this deficiency or the support will be modified to document qualification of the supports. Many of the drawings are not readily available for review for piping supports installed before 1980. The as built support configurations for these supports will be determined from field walkdowns. Design calculations will be performed to document their adequacy. The two and a half inch diameter and larger safety related piping supports will be documented under the NRC OIE Bulletin 79-14 program. Smaller diameter safety related piping supports will be qualified by the small bore piping program. All of the class II features in the safety related structures will be evaluated under the class II over class I program. These programs will use the proper approach for evaluation of base plates containing concrete anchors and weld to an embedded plate, as outlined in the recurrence control measures. The additional load on the embedded plate will also be evaluated.

Design calculations and drawings detailing end connections for most of the miscellaneous steel framing are available for evaluation. Review of miscellaneous steel drawings and calculations identified only two base plates attached with a mixture of concrete anchors and welds. Only one of these base plates is in a safety related structure. Since the baseplate calculation was performed before BFN initially operated, under less stringent documentation requirements, additional engineering evaluation was required to determine conclusively the applicability of this deficiency. The evaluation indicates that the installed baseplate configuration is acceptable in regard to this deficiency. Design drawings are not readily available for most of the miscellaneous steel framing installed by the field predominantly for the purpose of supporting various features such as piping supports and cable trays. The miscellaneous steel framing for which design drawings are not available BFN will qualify on an interim basis by performing a walkdown and an engineering evaluation of a representative sample of such framing. The instruction for the walkdown and the evaluation will require adherence to the proper procedure for evaluation of base plates containing concrete anchors and weld to an embedded plate. The available cable tray support drawings have been reviewed to determine if design has allowed replacement of concrete anchors with weld to an embedded plate. The review has not identified any cases where such a detail has been allowed. Cable tray supports were recently qualified for BFN by a vendor. Since individual drawings are not available for many of the cable tray supports at BFN, the qualification approach included walkdowns to determine the as built support configurations. The vendor was not specifically instructed to

note and evaluate base plates with mixed anchors and weld; however, the vendor was instructed to evaluate the worst case loadings. Since the vendor calculations do not indicate that any such base plates were encountered, BFN conducted a representative field survey of approximately twenty percent of the seismic cable tray supports in the reactor building to determine if this condition exists. No such base plates were found. Heating, Ventilating, and Air Conditioning (HVAC) supports will be qualified for BFN by a vendor. Since there is a limited availability of HVAC support drawings, the vendor qualification will include a field walkdown to determine support configuration. Instruction that will be supplied to the vendor will indicate that any base plates with mixed anchors and weld encountered in the walkdown must be identified and evaluated. To prevent recurrence of this deficiency, a copy of the SCRBFNCEB8621 was routed to support designers of various structural features at BFN to inform them of the calculation inadequacies for mixed anchor and weld connections. In addition, policy Memorandum PM 86-17 was issued September 11, 1986, stating requirements for design of base plates with this type of end condition. The requirements of the Policy memorandum were later incorporated in the Civil Design Guide DG-C1.6.4, Design of Structural Connections. These actions are expected to be sufficient to prevent repetition of this deficiency.

b) Evaluations will be performed to show that all the installations are acceptable when performed within the parameters specified in the note 15 on drawing 45A800-2. The evaluation will address all possible loads from multiple attachments transferred from the embedded plate to the concrete. The conduit support installations using the 45A800 drawing series were allowed only during the May 1984 to March 1986 time frame.

c) SCRBFNCEB8621 R0 will be revised to document that, in addition to the conduit drawing deficiency already identified in the SCR, several piping supports have been found without sufficient documentation for base plates utilizing concrete anchors and weld. The revised SCR will also indicate that all types of structures, including those already enumerated plus others such as cable trays and HVAC supports, have been or will be reviewed for this deficiency. The remedial corrective action for the SCR will show that drawing review as well as field walkdowns are required to ensure that all base plates installed using mixed concrete anchors and weld have been evaluated. It will also indicate expected completion dates for the corrective action for the respective units at BFN. The Engineering Report (ER) associated with the

SCRBFNCEB8621 R0 will be superseded by the ER for the revised SCR. The new ER will present the information that corresponds to the revised SCR.

d) The SCRBFNCEB8621 R1 will specify that this deficiency is applicable to surface mounted plates regardless of the concrete anchor type used.

Revised CAP

a) **LTTIP & 79-14 PIPE SUPPORTS:**
(Units 3 and 1)
All class I piping and pipe supports will be walked down and as-built configuration information will be gathered. Supports will either be modified, deleted or totally replaced with new supports depending on the walkdown information. Engineering evaluation will be performed to document and qualify all situations found in the field, including mixed-bolted welded plates.

SMALL BORE PIPE SUPPORTS:
(Units 3 and 1)
Small bore walkdown/evaluation program will identify, document, and modify if necessary, the small bore pipe supports based on critical attributes and detrimental conditions, including mixed-bolted welded plates.

CLASS II/I PROGRAM:
(Units 3 & 1 and Unit 2 post restart)
Effects of class II over class I features in the safety related buildings will be evaluated using USI A46 approach.

MISC. STEEL FRAMING:
(Units 3 and 1)
Structural steel features with class I attachments will be walked down and as-built configuration information will be gathered. Steel features will either be accepted as is or modified. Evaluation will include documentation and qualification of all situations found in the field, including mixed-bolted welded plates.

CABLE TRAY AND CONDUIT SUPPORTS
(Units 3 & 1 and Unit 2 post restart)
Evaluate all existing cable tray and conduit supports using USI A-46 approach and all new supports using the Design Criteria BFN-50-C-7104.

HVAC SUPPORTS:
(Units 3 and 1)
Perform walkdown and as-built analysis of all Class I HVAC ductwork. Any base plates with mixed anchors and weld encountered in the walkdown must be identified and evaluated.

To prevent recurrence of this deficiency, a copy of the SCRBFNCEB8621 was routed to support designers of various structural features at BFN to inform them of the calculation inadequacies for mixed anchor and weld connections. In addition, policy Memorandum PM-86-17 was issued September 11, 1986, stating requirements for design of base plates with this type of end condition. The requirements of the Policy memorandum were later incorporated in the Civil Design Guide DG-C1.6.4, Design of Structural Connections. These actions are expected to be sufficient to prevent repetition of this deficiency.

b) Evaluations will be performed to show that all the installations are acceptable when performed within the parameters specified in the note 15 on drawing 45A800-2.
c) This corrective action is incorporated in proposed CAP in item "a".
d) Revise procedures to evaluate surface mounted plates with mixed weld and concrete anchors regardless of the anchor type used.

Technical Justification

Unit 2 CATD has been partially closed based on the resolution of SCRBFNCEB8621. The only open item for Unit 2 per memo from J.L. Thompson to J.E. Maddox, Rims R78 930602 252 is the evaluation of the effects of class II over class I features in safety related buildings using USI A46 approach.

All surface mounted base plates in safety related structures at BFN which have one or more concrete anchors replaced with weld to an underlying embedded plate does not need to be qualified. The basis for this deviation is our commitment to NRC as noted in NPF, Vol. III, Section 3.0, which states that the "Seismic Design Program" deals with concerns which have surfaced at BFN related to structural adequacy of various safety related structural and suspended systems. The proposed CAP deals with all safety related structural and suspended systems.

As noted in CAQR's BFP880666PER & BFP880665 and the closure of SCRBFNCEB8621, the review of the structural and miscellaneous steel drawings and subsequent evaluations has been documented for units 1, 2 & 3 in calculations CD-Q0303-881785 and CD-Q0303-881842.

Note that most of the ductwork in Units 3 and 1 have already been walked down during Unit 2 cycle 5.

The preventive actions are complete. They included the issuance of CEB Policy Memo/Reports, Revision to Civil Design Guide DG-C1.6.4 and the completion of employee training. Documentation of these items can be found in the closure sheet of SCRBFNCEB8621.

Calculation CD-Q0057-890803 documents the acceptability of supports installed using note 15 of drawing 45A800-2.

As noted in the Unit 2 closure package for this CATD, the Engineering Report for SCRBFNCEB8621 R0 has been reviewed and found to adequately describe the condition identified.

Guidance for evaluation of surface-mounted plates with mixed weld and concrete anchors (regardless of the anchor type used) is provided in the Project Pipe Support Design Handbook, BFEP-D1-C1, section 22.0.3, and in Design Guide DG-C1.6.4, in lieu of SCRBFNCEB8621 R1.

It should also be noted that all types of anchors have been identified in the walkdown, and have been evaluated.

CATD 22800-BFN-01 (LEVEL IIb DEVIATION) - TVA TESTS ON UNISTRUT CLAMPS ARE TWO TO THREE TIMES HIGHER THAN THE UNISTRUT CORPORATION TEST RESULTS

CATD 22800-BFN-01 documents the issue that TVA Singleton Lab test results for P2558-20 to P2558-50 Unistrut clamps for load direction parallel to the pipe axis and used by TVA for the design are two to three times higher than the Unistrut Corporation test results.

Previously Approved CAP

Browns Ferry Nuclear Plant (BFN) identified the load capacity inconsistency for Unistrut P2558 series in SCRBFNCEB8701 R0 and SCRBFNCEB8702 R0. The corrective action for these SCRS will require a review of field records, (Purchase Orders, Workplans, etc.) for Unistrut P2558-Series or similar clamps installed since May 1984.

Prior to May 1984 Unistrut P1100-Series or similar clamps were used at BFN. In addition, the corrective action will require a review of existing calculations for Unistrut P2558-Series or similar clamps using allowables given in QIR-CEB-87-099. This QIR will be revised to incorporate available allowables for B-Line B2400-Series clamps.

Additional testing will be performed for material finishes not previously tested. The walkdown/qualification for small bore piping will use the QIR allowables for clamp qualification.

The QIR will be incorporated into the BFN Pipe Support Handbook as the method to prevent recurrence.

Revised CAP

A review of all pipe support drawings was conducted to identify where Unistrut clamps had been utilized. Where the review identified a questionable pipe clamp, its use was evaluated by performing calculations.

Prior to May 1984 Unistrut P1100-Series or similar clamps were used at BFN. In addition, the corrective action will require a review of existing calculations for

Unistrut P2558-Series or similar clamps using allowables given in QIR-CEB-87-099. This QIR will be revised to incorporate available allowables for B-Line B2400-Series clamps.

Additional testing will be performed for material finishes not previously tested. The walkdown/qualification for small bore piping will use the QIR allowables for clamp qualification.

The Pipe Support Design Handbook (PSDH) was issued as a Lead Civil Engineer Instruction as the method to prevent recurrence.

Technical Justification

As an alternate method, and without a reduction in commitment, it is sound engineering practice, and of significant cost benefit to utilize the review of pipe support drawings in lieu of a review of field records consisting of Purchase Orders, Workplans, etc.

The pipe support drawings will provide information concerning the location and type of Unistrut clamp(s) which are used.

The Pipe Support Design Handbook adequately addresses allowable load capacities and the proper design parameters of Unistrut pipe clamp series P2558 and B-Line pipe clamp series B-2400.

CATD 23701-BFN-03 (LEVEL IIa DEVIATION) - NO DESIGN BASIS REVIEW

CATD 23701-BFN-03 documents the issue that no design basis review nor completeness review of the Unreviewed Safety Question Determination could be found to be current with the ECN L2071 data sheet revisions as required by engineering procedure 2.03. The complete engineering or construction status of ECN L2071 for all three units could not be established.

Previously Approved CAP

Browns Ferry Nuclear Plant is not committed to implement the requirements of NRC REG 1.106. ECN L2071 shall be cancelled and drawings which were revised or originated by ECN L2071 shall be revised to remove all changes made by this ECN. TVA shall satisfy the intent of REG Guide 1.106 by performing the steps below:

1. Provide QA Level documentation of the guidelines for determining all active safety related electrically operated motor operated valves (MOV) and list all subject active valves for BFNP in a QA Level issued maintained calculation.

2. During normal plant operation, eliminate the overload on all active Engineering Safeguards Features Actuation System (ESFAS) valves. If an overload is required for cable protection, it shall be sized for cable protection and oversized for MOV operation. A properly sized overload shall be installed for motor protection only during MOV testing.

3. All active valves that are not modified according to Step 2 above shall have oversized overloads utilized.

Torque Switch bypass is addressed by CATD 23701-BFN-05.

Revised CAP

TVA shall resolve the described problem by satisfying the intent of R. G. 1.106 by performing the following:

1. Using the Q-List, identify all active safety related valves.

2. Using Design Criteria BFN-50-7200D, size thermal overload for active safety related valves. For MOV's which the TOL heater cannot be sized per Design Criteria BFN-50-7200D, an exception to the Design Criteria will be processed according to procedure, to have their TOL strapped out.

Technical Justification

ECN L2071 was cancelled and closed per PI 88-04 as a partial modification (RIMS No. B72 891126 001). The Final Closure Design Statement by Nuclear Engineering (RIMS No. B72 891126 002) indicates that the as-installed configuration associated with ECN L2071 is acceptable.

TVA's Design Criteria BFN-50-7200D used to size thermal overloads meets the intent of RG 1.106. This RG states that the trip setpoint should be established with all uncertainties resolved in favor of completing the safety-related action. Design Criteria BFN-50-7200D allows sufficient margin in the thermal overload heater size to accommodate increased stroke time caused by motor binding. This margin will allow the valve to perform its safety function before severe motor damage occurs. Leaving the MOV connected under these conditions (severe motor damage or failure is imminent) could adversely degrade, possibly to failure, the other connected loads to the board, although this would be within the single failure criteria.

The thermal overload program is one of the Electrical issues program. Our selection criteria was audited by the NRC and found acceptable (Inspection Report 89-59). This review resulted in no open items.

CATD 23701-BFN-04 (LEVEL IIa DEVIATION) - NO DESIGN BASIS REVIEW

CATD 23701-BFN-04 documents the issue that no design basis document could be found to control the design or to establish requirements for the bypass of the safety-related motor operated valve thermal overload and torque switch when needed. Inconsistencies were found between the number of MOVs requiring the bypass design and those implemented by ECNs or used for the review of IE Circular 81-13 and Bulletin 85-03.

Previously Approved CAP

Browns Ferry Nuclear Plant is not committed to implement the requirements of NRC REG 1.106. ECN L2071 shall be cancelled and drawings which were revised or originated by ECN L2071 shall be revised to remove all changes made by this ECN. TVA shall satisfy the intent of REG Guide 1.106 by performing the steps below:

1. Provide QA Level documentation of the guidelines for determining all active safety related electrically operated motor operated valves (MOV) and list all subject active valves for BFNP in a QA Level issued maintained calculation.

2. During normal plant operation, eliminate the overload on all active Engineering Safeguards Features Actuation System (ESFAS) valves. If an overload is required for cable protection, it shall be sized for cable protection and oversized for MOV operation. A properly sized overload shall be installed for motor protection only during MOV testing.

3. All active valves that are not modified according to Step 2 above shall have oversized overloads utilized.

Torque Switch bypass is addressed by CATD 23701-BFN-05.

Revised CAP

TVA shall resolve the described problem by satisfying the intent of R. G. 1.106 by performing the following:

1. Using the Q-List, identify all active safety related valves.

2. Using Design Criteria BFN-50-7200D, size thermal overload for active safety related valves. For MOV's which the TOL heater cannot be sized per Design Criteria BFN-50-7200D, an exception to the Design Criteria will be processed according to procedure, to have their TOL strapped out.

T hnical Justification

ECN L2071 was cancelled and closed per PI 88-04 as a partial modification (RIMS No. B72 891126 001). The Final Closure Design Statement by Nuclear Engineering (RIMS No. B72 891126 002) indicates that the as-installed configuration associated with ECN L2071 is acceptable.

TVA's Design Criteria BFN-50-7200D used to size thermal overloads meets the intent of RG 1.106. This RG states that the trip setpoint should be established with all uncertainties resolved in favor of completing the safety-related action. Design Criteria BFN-50-7200D allows sufficient margin in the thermal overload heater size to accommodate increased stroke time caused by motor binding. This margin will allow the valve to perform its safety function before severe motor damage occurs. Leaving the MOV connected under these conditions (severe motor damage or failure is imminent) could adversely degrade, possibly to failure, the other connected loads to the board, although this would be within the single failure criteria.

The thermal overload program is one of the Electrical issues program. Our selection criteria was audited by the NRC and found acceptable (Inspection Report 89-59). This review resulted in no open items.

CATD 23900-BFN-04 (UNIT 2 ONLY; LEVEL IIa DEVIATION) - CABLE DATA NOT ENTERED INTO COMPUTERIZED CABLE ROUTING PROGRAM

CATD 23900-BFN-04 documents the issue that the verified cable data (dia., weights, etc.) have not been entered into the computerized cable routing program. Also, not all the cable weight data for BFN has been reflected in the design standard for the list of cables not listed in Design Standards DS-E12.1.13 and DS-E12.1.14.

Previously Approved CAP

The Corrective Action for SCRBFNECB8601 shall provide present status of Raceway Fill and a method of tracking and controlling Cable Tray Fill. The Corrective Action for SCRBFNEEB8602 shall provide QA level data for cable outside diameters and wights. UE&C Interim Evaluation of Cable Tray/Supports, Document No. 7841.008-S-E-001 Volume 1-5 (R25860303017) provides an evaluation of all Cable Trays and Supports for Seismic considerations, which are required for unit 2 restart. A continuation of this type of program shall be implemented for the unit 1 and unit 3 drywell trays prior to the restart of each respective unit.

Revised CAP

Auditible values were incorporated into electrical design standards DS-E12.1.13 and DS-E14.1.14. These standards were later incorporated into TVA On-line Mark Number Database Computer Software System ID 262486 (ON-MARK). ON-MARK has superseded design standards DS-E12.1.13 and DS-E14.1.14.

A computerized cable router for Units 1 and 2 is not required. BFN's Units 1 and 2 shall use the existing cable and conduit schedule drawing for the installation of new and existing cables and raceways.

Technical Justification

Site Engineering has evaluated the development of a Unit 1 and 2 computer program for routing cables at BFN and has determined that a router for Unit 1 and 2 would be ineffective based on the existing overfill conditions. Since any design which adds cable to trays would require physical verification of tray conditions, cable routing is only feasible after a conceptual walkdown has confirmed this. Engineers and Designers routinely perform these walkdowns when considering use of cable trays for routing of cables.