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To accomplish this task, the WP will evaluate the overall welding program, from definition through implementation. The Department of Energy, utilizing the services of EG&G (DOE's prime contractor at the Idaho National Engineering Laboratory), was contracted to provide an independent review of TVA's welding program as applied to safety-related systems, structures, and components, and welding concerns for WBN Unit 1. This review is called the Depart of Energy/Weld Evaluation Project (DOE/WEP).

To assure a comprehensive review, the Manager of Nuclear Power has retained recognized welding industry experts as consultants to provide an independent oversight of the welding program. These include Dr. Geoffrey R. Egan (APTECH Engineering), James R. McGuffy (Independent Consultant), and Professor Emeritus Roy B. McCauley (Roy B. McCauley Associates).

The WP is responsible for assessing all information including findings and recommendations of the outside contractors and making the final determination as to the adequacy of TVA's welding program. Figure IV-1 shows the organizational relationships for the TVA welding program.

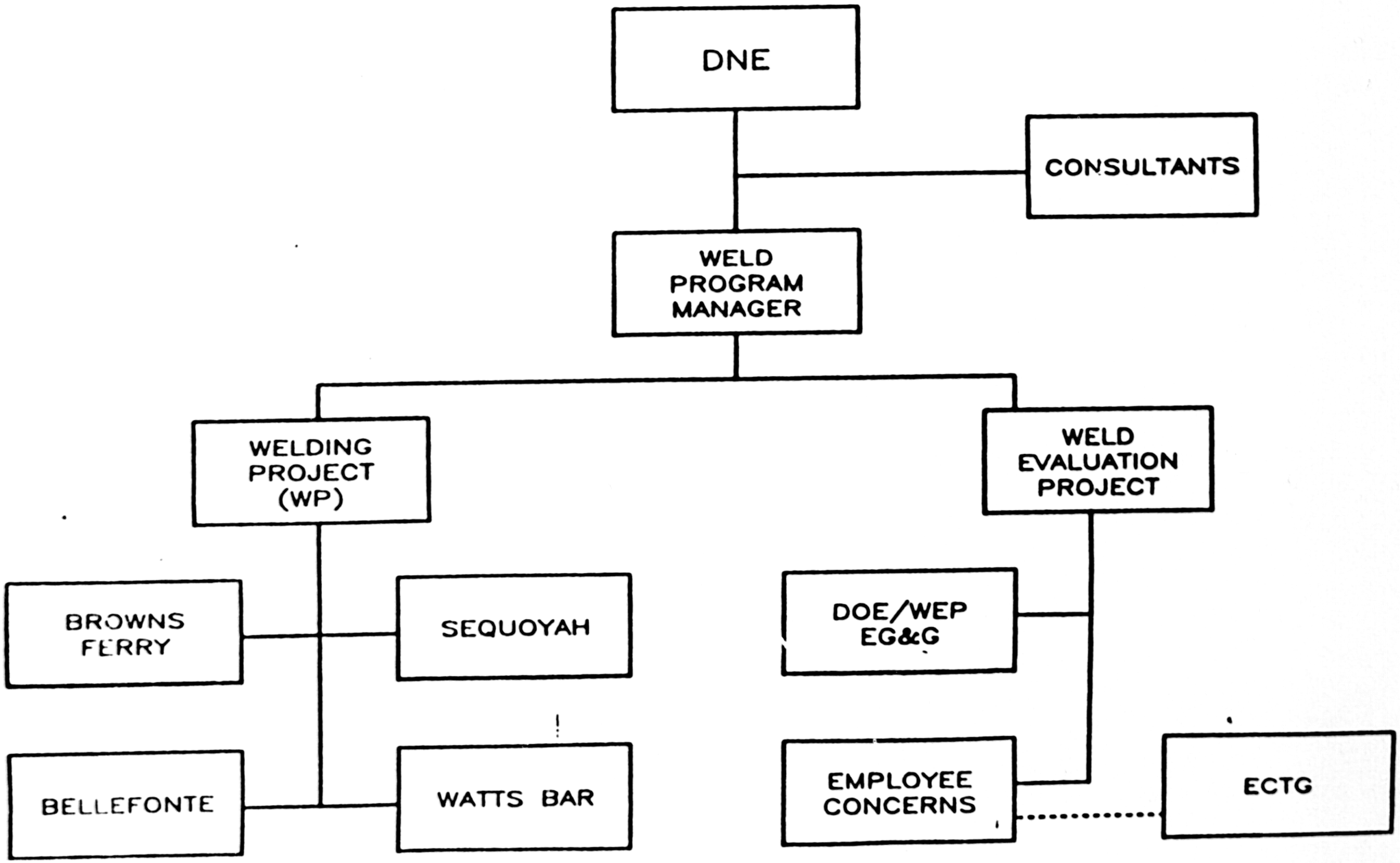
6.2 Purpose

The purpose of the weld evaluation is to:

a. Assure that TVA meets its commitments in the area of welding.

Figure IV-1

TVA WELD PROGRAM



b. Assure that TVA safety related welding for WBN is adequate to meet its intended function.

6.3 Evaluation Method

6.3.1 Phase I Program Evaluation

DOE/WEP has performed an independent review of the TVA written welding program (design documents, policies, and procedures) as applied to safety-related systems, structures, and components for Unit 1 to assess compliance of the TVA weld program to the requirements in the WBN FSAR and has provided a report (DOE/ID-10152 December 1986) to TVA.

The WP will include the results of this review in a comprehensive weld program review to verify that all the commitments made in the WBN FSAR were incorporated in the implementing procedures and to identify program problem areas through an evaluation of employee concerns and other quality indicators.

6.3.2 Phase II Program Implementation and Hardware Evaluation

The WP is evaluating program implementation and hardware through reinspection and engineering evaluations. This will be accomplished as follows:

a. Perform independent audits of welding program implementation.

b. Evaluate the need for reinspections based on analysis of the quality indicators, audit findings, and employee concerns.

c. Implement any additional reinspections and deficiency resolutions.

d. Issue a final report regarding WBN.

The WP activities address the adequacy of program records and installed hardware.

To assist in accomplishing the above tasks for Unit 1, DOE/WEP is to validate the quality and determine the suitability of the welds. This work will be accomplished as follows:

a. Determine compliance of welds and weld records to requirements of the applicable codes or standards.

b. Assess the results of the weld program used during the entire construction process to determine if the welds meet TVA commitments.

c. Address welding related employee concerns.

DOE/WEP is conducting its assessment of the weld quality in a logical progression, beginning with the identification of the TVA commitments in the WBN FSAR, and ending with concurrence of TVA's proposed corrective action for resolving weld program deficiencies identified during the assessment. DOE/WEP is evaluating weld quality by reviewing weld program documentation and reinspecting

Unit 1 welds. To perform the examination DOE/WEP formed groups of welds that are statistically normalized. The statistical methods being used are based on multiple sampling methodology as described in Nuclear Construction Issues Group (NCIG)-02. The group classifications are:

a. Specific Group--A group formed to address a specified problem that can be isolated to a specific component or group of components and will be 100 percent evaluated. These groups will be excluded from any "special" or "general" groups.

b. Special Group--A group formed to address a specified problem that cannot be isolated to specific components but can be isolated to a certain type of aspect, where quality can be assessed by statistical techniques, or can be isolated to a bounded group of components whose total number is appropriate for statistical sampling.

c. Generic Group--A logically bounded division of the total population of welded components. These groups are formed to enhance the detectability of unspecified problems and will be statistically evaluated. The "general" groups will be defined to be nonoverlapping and to cover the entire portion of the plant that will be analyzed statistically. (Figure IV-2 shows the distribution between piping and structural groups.)

Figure IV-2

GENERAL GROUPS

	PIPING			STRUCTURAL					HVAC DUCT
	ASME SMALL BORE	ASME LARGE BORE	ANSI B31.1, B31.5	CIVIL	PIPE SUPPORTS	I&C SUPPORTS	ELECTRICAL SUPPORTS	HVAC SUPPORTS	
1986	(A)	(B)	(C)	(D)	(F)	(G)	(I)	(K)	(M)
FEB. 1981				(E)		(H)	(J)	(L)	
1973									

The examination program has been structured such that all Unit 1 safety-related welds performed by TVA have been included in the assessment. The weld program implementation is being assessed by dividing the safety-related welded components into homogeneous groups. The weld evaluation is based on document review, engineering analysis and reinspection of the welds.

Homogeneous groups were formed to address problems identified from the review of quality indicators (such as Nonconformance Reports, Management Assessment Reports, Corrective Action Reports, 10 CFR 50.55(e) reports, etc.). Approximately 8,000 documents deemed "quality indicators" were reviewed, representing 14 years of construction. Of these, approximately 3,000 quality indicators were relevant to welding.

6.3.4 TVA Review

To assure overall evaluation comprehensiveness, TVA, through the Welding Program is performing additional reviews. This includes corrective action based on evaluating the data provided in the DOE/WEP evaluation and the TVA QA program. An example of these additional reviews is TVA's decision to review all of the WBN radiographs using Level II nondestructive examination (NDE) inspectors and 100 percent independent interpretation by Level III NDE inspectors.

6.4 Results and Corrective Actions

The results to date (March 4, 1987) are:

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a. The DOE/WEP evaluation of the TVA written welding program (design documents, policies, and procedures) from the date of the first safety-related weld through February 1, 1986, concluded that the program satisfied the licensing commitments.

b. Deficiencies have been identified in the implementation of the TVA written welding program (design documents, policies, and procedures). Specific program implementation deficiencies identified to date are:

1. Control building platform welding,
2. Radiographic film interpretation,
3. Instrument panel welding,
4. Pipe lug welding,
5. HVAC duct weld inspection.

Two significant breakdowns are:

a. Control Building Platform Welding
Structural steel primarily located on elevation 741.0' was discovered to have several welded connections which were deemed unsuitable for service. This problem was reported in conjunction with Significant Condition Report (SCR) WBN CEB 8689. Welded connections that do not satisfy the acceptance criteria will be brought into compliance using approved procedures and qualified personnel.

b. **Field Weld Radiographs**

During the DOE/WEP review, two radiographs were identified that contain potential indications which would not meet the interpretation criteria. Based on the above, a sample inspection of radiographs was instituted. After review of seventy additional radiographs, it appeared that the interpretation problems were associated with one interpreter. A 100 percent review of this interpreter's radiographs was instituted as well as a sampling review of all other interpreters' radiographs. This review resulted in a 100 percent review of all WBN TVA production weld radiograph film. This problem was reported under SCRs WBN NEB 8651 and 8665. Welds that do not satisfy the radiographic acceptance criteria will be repaired using approved procedures and qualified personnel.

6.6 <u>Preventive Actions To Date (March 4, 1987)</u>

TVA has instituted major changes and improvements in the Quality Assurance Program. These changes, as specified in SCR WBN CEB 8689, include significantly increased emphasis on training and product quality. The improvements are realized through enhancements of procedures and quality control instructions, and organizational changes. In addition, TVA production radiographs for WBN will receive an independent 100 percent review using Level III inspectors. Programmatic changes being reviewed include:

a. Inspector training which emphasizes radiography,

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b. A review of the applicable standards.

c. Independent peer review of all radiograph interpretations.

d. Radiography in the scope of all future corporate nondestructive examination audits.

e. QA surveillance of radiography.

6.7 Summary

At the completion of these activities, formal reports will be issued. The results of these activities will be factored into the specific employee concern investigation report, as applicable, and made available to the employees through the ECTG program.

Through the weld program review and upon the program completion, the Welding Project will review the results to identify any additional items to be addressed to assure comprehensiveness.

The weld program review will accomplish the following:

a. Assure that all elements have been completed.

b. Document findings and resolutions.

c. Assure that all necessary corrective and preventive actions have been completed or are included in a scheduled corrective and preventive action plan.

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d. Assure that program changes instituted as a result of this program review are effective in preventing similar problems for future work.

This program was undertaken to verify that TVA-performed welds are adequate to meet TVA commitments, code, and regulatory requirements and take those actions prior to fuel load necessary to assure that future TVA-performed welding activities meet these commitments.

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TABLE IV-1

TABULATION OF THE NUMBER OF EMPLOYEE CONCERNS BY CATEGORY

Category	Description	No. of Concerns As of 3/4/87
CRV 01	WELDER CERTIFICATIONS	113
	A. Improper welder recertification	
	A.1 Backdating of welder certification	
	A.2 Nonrigorous verification of requirements for recertification	
	A.3 Requalification test not per code requirements	
	A.4 Welder not qualified for process used	
	B. Questionable welder training and experience	
	C. Administrative problems associated with recertification	
	D. Welder recertification, not WEP applicable	
CRV 02	INSPECTOR CERTIFICATION/QUALIFICATION	48
	A. Visual inspection qualifications do not meet code	
	B. Questionable visual inspector experience and training	
	C. Inspector qualification, not WEP applicable	

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Category	Description	No. of Concerns As of 3/4/87
CRV 03	WELD FILLER MATERIAL CONTROL	50
	A. Procedures for coated electrode not followed	
	B. Poor quality flux	
	C. Inadequate weld filler traceability	
	D. Weld filler control, not WEP applicable	
CRV 04	PARENT METAL PROBLEMS	8
	A. Unrepaired arc strikes	
	B. Excessive excavation	
CRV 05	DOCUMENTATION/FALSIFICATION	56
	A. Improper alterations	
	A.1 Unauthorized access to computerized weld information system	
	A.2 Alterations using correction fluid	
	B. Incorrect or inaccurate documentation	
	B.1 Undocumented temporary welds	
	B.2 Documentation buyoff without inspection	
	B.3 Unspecified documentation inaccuracies	
	C.. Inadequate document control	
	C.1 Lost or missing documentation	
	C.2 Documentation does not comply with manual	
	C.3 Welds not identified/stenciled	
	D. Documentation, not WEP applicable	

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Category	Description	No. of Concerns As of 3/4/87
CRV 06	WORKMANSHIP/SPECIFIC WELD PROBLEMS	72
	A. Incomplete welds	
	B. Welds do not satisfy acceptance criteria	
	C. Possible subsurface defects	
	D. Unsatisfactory weld appearance	
	E. Welding dissimilar metals	
	F. Workmanship, not WEP applicable	
CRV 07	NDE PROCESS/PROCEDURE	88
	A. Inadequate process control	
	A.1 HVAC ductwork systems not visually inspected	
	A.2 Inspection criteria problems	
	A.3 Inspection through paint	
	A.4 Weld inspection not performed	
	B. Questionable inspection practice	
	B.1 Surface conditioning for NDE	
	B.2 Fitup performed by craft	
	B.3 Inspection tools not provided	
	C. Not WEP applicable	
CRV 08	WELD PROCESS/PROCEDURE	57
	A. Weld procedures not properly followed	
	B. Weld procedures not adequate	

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Category	Description	No. of Concerns As of 3/4/87
	C. Welding equipment unsuitable	
	D. Other weld process control problems	
	E. Improper weld repair	
	F. Weld process control, WEP not applicable	
CRV 09	OTHER WELD QUALITY PROBLEMS	114
	A. Questionable design practice	
	A.1 Questionable box hanger weld joint design	
	A.2 Use of straight butt joint configuration	
	B. Questionable management practice	
	B.1 Inadequate corrective action follow-up	
	B.2 Creation of busy work	
	B.3 Disposition by engineering analysis	
	B.4 Rework to avoid disciplinary action	
	C. Questionable construction practices	
	C.1 Use of weld bosses	
	C.2 Sandblasting while welding	
	C.3 Post weld surface conditions	
	D. Other quality problems, not WEP applicable	

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7.0 Q-List

7.1 Introduction

10 CFR Part 50, Appendix B, requires the identification of structures, systems, and components covered by the quality assurance program. Originally, TVA utilized a method which required the interpretation of design drawings to determine which structures, systems, and components required selected levels of quality assurance. In order to reduce interpretation of requirements, TVA developed the WBN Q-List, a comprehensive listing of systems, structures, and components requiring quality assurance measures to be applied.

TVA's Design and Construction organizations implemented the Q-List in early 1984. In early 1985, Operations personnel implemented a Critical Systems, Structures, Components (CSSC) Q-List which was a special subset of the WBN Q-List. The CSSC Q-List was intended to identify all structures, systems, and components that perform a safety function, requiring full 10 CFR Part 50, Appendix B, quality assurance. Based on a detailed review of systems 62 and 63 and the initial use of the CSSC Q-List, Site Quality Assurance issued a nonconformance report (NCR) which identified several deficiencies in both the WBN Q-List and the special CSSC Q-List sort.

The cause of the nonconformance was determined to be a lack of consistent definitions betwe the Design and Operations organizations and a lack of adequate review d ing the preparation phase of the Q-List. Upon detailed re ew NCR, it was also determined that inadequate

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The cause of the nonconformance was determined to be a lack of consistent definitions between the Design and Operations organizations and a lack of adequate review during the preparation phase of the Q-List. Upon detailed review of the NCR, it was also determined that inadequate maintenance of the Q-List by Engineering was a contributing factor. A complicating factor in the evaluation of the NCR was the lack of supporting design documents used in preparation of the Q-List. These findings indicate a past deficiency in the QA program implementation.

In order to address the deficiencies and correct the causes of the deficiencies, program changes and specific corrective actions have been implemented as described below. Many of these changes/corrective actions are broad in scope and require the preparation of base documents for the Q-List.

7.2 Scope

The corrective actions being developed to address the Q-list issues are:

- Implementation of a single Q-List which ensures consistent terminology and definitions for plant activities. The CSSC Q-list sort originally developed will not be utilized.

- Information presented in the revised Q-List will be clear and concise. Previously, when using the Q-List, the user was required to interpret broad, general information related to systems, structures, or components.

- A new Q-List is being prepared with independence from the existing Q-List, thus ensuring that existing errors are not propagated into the new Q-List. The old Q-List will then be compared with the new Q-List and differences resolved, including hardware changes, if required.

- Documents are being prepared to support information included in the new Q-List. These documents will provide a consistent evaluation of all components as well as enable a detailed evaluation of future questions.

- A detailed procedure for the preparation of the WBN Q-List has been issued and is being implemented.

7.3 Implementation of Corrective Actions

A Watts Bar Engineering procedure (WBEP EP-43.15) has been issued to control engineering functions during the preparation of the new Q-List. The procedure assigns, in detail, the responsibilities for each phase of the preparation. Maintenance of the new Q-List will be in accordance with approved procedures.

Resolution of this problem requires a coordinated approach in the development of the new Q-list, thus ensuring usability. Basic decisions had to be made prior to initiation of the new Q-List. These decisions were: (1) WBN would utilize only one Q-List; (2) definitions would be consistent for all WBN organizations; (3) information required for the users would be defined; and (4) a revised format for presentation of Q-list information would be

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... of the program required extensive
...neering, Construction, and Operations
...ine the information and format which would
...the Q-List. After this initial phase, the
...efined in section 7.2 were developed to
...ments were met. This required initiation of
...r Quality Assurance Manual (NQAM) to
... QA Programs into a clear, concise format;
...red documents; and preparation of procedures
...f the new Q-List.

... developed is structured to require minimal
...er. Information presented will be based on
...riteria used to determine what QA programs
... apply to a component will be controlled in

...vise the Q-List is being done with the
...1) provide an accurate Q-List; (2) present
...ar, concise manner which requires minimum
...er; and (3) ensure that the basis of the
...for all entries are adequately documented in
...-list will be compared to the existing list
... evaluated and resolved, including
...will result in a new Q-List for WBN which

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will be user oriented and a support document for day-to-day activities at WBN. Implementation schedules for this program are being developed with a completion date prior to fuel loading.

8.0 Concrete Quality

8.1 Introduction

The governing requirements for concrete at WBN are contained in TVA's General Construction Specification, G-2. The Watts Bar FSAR defines this specification as TVA's commitment while also describing the differences between G-2 and other industry standards. Nuclear industry standards for concrete construction were issued after commencement of WBN construction.

8.2 Definition

While investigating an Employee Concern (EC) at Watts Bar, some inconsistencies in the implementation of G-2 were noted. These involved a number of time periods when the percentage of low strength test results exceeded procedure requirements; the lack of procedural control of bedding mortar in horizontal construction joints; and instances where required sampling frequency requirements were not achieved. These inconsistencies indicate a past deficiency in QA program implementation.

8.3 Evaluation

The noted discrepancies were investigated and evaluated to determine causes and potential effects. The specific evaluations are discussed below. In general, the shortcomings noted above were determined to have been caused by three deficiencies: (1) sufficient technical instructions not included in specifications/procedures; (2) concrete mix adjustments based on results of cylinder three-day strength tests were not uniformly effective in increasing concrete strength as required; and (3) test sampling requirements not being achieved in specific instances.

Based on evaluation, it was determined that for certain time periods lower than required concrete strength could have resulted from these discrepancies. The effect of this strength decrease, however, could not be determined without further engineering evaluations which are discussed below.

8.3.1 Equivalent Strength

To determine the equivalent strength of concrete, a data base of concrete and bedding mortar strength test data was compiled. These data paralleled specification requirements. To compensate for the effects of sampling deficiencies, the strengths were decreased by 10 percent. This established equivalent strengths for the concrete and bedding mortar in question.

8.3.2 In-Place Strength

The in-place strength of concrete is determined by standard cylinder test results without accounting for strength increases to account for strength developed subsequent to the casting of the test cylinder. To estimate this strength increase, a method was

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developed which was based on test data from Watts Bar and Sequoyah. The method is described in TVA report CEB-86-12 "Study of Long Term Strength at Sequoyah and Watts Bar Nuclear Plants." This study considered member size, concrete class exposure conditions, and concrete placing temperature. This study determined the increases in strength that may be conservatively estimated as a result of elapsed time after casting.

To confirm the adequacy of the increased values, a nondestructive test program utilizing the Windsor Probe method has been initiated.

8.3.3 Structural Evaluations

All placements were identified where the equivalent strength of concrete or bedding mortar was less than design requirements. For these placements, in-place strengths were estimated and design calculations for the affected structures were reviewed. Where necessary, new calculations were prepared. For most structures reviewed, the original conservatism, inherent in the design process, confirmed the appropriateness of the selection of originally specified concrete strength. In a number of cases, however, new calculations incorporating as-constructed data and more refined methods of analysis confirmed the adequacy of these structures.

8.3.4 Concrete Anchors Evaluation

Surface mounted plates using expansion anchors or grouted bolts are generally used for support of piping, conduit, instrumentation, and HVAC systems. With few exceptions, the concrete strength assumed for these anchorages is 3000 psi. The exceptions were in areas where higher strength concrete was used due to increased loading conditions. Calculations for these were reviewed using estimated in-place concrete strength and found to be adequate.

In the Diesel Generator Building, Intake Pumping Station, Control Building, and Auxiliary Building there are a few small structural elements which have an average estimated in-place strength less than 3000 psi. A review of concrete expansion anchors installed in these elements showed that no anchor was installed in an element that has an estimated in-place strength of less than 2700 psi. Proof load Test data for anchors installed in concrete with lower than 3000 PSI strength was reviewed to determine if an excessive failure rate resulted. It did not. In fact, failures were well within the 95 percent acceptance that would be expected for this type of feature.

The net result of these actions is confirmation of the adequacy of concrete anchors used for surface mounted plates.

8.3.4.1 <u>NRC OIE Bulletin 79-02 Evaluation</u>

As a result of lower estimated in-place concrete strengths, a re-evaluation of TVA's 79-02 report was conducted. The original TVA 79-02 report determined that in excess of 99 percent of the sampled supports had a factor of safety of greater than four using long term strength. Using 3000 psi concrete strength in place of increased values which accounted for long term strength gain, over 97 percent of the sampled supports still maintained a factor of safety of greater than four. Accordingly, it was concluded that the effect of lower long term concrete strength is not significant.

TVA's commitment to complete a 79-02 evaluation for all Category I pipe supports as an element of the Hanger and Analysis update Program will include a reevaluation of anchors based on estimated in-place concrete strength (see Section IV.3.0).

8.3.5 Embedment Evaluation

Calculations for embedded plates used in the steam valve rooms and in the Reactor Building were reviewed. These calculations were chosen because these areas contained most of the lower in-place strength concrete. Calculations were revised where necessary. This review concluded that embedments are adequate for their design loads.

For other Category I structures, a similar calculation review was conducted using construction drawings to locate embedments. In total, embedment calculations for all low strength pours were reviewed. This review showed that embedments are acceptable.

Prior to these embedded plate investigations, there were a number of studies performed to qualify embedded plates. Due to the potential for these studies to be effected by the presence of lower strength concrete, the studies were re-evaluated using the estimated in-place concrete strengths. The conclusions of these studies are uneffected by the substitution of estimated in-place strength values.

8.3.6 Effect of Reduced Stiffness in Seismic Response

Because a reduction in concrete strength reduces the modulus of elasticity, the effect of this alteration in stiffness was, evaluated to determine change in seismic response. The worst case reduction in the modulus was about 8 percent assuming a 15 percent concrete strength reduction. This reduction is within the accuracy of our stiffness estimates and is not significant to the seismic response of structures.

The use of bedding mortar was also considered to determine its effect on seismic r[illegible]onse. Due to the limited quantities of bedding mortar, and its distribution throughout structures, the calculated reduction of flexural stiffness (of about 30 percent) from the original assumption, would not have a significant effect in overall structural response.

8.4 Confirmatory Testing

In order to verify the adequacy of the in-place concrete and the engineering evaluations performed, a nondestructive test program utilizing the Windsor Probe method has been developed. The results will provide a comparison of the in-place concrete placed during periods when the strength requirements were outside the specifications with periods known to have acceptable strength. Where Windsor Probe results indicate low strength, core samples will be obtained to determine in-place strength.

8.5 Summary

The presence of some concrete and bedding mortar in WBN structures that was of a strength less than requirements was evaluated. The evaluations determined that the structures are structurally adequate and acceptable from an engineering standpoint [say whether they meet licensing commitments]. Some confirmation actions remain to be completed, notably a review of Category I engineered pipe supports as well as completion of confirmatory testing noted above. No concrete rework is anticipated as a result of these evaluations.

To prevent recurrence of these items in the future, project procedures and Specification G-2 have been revised to clarify requirements for use of bedding mortar and the use of concrete in congested areas.

9.0 Design Calculations

9.1 Problem Description

A significant deficiency associated with engineering calculations was identified to TVA in an INPO review of Watts Bar Nuclear Plant.

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Further evaluation determined that some calculations were not properly documented and controlled and some of those that were documented were not uniformly kept up-to-date. The root cause of this deficiency is attributed to:

a. Lack of definition of the minimum set of calculations required to support the design for TVA's nuclear plants.

b. Adherence to procedures controlling design changes was questionable.

c. Existing calculations were not considered when design changes were made.

d. Existing calculations that did not require change were not adequately documented stating that no change was required.

The resolution of this issue will determine the extent of applicability and provide the corrective actions to bring the essential calculations to a level of acceptability and implement procedural changes to maintain a level of acceptability. This area of concern indicates a past deficiency in QA program implementation.

9.2 Approach to Resolution

The Division of Nuclear Engineering issued the following requirements to be followed by all disciplines and in determining the generic applicability of this deficiency:

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a. Define all "essential" calculations for the plant to support the Watts Bar design bases..

b. Locate all available essential calculations. If these calculations can not be located, they must be developed.

c. Calculations determined not to be essential, but which are deemed desirable should be identified, categorized and indexed by unit, features, system, etc. in order that they may be readily accessed when a change to that feature or system is required.

Essential calculations are defined as associated with those plant systems or features whose failure could:

a. Result in a loss of Reactor Coolant System (RCS) integrity.

b. Result in the loss of ability to place the plant in the appropriate shutdown mode, or

c. Result in a release of radioactivity offsite in excess of a significant fraction of the 10 CFR 100 guidelines.

Desirable calculations are defined as those calculations not included in the above definition of essential calculations.

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Each discipline has issued a policy implementing the Division requirements and has developed a plan for resolving this issue.

9.3 Electrical Discipline

Evaluation of the calculations required to adequately demonstrate an acceptable electrical and instrumentation and control design for Watts Bar Nuclear Plant was conducted and a list of required calculations identified. This list has been cross-referenced to existing calculations, and the additional calculations necessary to support fuel loading at Watts Bar have been identified.

Sargent and Lundy Engineers was contracted to provide an independent assessment of the electrical and instrumentation and control system calculations necessary to support the Design Basis for Watts Bar Nuclear Plant. This effort has been completed. The Division of Nuclear Engineering (DNE) Electrical Engineering Branch (EEB) has issued a policy memorandum as a result of the Sargent and Lundy assessment to establish branch policy regarding the preparation of electrical calculations for WBN. This policy memorandum identifies all EEB/Controlled calculations necessary to fully document the design basis of a standard TVA Nuclear Plant. It further identifies the set of calculations that must be performed before fuel loading and calculations that can be performed after fuel loading.

Another EEB Policy memorandum has also been issued to establish branch policy regarding the documentation of calculations status. This policy requires the lead engineer to monitor the resolution of all deficiencies and to document the status of each calculation on a continuing basis. This will be accomplished by maintaining a detailed calculations checklist.

In addition to the design change review program and development and maintenance of a minimum set of electrical calculations mentioned above, a long term program has been established to develop the software programs and an electrical data base for any future calculations. Steps to be taken are:

a. Obtain established standards, procedures, and computer programs for the performance of electrical calculations,

b. Train TVA design personnel in the performance of electrical calculations,

c. Perform, for each nuclear plant, all electrical calculations required to ensure that: 1) the plant safety-related electrical design bases are met and 2) the plant electrical systems support the nuclear program's reliability and availability goals, and

d. Develop an efficient, verifiable method for maintaining issued electrical calculations.

With the exception of c.2 above, noted actions for WBN will be complete prior to fuel load.

Deficiencies identified by this program will be corrected prior to fuel load.

9.4 Nuclear Discipline

The Nuclear Engineering Branch has issued a program for Design Calculations Establishment and Maintenance. A list of essential calculations necessary to support the plant design basis will be generated and existing calculations examined to ensure that all essential calculations exist. A sampling of NEB calculations (approximately 65 for WBN) will be reviewed to ensure that they reflect, or bound, current plant configuration. The minimum set of calculations including completion of sampling, revisions, and development of new calculations (if required) will be completed for WBN prior to fuel load. An interim procedure for classifying calculations within NEB as either essential or desirable has been issued. After the classification of existing calculations has been completed, the review will be performed.

9.5 Mechanical Discipline

The Mechanical Engineering Branch has issued a policy memorandum which outlines the following action to be taken:

a. Identify all essential mechanical calculations.

b. Locate all existing calculations and ensure they are listed in the calculation log.

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c. Compare the lists developed in steps a and b to determine what essential calculations are missing. Determine and schedule what calculations should be developed prior to fuel loading.

d. Develop and issue any missing essential calculations prior to fuel loading.

9.6 <u>Civil Discipline</u>

The Civil Engineering Branch has issued a policy memorandum which outlines the following actions to be taken:

a. Calculations are performed for all designs and design changes.

b. Calculations determined to be "essential" comprise the minimum set of calculations and must be located and indexed by feature, system, etc. These calculations shall be organized and filed in such a manner to permit rapid retrieval. If not available, they will be regenerated and/or updated.

c. Calculations determined to be "desirable" will be indexed by feature, system, etc. As required by design modifications, safety evaluations, or field changes, these calculations will be retrieved and revised or regenerated.

9.7 Summary

In summary, the calculations program will ensure that those calculations required to make a certification of readiness for licensing are performed. Also, the program will ensure that future design changes are reviewed to ensure appropriate calculations are completed and issued. Any necessary corrective actions will be completed prior to licensing for fuel load.

10.0 Soil Liquefaction

10.1 Introduction

The potential for soils to liquefy has been a design consideration at Watts Bar since the early stages of plant design. The evaluation of this potential is discussed in FSAR Section 2.5.4.8. Specific areas of liquefaction design and analysis are: intake channel, ERCW piping, and buried 1E conduits.

10.2 Employee Concerns

In 1985, a number of employee concerns were expressed regarding the design and construction of soil liquefaction mitigation measures that had been constructed on the west side of the intake pumping station.

The concerns were classified into three categories:

(1) Use of an alternate material,

(2) Incomplete excavation of potentially liquefiable material, and

(3) Leakage between the Intake Pumping Station and Trench B.

10.3 Investigation

The employee concerns categorized above were investigated by TVA. The investigation was documented in a joint DNC/DNE report. Highlights of that report include the following:

10.3.1 1075 Crushed Stone

The employee concerns alleged that the use of 1075 crushed stone was not authorized for use and not documented in the FSAR, was not subjected to appropriate in-place density tests, and was used as a construction expedient. The DNE/DNC investigation concluded that the substitution of 1075 crushed stone was a reasonable alternative to use of compacted earthfill. In fact, it was an improved substitution that was authorized by design documents, not by informal means, and that conduct of in-place density tests for this type of material are impractical. Due to the coarseness of the material, test results are generally erratic and unreliable.

10.3.2 Gap Between Trench "B" and Intake Pumping Station

The employee concerns alleged that excavation between Trench B and the backfills for the Intake Pumping Station did not totally remove all potentially liquefiable soils. The DNC/DNE investigation determined that the design documents adequately described the excavation; a visual inspection performed by the principal design engineer when the barrier was being excavated confirmed its adequacy.

10.3.3 Leakage Between Trench B and the Intake Pumping Station

The employee concerns alleged that because the stability of surface and subsurface materials had not been evaluated, a leakage area might have a detrimental effect. Although the source of the leakage has not been defined with any precision, a monitoring program has been initiated which is designed to pinpoint the source. Potential sources include the CCW blowdown line and the yard holding pond. The seepage flow has been quantified to be in the order of 75 gpm, but is intermittent, and, except for some surface errosion (approximately six inches) of topsoil, damage is negligible. Due to the above, it has been concluded that the small seepage is not leeching any material, either sand or earth out of Trench B, nor is it causing any further errosion of the surface.

10.4 Consultant Review

Subsequent to the investigation performed by TVA to address the above concerns, TVA engaged two prominent consultants to review TVA findings. Both R. L. Cloud Associates and Professor H. Bolton Seed reviewed elements of the TVA investigations and concurred with TVA's reasoning and conclusions.

10.5 Summary

Based on the investigations conducted by TVA into the expressed employee concerns, it is concluded that the three categories of concern which involve use of alternate materials, extent of excavation, and leakage do not have a detrimental effect on liquefaction mitigation measures at Watts Bar. Some continuing actions, particularly to monitor leakage, will continue to be pursued and longer term results will be evaluated when available.

11.0 Containment Isolation

11.1 Background

Watts Bar Nuclear Plant (WBN) was designed to the 1967 interim AEC/NRC general design criteria (GDC) and revisions 0 and 1 of the supporting Westinghouse System Design Criteria 1.14 "Systems Standard Design Criteria - Nuclear Steam Supply System Containment Isolation." The Sequoyah Nuclear Plant (SQN) had a similar design basis. TVA, in an April 1980 letter to NRC, indicated that the SQN design complies with the current (1971 issuance) GDC's. In early 1986, an NRC Operational Readiness Inspection at Sequoyah Nuclear Plant (and the associated Inspection Report 50-327/86-20) identified an unresolved item on the design of the containment isolation features for certain piping penetrations regarding compliance with the recent staff interpretations of these GDCs. At Sequoyah, the NRC questioned the adequacy of the isolation schemes for a small number of penetrations that TVA believed complied with the intent of the original NRC GDC on "some other defined basis."

11.2 Implementation

At issue is the extent to which the design of the containment isolation features at Watts Bar should be upgraded to conform to

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the current interpretation of the GDC. The isolation scheme of principal concern is the case of closed systems (i.e., no isolation valve) outside containment where used with a check valve inside containment. The current NRC staff interpretation of the requirements no longer acknowledges "closed systems" outside containment in a way that would permit the original TVA isolation schemes to be acceptable.

[illegible].3 Investigation

Realizing that the containment isolation issue that arose on SQN may have applicability to WBN, DNE formed a task group to re-evaluate the containment isolation features at WBN. The charter of the task group is to define the scope of the potential design weaknesses in the present design, to recommend corrective action at the conceptual design level, and to develop an implementation plan to resolve and close this issue. The Task Group assumed at the onset that some of the containment isolation schemes would not be acceptable to the NRC in light of the improvements being required at SQN. It was realized also that the WBN situation is not identical to the situation at SQN. Cost, schedule, and ALARA considerations may be different. Therefore, the optimum upgrade actions at WBN may not be identical to those most appropriate for SQN.

An initial letter was sent to the NRC on November 7, 1986, informing them of the investigation at Watts Bar and committing TVA to status reports as major milestones are reached. The first progress report was issued December 11, 1986.

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The first step in the investigation was to divide the WBN penetrations into three categories: those that explicitly meet the GDC, those that are acceptable within the "other defined basis" defined in the NRC Standard Review Plan (SRP), and those penetrations for which enhancements are necessary in order to bring them into compliance with either the GDC or the SRP.

The three categories were generated by reviewing containment penetrations using Table 6.2.4-1 of the FSAR and TVA drawing 48N406-1 Revision 23 (a listing of all penetrations penetrating primary containment). The appropriate system flow diagrams were then consulted and the penetration located on the drawing. The valves closest to the penetration on both sides were identified, including those on branch lines. These valves were then checked against the draft WBN technical specifications to determine if they had been previously designated as containment isolation valves. The valves were evaluated to determine (1) type of containment isolation signal received, (2) provisions for leak rate testing per Appendix J, and (3) the compliance with the appropriate GDC directly or via SRP 6.2.4. After all the reviews had been completed on a penetration, it was assigned to one of the three categories outlined above. Thirty-nine (39) of the 189 penetrations are spares or hatches, which are not specifically covered by the GDC or by the SRP and so are not included in the three categories outlined above.

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11.4 Summary

The DNE task group has completed its evaluation of the containment isolation features at WBN and has presented its conceptual design changes on 23 penetrations which were found to have isolation features that would need to be upgraded to conform to the current GDCs either explicitly or via one of the bases defined in the Standard Review Plan. These penetrations fell into a small number of groups.

Normal RCS charging line

ECCS and containment/RHR spray lines

Relief valve discharge lines

RCP seal injection lines

Hydrogen analyzer lines

A design review is planned prior to finalization of an implementation plan and subsequent procurement and design modifications prior to fuel load.

12.0 Equipment Seismic Qualification

12.1 Introduction

During 1986 a number of Conditions Adverse to Quality (CAQs) were issued which indicated a general concern that the seismic qualification of some nuclear safety-related equipment had not been maintained throughout the design, installation, testing, and operations phases of the project. This represents a deficiency in QA program implementation.

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12.2 Background

When a piece of nuclear safety-related electrical or mechanical equipment is originally specified, one of the key design attributes which is defined is the capability of the equipment to withstand the effects of an earthquake, and other concurrent design basis loads either by continuing to operate during and after the seismic event or by retaining its structural integrity. Typically, this attribute is included in the procurement specification; the component is designed to accommodate it; fabricated to that standard and qualified by vendor-sponsored analysis or test to demonstrate seismic capability. (Alternately, TVA-sponsored analysis or test is sometimes used to demonstrate seismic capability.) The achievement of seismic qualification is routinely documented in a Seismic Qualification Report which is reviewed and approved by TVA or the NSSS vendor. In any of the qualification methods, a unique equipment configuration is typically shown to be seismically qualified.

After hardware, which has been qualified as described above, is delivered to the plant and the installation process commences, occasions arise where the component equipment cannot be installed precisely as specified in the design documents. Typically, the variations are due to physical constraints and interferences caused by the physical proximity of one component to the other.

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At Watts Bar, dispositioning of these physical interference type questions may not have had the in-depth coordinated design review to assure that the seismically qualified configuration was not compromised by the field changes. In short, the field changes were sometimes made without the necessary interface review to ensure seismic qualification of the as-installed configuration.

For a discussion of maintenance of seismic qualification through introduction of spare and replacement parts, see section IV.14.0.

12.3 Investigation

To address the issue, a multidiscipline team was formed with representation from various Engineering Branches, Construction, Maintenance, Modifications, and Licensing. This group is in the process of developing the scope of the issue. Their methodology is to review all CAQ's written on the subject; identify all equipment requiring seismic qualification and evaluate programs for maintaining seismic qualification of the installed equipment. At the conclusion of this evaluation, a resolution plan will be developed.

12.4 Summary

TVA recognized some weaknesses in maintaining the integrity of seismic qualification throughout the procurement, design, test, and operations phases. A team of specialists is investigating the situation and will put into place a resolution plan to correct past shortcomings as well as to adjust the program to prevent recurrence prior to licensing for fuel load.

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13.0 "Use-As-Is" NCRs

13.1 Introduction

During September 1986, Engineering Assurance (EA) conducted an audit of Watts Bar Engineering Project (WBEP) activities related to the handling of construction nonconformance reports (NCRs). The audit evaluated the WBEP activities related to the disposition, documentation and control of construction NCRs with special emphasis placed on NCRs with "use-as-is" or "repair" dispositions to ensure that these dispositions were adequately justified and design safety margins were not compromised.

The audit identified one deficiency (No. 86-27-01) that contained four concerns:

(1) "Use-as-is" and "repair" dispositioned NCRs are not tracked against the affected document, so in most cases for NCRs designated as not requiring a drawing change, there is no retrievable, consolidated record of the accepted variations from the drawing or original design and the cumulative effect of the design on the margin of safety is indeterminate. Also, very little evidence could be found to indicate that these NCRs have received the same level of independent design verification and interdiscipline reviews as the original design.

(2) "Use-as-is" dispositioned NCRs that come under the ASME code that are designated as not requiring a drawing change also do

not meet ASME code requirements, since the NCR cannot be readily linked to the drawing to indicate as-constructed configuration. NCRs dispositioned as requiring a drawing change did not exhibit these problems since the drawing, NCR, and ECN are all cross-referenced.

(3) Many "use-as-is" dispositioned NCRs either do not have any written justification or lack adequate justification detail, such as references to supporting documents or analysis, making it difficult or impossible to trace the justification without recourse to someone familiar with the condition described.

(4) There does not appear to be any project procedural guidance for the handling of these NCRs. It is recognized that division guidance is also lacking, and this has been referred to the Engineering Assurance Procedures Group for resolution. The project, however, must have some interim and detailed implementing guidance to ensure these NCRs are adequately and consistently handled.

As a result of this audit deficiency, WBEP issued a Significant Condition Report (SCR) WBN WBP 8601 RO. The cause of the SCR was determined to be that requirements for documenting the DNE final disposition of "use-as-is" or "repair" for DNC Conditions Adverse to Quality (CAQs) were not specified in a project procedure or in a division level procedure. The level of

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documentation for the technical evaluation, review, approval and the configuration resulting from CAQs approved by DNE as "use-as-is" or "repair" was not consistently in accordance with ANSI N45.2-1971 because personnel performing the activities were not aware of the requirements.

A plan that implements the corrective action for SCR WBNWBP8601 and Engineering Assurance Audit Deficiency 86-27-01 is being developed. This plan provides the methods to be used for ensuring that the current WBN design is reviewed to reconcile the effects that past dispositions of "use-as-is" and "repair" CAQ's have had on the configuration of the plant and to evaluate and document the cumulative effect those past CAQ's have on the design margin of safety. This corrective action plan will bring WBEP's documentation (drawings, design criteria, specifications, and FSAR) up to an acceptable level for these CAQs based on the requirements in ANSI N45.2 1971. Additionally, the plan implements a project procedure to ensure continued compliance with ANSI N45.2-1971. Any conditions adverse to quality found during this review will be documented and handled per NEP 9.1. These findings indicate a deficiency in the Watts Bar QA program.

13.2 Scope

All Conditions Adverse to Quality (CAQ's) with a final corrective action disposition by DNE, DNC, or the Site Director's Office (SDO) prior to the implementation of WBEP-EP43.23 will be evaluated per this plan. These CAQ's will include DNE initiated

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NCR's, SCR's, Problem Identification Reports (PIR's); DNC and SDO initiated NCR's, SCR's that were dispositioned by DNE, DNC and SDO, and any vendor CAQ's that were dispositioned by DNE.

Because there was no procedural guidance for documenting the dispositioning of DNC CAQ's as "use-as-is" and "repair" by DNE, there was reason to believe that the same lack of procedural guidance could have caused DNE initiated CAQ's to be dispositioned "use-as-is" without having the affected documents revised to reflect the disposition of the CAQ. Several examples were identified to confirm that the condition exists for DNE initiated CAQs.

This plan will include reviewing all WBN CAQ's to determine those that had a final disposition "use-as-is" or "repair". For these CAQs, a further review will be made to determine the DNE documents such as drawings, design criteria, procurement specifications, FSAR, etc., that contained design requirements which were affected by the disposition.

A project procedure to control the handling of all CAQs by WBEP will be developed and DNC and SDO procedures will be revised as required to implement the action required to prevent recurrence.

13.3 Implementation of Corrective Actions

A Watts Bar Engineering Procedure (WBEP EP-43.23) has been issued to control WBEP reporting, handling, and dispositioning of CAQs on

WBN. The procedure implements the requirements of 10 CFR 50 Appendix B, ANSI N45.2-1971, ASME Code and Division of Nuclear Engineering NEP9.1. The procedure was reviewed by DNE Engineering Assurance and WBEP lead engineers and assistant project engineers. Training on the issued procedure was given to WBEP personnel.

Upon implementation of WBEP EP-43.23, a review will be performed on all past CAQs dispositioned by DNE and CAQs dispositioned by DNC or SDO. The review will identify and document those CAQs that had a final disposition for any part or all of the CAQ of "use-as-is" or "repair". These CAQs will have a further review that will identify and document the affected design documents (i.e., drawings, specifications) that were not revised as a result of the CAQ disposition of "use-as-is" or "repair" and contained requirements that were not met as described in the CAQs. Upon completion of determining the affected design documents, a listing will be made of each design document referencing the CAQs that affected the document.

Each design document will be reviewed by the responsible engineer to determine the cumulative effect the past CAQs have on the technical adequacy of the current revision of that document. A calculation will be prepared or revised, if a calculation already exists, that will provide the technical justification of the acceptance of the most recent issued revision of the document and will contain the analysis supporting the acceptance of the

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cumulative effect of past CAQs dispositioned "use-as-is" or "repair" and identify any reduction in the design margin of safety. If it is determined that this current revision of the document is not technically acceptable, a CAQ will be initiated to document the deficiency and will be processed per NEP 9.1. If the calculation shows that the current revision level of the drawing is technically acceptable, the design document will be revised to reflect the configuration that the CAQ describes or the CAQ will be listed on the design document with the following note: "This drawing (or specification if applicable) has the following CAQs that affect the design and as-constructed configuration. These CAQs are not reflected in this revision and must be considered when evaluating any change to this drawing."

When all drawings are revised, a matrix will be prepared and issued as a WBEP drawing to show the cross reference of the CAQs to drawings affected by the CAQs. This drawing will establish a baseline and will not be updated. A memorandum will be sent to the originating organizations of the CAQs with a copy of the matrix drawing and instructions to file the memo with each listed CAQ.

Personnel involved in the implementation of this plan will be trained in the requirements of the plan prior to performing any related activities. This training will be recorded in their Individual Training Record (ITR).

13.4 Summary

The objective of this corrective action plan is to ensure that WBN design documents (i.e., drawings, design criteria, specifications, FSAR, etc.) reflect the as-built conditions described by CAQs that had a final disposition of "use-as-is" and "repair". This plan also provides for an evaluation and documentation of the acceptability of any resultant design changes and ensures that these changes are consistent with the design requirements and commitments in the FSAR. The plan will evaluate the cumulative effect that past dispositions have had on the design margin and will result in a documented and technically justified evaluation of the effect that past CAQ dispositions of "use-as-is" and "repair" has had on the current WBN design prior to fuel load.

This plan establishes a procedure for handling CAQs in WBEP that will comply with the requirements of ANSI N45.2-1971 and the ASME Code and ensure continued documentation of the design margin.

When completed, these objectives will accomplish the required corrective action and action to prevent recurrence to close EA audit deficiency 86-27-01 and SCR WBNWBP 8601.

14.0 Control of Replacement Items

14.1 Introduction

In October 1986, the Watts Bar applicability review of a SQN nonconformance determined that replacement items at WBN may not have been afforded the control necessary to ensure that only qualified items are introduced into nuclear safety related components or systems. During that review, it was concluded that the spare parts program at WBN contained weaknesses that could allow previously qualified (seismic or environmental) equipment to be degraded through installation of commercial grade replacement parts.

14.2 Background

When a piece of nuclear safety-related equipment is originally specified, two of the key design attributes which are defined are:

(1) The capability to withstand the effects of an earthquake (and other specified design basis loads) either by continuing to operate during and after the seismic event or by retaining structural integrity.

(2) The capability to withstand the effects of required design basis operating environments (temperature, humidity, pressure, radiation) by continuing to operate during and after the design basis events.

Typically, these attributes are specified by the designer in the procurement specification so that the equipment is built to applicable codes and standards. Typically, the manufacturer performs required qualification testing to demonstrate seismic or environmental capability. Qualification test reports document t..., tests. This process establishes that the purchased equipment is qualified for the tested configuration.

Upon shipment of the equipment to the site and subsequent installation, the configuration must remain identical to that tested for the equipment to remain qualified. During the normal course of operations, occasions arise where replacement of the entire component or individual components or parts within the equipment is required. Throughout the conduct of the Watts Bar project, programs have been in place to control requisition, receipt inspection and storage of replacement equipment, equipment components, or parts. However, these programs have not always been adequate to ensure that the seismic and environmental qualification of the equipment is maintained.

14.3 Program Plan

To address the issue, WBN is currently following the corporate lead established by the efforts of SQN. WBN will develop a program plan, building upon experience gained at SQN, to identify equipment which could have had qualification voided through replacement of equipment, equipment components or parts. A review of these pieces of equipment will then be conducted to identify deficiencies and specify appropriate corrective action. This program will be completed prior to fuel loading. To eliminate the near term potential for continued voiding of equipment qualification, a corporate policy statement was issued by the Manager of Nuclear Power requiring immediate actions be taken.

At WBN, those actions include:

- To ensure traceability of replacement parts to final installed equipment no quality assured items are being issued by Power Stores without a specifically designated application.

- To facilitate maintaining a maintenance history for safety related components, a copy of all Stores Requisitions or Procurement Documents will be attached to the work document (Maintenance Request, Maintenance Instruction, or Work Plan).

- The use of safety-related shop spares and bulk items was stopped and quantities returned to Power Stores.

- Consumables and bulk items shall be procured to the highest quality level expected for plant-wide use.

- Until the program is fully developed, traceability of commercial grade items will be maintained.

- A conditional release on commercial grade items is in place until the dedication program is developed.

- Commercial grade items for safety-related applications can only be purchased with Plant Manager's approval.

It is planned to contract with a private engineering contractor the following tasks:

- Define the commercial grade dedication process.

- Evaluate Power Stores inventory of commercial grade items and shop returned spares using the new commercial grade dedication process.

- Evaluate conditionally released items.

- Evaluate previously installed commercial grade items and subsequent CAQ's where documentation is insufficient to permit dedication.

14.4 Summary

Watts Bar plans to take advantage of the corporate program developed at SQN as well as the lessons learned during the SQN dedication process. The final plan implemented at Watts Bar will ensure that no safety related component has been degraded by the introduction of unqualified spare or replacement parts. This effort will be complete and a long term program in effect prior to fuel load.

15.0 Construction Phase Quality Assurance Records

15.1 Introduction

The Site Quality Assurance Organization is performing a comprehensive construction phase records verification at WBN. The intent of this review is to verify the essential attributes of the quality assurance records necessary to substantiate the quality of construction, maintenance, modification, and testing activities. Records to be reviewed are those records generated onsite by the Nuclear Site Director's Organization (NSD) and Division of Nuclear Construction (DNC) to support the construction phase. Design records are not in the scope of this review effort and will be evaluated by the Design Baseline and Verification Program.

The records review has resulted from several indicators such as nonconforming condition reports (NCRs), significant condition reports (SCRs), and employee concerns. The cumulative effect of these reports indicate a potential problem in the construction phase records area. This review will encompass the various discipline types of QA records. The results of the review and disposition of items not conforming to procedural requirements will be documented.

15.2 Scope

The categories of equipment or features listed in Table IV-2 have been identified as a minimum for the records verification. Within each category (e.g., motors) records for individual pieces of equipment or features will be retrieved and reviewed for validation of the essential attributes of that record.

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TABLE IV-2

EQUIPMENT CATEGORIES

INSTRUMENT AND ELECTRICAL EQUIPMENT

Cable
Motor Control Center
Electrical penetration (Primary Containment)
Cable Tray System
Cable Tray Supports
Safety Cable
Panel
Junction Box
Conduit
Battery Systems
Motors
Barriers and Seals
Instrument Lines
Instrument Components
Electrical Support

MECHANICAL EQUIPMENT

Piping
Piping Penetrations
ASME Valves
Non-ASME Valves
ASME Pumps
Non-ASME Pumps
Tanks
NSSS Vessels and Appendages
Heat Exchangers
Package Units
HVAC
Transfer, Lifting, and Handling Devices
Component Insulation

HANGERS, SUPPORTS, AND RESTRAINTS

Typical Hangers
Engineered Hangers

CIVIL AND ARCHITECTURAL FEATURES

Excavation
Soil Sampling and Backfill
Foundation Treatment
Concrete Placement
Cadwelding
Structural Steel and Embedments
Protective Coating

15.3 Program Implementation

The quality assurance program as described in revision 9 of the Topical Report commits TVA to the 1974 edition of ANSI N45.2.9 for collection, storage, and maintenance of QA records (with exceptions taken for storage methods). The types of records required to be maintained are listed in Appendix A of ANSI N45.2.9. A review is being performed to ensure adequate implementation of Appendix A requirements in site procedures and instructions. Data sheets will then be generated to detail each record that is required to be maintained for a piece of equipment or feature. The data sheets will include requirements for NSD records as well as DNC records.

A review of records will be performed for each category of equipment or feature. Attributes to be considered during this review are the existence, retrievability, completeness, and legibility of the QA record. Any problems identified during the QA records verification will be documented in the new standardized condition adverse to quality (CAQ) reporting system as described in Section VI. Problems which are currently documented in open tracking systems such as NCRs, SCRs, and audit deviations will not be duplicated in the new CAQ program, but will be identified as a part of this review.

15.4 Summary

The QA records verification will look at the WBN construction phase records necessary to substantiate the quality of construction, maintenance, modification, and testing activities at WBN. The status of these records will be determined, and any problems identified will be documented through the CAQ reporting process. The documented results of this verification along with the completion of required corrective action for any identified problems will ensure that construction phase quality assurance records are in compliance with TVA commitments.

16.0 Prestart Test Plan

The majority of preoperational testing required to be performed prior to Unit 1 fuel loading was completed at WBN prior to January 1985. Recognizing the need for systems to perform their respective design functions, plant management is formulating a Prestart Test Plan. The Prestart Test Plan consists of the performance of selected plant surveillance instructions, test instructions and selected integrated tests as necessary to demonstrate the plant's readiness for operation. Testing will also include a controlled reactor coolant system heatup using reactor coolant pump heat.

The major activities associated with the formulation of the Prestart Test Plan are as follows:

- Identify the systems for which functional design requirements must be verified prior to licensing for fuel load.

- Identify and schedule the performance of appropriate test activities (surveillance, special test instruction, etc.) to demonstrate acceptable functional design requirements.

- Identify "integrated" testing to be performed.

- Integrate work activities necessary to be completed to support testing in the prestart schedule, including design modifications, post modification testing, and corrective and preventive maintenance.

- Identify review and approval mechanisms to consolidate the results of all testing performed to verify system readiness to operate.

- Identify any special administrative controls associated with the Prestart Test Plan.

The development and performance of the Prestart Test Plan has the benefits of added verification that specified plant procedures perform their intended function and increased familiarization of plant personnel with specified procedures.

Activities associated with the Prestart Test Plan will be sequenced in the plant's planning schedule. This will provide all responsible organizations the ability to develop workable schedules, identify, track, report progress, and verify results of activities necessary to support the plant's operation. This will also aid in ensuring that all required work activities are addressed and completed prior to system alignment and testing.

Summary

The preoperational testing required to be conducted prior to the initiation of start-up testing was completed prior to January 1985. As previously documented in TDP's, there were areas that required improved controls and implementation. These areas of concern have been and are being addressed in such a method that the implementation of corrective action will provide the assurance that systems, structures and components will function in accordance with design requirements.

The Prestart Test Plan and heatup testing planned will ensure that safety and nonsafety systems are tested and ready for licensing for fuel load and subsequent start-up and power escalation testing.