COMANCHE PEAK STEAM ELECTRIC STATION

UNIT 1 and COMMON

CORRECTIVE ACTION PROGRAM

PROJECT STATUS REPORT

EQUIPMENT QUALIFICATION

TU ELECTRIC

Generating Division

Revision 0

TU ELECTRIC
COMANCHE PEAK STEAM ELECTRIC STATION
UNIT 1 AND COMMON

IMPELL CORPORATION
PROJECT STATUS REPORT

EQUIPMENT QUALIFICATION

John H. Wawrzeniak
John Wawrzeniak
Impell Project Manager

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This Project Status Report (PSR) summarizes the systematic validation process for equipment requiring environmental and/or seismic qualification implemented by Impell Corporation (Impell) at Comanche Peak Steam Electric Station (CPSES) Unit 1 and Common[1]. This Project Status Report (PSR) presents the results of the design validation and describes the Post Construction Hardware Validation Program (PCHVP). Impell activities are governed by the TU Electric Corrective Action Program (CAP) which required Impell to:

1. Establish a consistent set of CPSES equipment qualification design criteria that complies with the CPSES licensing commitments.

2. Produce a set of design control procedures that assures compliance with the equipment qualification design criteria.

3. Evaluate systems, structures and components, and direct the corrective actions recommended by the Comanche Peak Response Team (CPRT) and those determined by Corrective Action Program (CAP) investigations to be necessary to demonstrate that systems, structures and components are in conformance with the equipment qualification design criteria.

4. Assure that the validation resolves the equipment qualification related design and hardware issues identified by the Comanche Peak Response Team (CPRT), external sources[2] and the Corrective Action Program (CAP).

5. Validate that the environmental and/or seismic qualification of equipment is in conformance with the licensing commitments and that the installed hardware is in conformance with the validated design.

---

[1]Common refers to areas in CPSES that contain both Unit 1 and Unit 2 systems, structures and components.

[2]External sources include:
- o NRC Staff Special Review Team (SRT-NRC)
- o NRC Staff Special Inspection Team (SIT)
- o NRC Staff Construction Appraisal Team (CAT)
- o Citizens Association for Sound Energy (CASE)
- o Atomic Safety and Licensing Board (ASLB)
- o NRC Region IV Inspection Reports
- o NRC Staff Technical Review Team (TRT) [SSERs 7-11]
- o CYGNA Independent Assessment Program (IAP)

Comanche Peak Response Team (CPRT) issues are issues identified by the following:
- o CPRT Design Adequacy Program (DAP)
- o CPRT Quality of Construction Program (QOC)

6. Produce a set of consistent and validated equipment qualification documentation.

A consistent set of design criteria for CPSES Unit 1 and Common equipment requiring environmental and/or seismic qualification has been developed and used by Impell for the design validation process. This set of design criteria is in conformance with the CPSES licensing commitments. It has been independently and extensively reviewed by the Comanche Peak Response Team (CPRT).

Impell established design and design control procedures to implement the design criteria and engineering methodologies, and to govern the work flow and technical interfaces with other organizations for both the design and hardware validation processes. These procedures specify the processes which have been implemented throughout the equipment qualification portion of the Corrective Action Program (CAP).

Evaluations have been performed to validate the CPSES Unit 1 and Common equipment requiring environmental and/or seismic qualification. The results are documented in three Design Validation Packages (DVPs). The as-built hardware requiring environmental and/or seismic qualification is being validated to the design by the Post Construction Hardware Validation Program (PCHVP).

The equipment qualification related design and hardware issues identified by the Comanche Peak Response Team (CPRT) and issues identified during the performance of the Corrective Action Program (CAP) have been resolved. This resolution has been accomplished by the incorporation of engineering methodologies and design criteria into equipment qualification design and design control procedures and Post Construction Hardware Validation Program (PCHVP) implementing procedures, and the development of design changes as required.

The Post Construction Hardware Validation Program (PCHVP) assures that equipment requiring environmental and/or seismic qualification is installed in conformance with the validated design. Impell has reviewed the revised CPSES electrical and mechanical installation specifications to assure that the validated equipment qualification design requirements are incorporated. The Post Construction Hardware Validation Program (PCHVP) for equipment qualification, including the inspections, engineering walkdowns and evaluations, implements corrective actions recommended by the Comanche Peak Response Team (CPRT), as well as those required by the Corrective Action Program (CAP) investigations.

Impell will provide to TU Electric a complete set of validated design documentation for CPSES Unit 1 and Common equipment requiring environmental

and/or seismic qualification, including the qualification documentation, design changes, inter-organization transmittals, and hardware modifications. This documentation can provide the basis for CPSES configuration control[3] to facilitate maintenance and operation throughout the life of the plant.

In-depth quality and technical audits performed by Impell Quality Assurance (QA), TU Electric Quality Assurance (QA), and the independent Engineering Functional Evaluation (EFE) verified that implementation of the validation program was in conformance with 10CFR50, Appendix B quality assurance requirements. These audits assure that the environmental and/or seismic equipment qualification procedures, design criteria and design comply with the licensing commitments.

The CPSES Unit 1 and Common equipment qualification portion of the Corrective Action Program (CAP) validates that:

- The environmental and/or seismic design of equipment complies with the CPSES licensing commitments.
- The as-built equipment configurations comply with the validated design.
- The environmental and/or seismic design of equipment complies with the CPSES licensing commitments and the ability of the equipment to perform its safety-related functions will not be adversely affected by the environmental and/or seismic conditions to which it may be subjected.

---

[3]Configuration control is a system to assure that the design and hardware remain in compliance with the licensing commitments throughout the life of the plant.

ABBREVIATIONS AND ACRONYMS

ANI	Authorized Nuclear Inspector
ANSI	American National Standards Institute
ARS	Amplified Response Spectra
ASLB	Atomic Safety and Licensing Board
CAP	Corrective Action Program
CAR	Corrective Action Request
CASE	Citizens Association for Sound Energy
CFR	Code of Federal Regulations
CPE	Comanche Peak Engineering (TU Electric)
CPRT	Comanche Peak Response Team (TU Electric)
CPSES	Comanche Peak Steam Electric Station
CYGNA	CYGNA Energy Services
DAP	Design Adequacy Program (CPRT)
DBCP	Design Basis Consolidation Program
DBD	Design Basis Document
DIR	Discrepancy Issue Report (CPRT-DAP)
DR	Deficiency Report
DVP	Design Validation Package
Ebasco	Ebasco Services Incorporated
EEQSP	Environmental Equipment Qualification Summary Package
EFE	Engineering Functional Evaluation
EQDP	Equipment Qualification Data Package
EQML	Equipment Qualification Master List
FSAR	Final Safety Analysis Report
GIR	Generic Issues Report
HELB	High Energy Line Break
HVAC	Heating, Ventilation and Air Conditioning
IAP	Independent Assessment Program (CYGNA)
Impell	Impell Corporation
IRR	Issue Resolution Report (CPRT)
IE	Office of Inspection and Enforcement (NRC)
NCR	Nonconformance Report
NOV	Notice of Violation
NRC	United States Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
NUREG	NRC Document
PCHVP	Post Construction Hardware Validation Program
PSR	Project Status Report
QA	Quality Assurance
QOC	Quality of Construction and QA/QC Adequacy Program (CPRT)
QC	Quality Control
QTR	Qualification Test Report

SDAR	Significant Deficiency Analysis Report (TU Electric)
SEQSP	Seismic Equipment Qualification Summary Package
SER	Safety Evaluation Report (NRC, NUREG-0797)
SRT	Senior Review Team (CPRT)
SRT-NRC	Special Review Team (NRC)
SSE	Safe Shutdown Earthquake
SSER	Supplemental Safety Evaluation Report (NRC, NUREG-0797)
SWEC	Stone & Webster Engineering Corporation
SWEC-PSAS	Stone & Webster Engineering Corporation - Pipe Stress and Support Project (SWEC)
TAP	Technical Audit Program (TU Electric)
TERA	Tenera, L.P.
TQR	Technical Quality Review (Impell)
TRT	Technical Review Team (NRC Staff, SSERs 7-11)

1.0 INTRODUCTION

In October 1984, TU Electric established the Comanche Peak Response Team (CPRT) to evaluate issues that have been raised at CPSES and to prepare a plan for resolving those issues. The Comanche Peak Response Team (CPRT) program plan was developed and submitted to the NRC.

In mid-1986, TU Electric performed a qualitative and quantitative review of the preliminary results of the Comanche Peak Response Team (CPRT) (References 19 and 20). This review identified that the Comanche Peak Response Team (CPRT) findings were very broad in scope and included each discipline. TU Electric decided that the appropriate method to correct the issues raised and to identify and correct any other issues that potentially existed at CPSES would be through one integrated program rather than a separate program for each issue. TU Electric decided to initiate a comprehensive Correction Action Program (CAP) to validate the entirety of CPSES safety-related designs[1,2]. The scope of the CAP has the following objectives:

- Demonstrate that the design of safety-related systems, structures and components complies with licensing commitments.
- Demonstrate that the existing systems, structures and components are in compliance with the design or develop modifications which will bring systems, structures and components into compliance with the design.
- Develop procedures, an organizational plan, and documentation to maintain compliance with licensing commitments throughout the life of CPSES.

The Corrective Action Program (CAP) is thus a comprehensive program to validate both the design and the hardware at CPSES, including resolution of specific Comanche Peak Response Team (CPRT) and external issues.

---

[1]Portions of selected non-safety-related systems, structures and components are included in the Corrective Action Program (CAP). These are Seismic Category II (Reference 26) systems, structures and components, and fire protection systems.

[2]NSSS design and vendor hardware design and their respective QA/QC programs are reviewed by the NRC independently of CPSES and are not included in the Corrective Action Program (CAP) as noted in SSER 13; however, the design interface is validated by the CAP.

TU Electric contracted and provided overall management to Stone & Webster Engineering Corporation (SWEC), Ebasco Services Incorporated (Ebasco), and Impell Corporation (Impell) to implement the Corrective Action Program (CAP), and divided the CAP into eleven disciplines as follows:

Discipline	Responsible Contractor
Mechanical	SWEC
- Systems Interaction	Ebasco
- Fire Protection	Impell
Civil/Structural	SWEC
Electrical	SWEC
Instrumentation & Control	SWEC
Large Bore Piping and Pipe Supports	SWEC-PSAS
Cable Tray and Cable Tray Hangers	Ebasco/Impell
Conduit Supports Trains A,B, & C >2"	Ebasco
Conduit Supports Train C $\leq$ 2"	Impell
Small Bore Piping and Pipe Supports	SWEC-PSAS
Heating, Ventilation and Air Conditioning (HVAC)	Ebasco
Equipment Qualification	Impell

A Design Basis Consolidation Program (DBCP) (Reference 3) was developed to define the methodology by which Impell performed the design and hardware validation. The approach of this Design Basis Consolidation Program (DBCP) is consistent with other contractors' efforts and products.

The design validation portion of the Corrective Action Program (CAP) identified the design-related licensing commitments. The design criteria were established from the licensing commitments and consolidated in the Design Basis Documents (DBDs). The DBDs identify the design criteria for the design validation effort. If the existing design did not satisfy the design criteria, it was modified to satisfy the design criteria. The design validation effort for each of the eleven Corrective Action Program (CAP) disciplines was documented in Design Validation Packages (DVPs). The DVPs provide the documented assurance (e.g., calculations and equipment qualification reports) that the validated design meets the licensing commitments, including resolution of all Comanche Peak Response Team (CPRT) issues.

The design validation effort included the review of the installation specifications to assure that they comply with the validated equipment qualification related design requirements. The validated installation specifications also contain the inspection requirements necessary to assure that the as-built hardware complies with the validated design.

The hardware validation portion of the Corrective Action Program (CAP) is being implemented by the Post Construction Hardware Validation Program (PCHVP), which demonstrates that existing systems, structures and components are in compliance with the installation specifications (validated design), or identifies modifications that are necessary to bring the hardware into compliance with the validated design.

The results of the performance of the Corrective Action Program (CAP) for each discipline are described in a Project Status Report (PSR). This PSR describes the results of the equipment qualification portion of the Corrective Action Program (CAP).

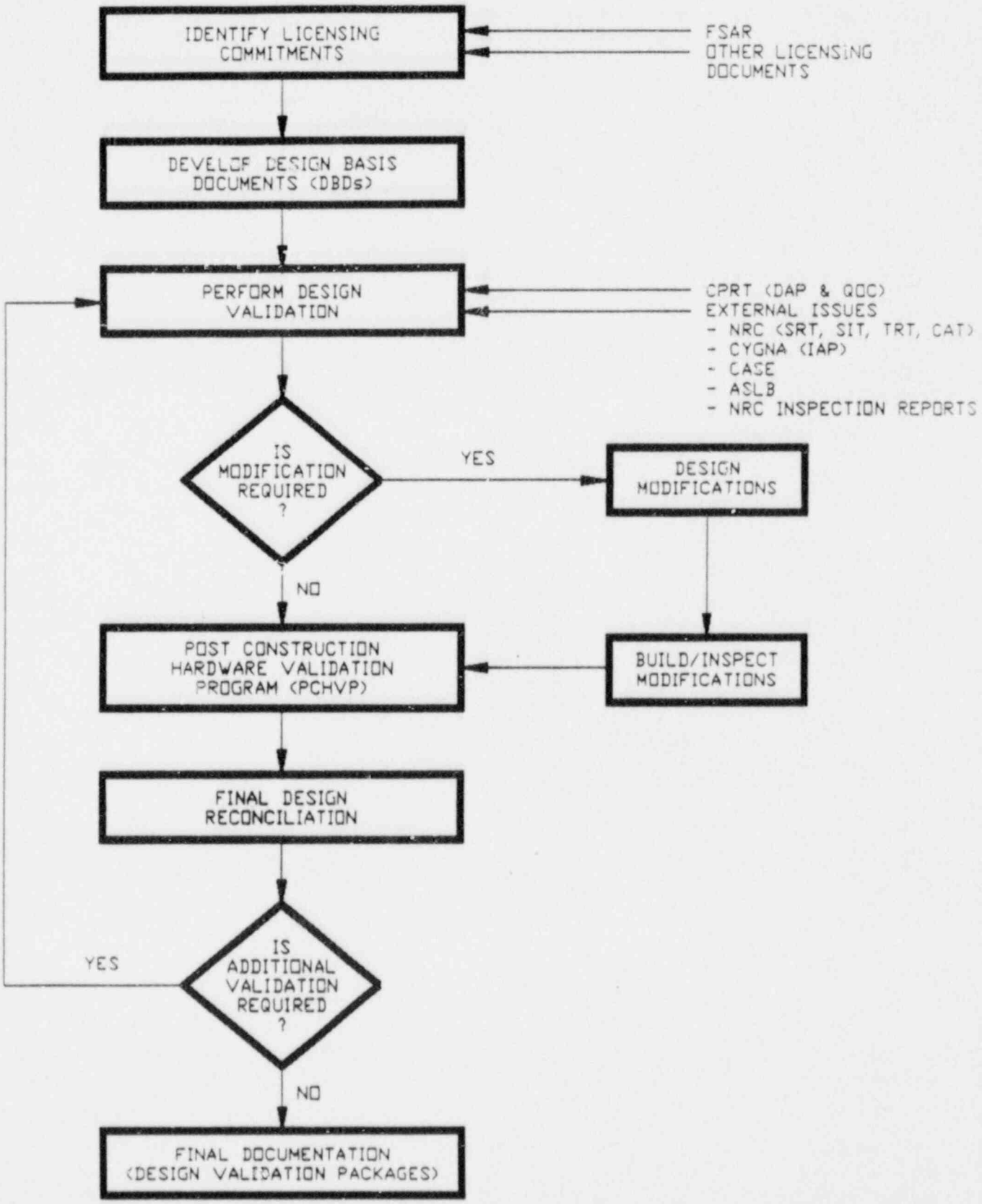
Impell has performed a comprehensive validation of equipment requiring environmental and/or seismic qualification for CPSES Unit 1 and Common in order to demonstrate that the design complies with licensing commitments. Impell was initially contracted by TU Electric in June 1986 to review the equipment qualification program and upgrade the documentation, as necessary. When the Corrective Action Program (CAP) was initiated in 1986, it incorporated and expanded upon Impell's existing program. The validation process was conducted in accordance with the Impell Design Basis Consolidation Program (DBCP), which controls implementation of the equipment qualification portion of the TU Electric Corrective Action Program (CAP). The equipment qualification portion of the Corrective Action Program (CAP) resolved the Comanche Peak Response Team (CPRT) Issue Resolution Report (IRR) issues (References 1, and 17). The equipment qualification portion of the Corrective Action Program (CAP) is shown schematically in Figure 1-1. The equipment qualification design criteria are contained within the CPSES Design Basis Documents (DBDs) (References 10 through 13).

The Corrective Action Program (CAP) validation of the CPSES Unit 1 and Common equipment requiring environmental and/or seismic qualification was accomplished by a review of equipment qualification documentation and, where necessary, an upgrade of that documentation to establish the qualification basis for equipment. This validation effort also included the identification of required field modifications for equipment that did not comply with the equipment qualification design criteria. The results of and the methodology used in implementing both the design and hardware related validations for CPSES Unit 1 and Common equipment qualification are presented in this Project Status Report (PSR).

This equipment qualification Project Status Report (PSR) describes the validation effort from the early stages of design criteria establishment through the development and implementation of the detailed design and design control procedures. The report traces the updating of installation specifications, the implementation of the Post Construction Hardware Validation Program (PCHVP) to validate the as-built equipment configurations, and the completion of CPSES Unit 1 and Common Design Validation Packages (DVPs).

FIGURE 1-1

CORRECTIVE ACTION PROGRAM (CAP)
EQUIPMENT QUALIFICATION



2.0 PURPOSE

The purpose of this Project Status Report (PSR) is to demonstrate that the equipment requiring environmental and/or seismic qualification in CPSES Unit 1 and Common is in conformance with the CPSES licensing commitments and satisfies the equipment qualification design criteria. The Project Status Report (PSR) also demonstrates that the safety-related functions of the equipment will not be adversely affected by the environmental and/or seismic conditions to which the equipment may be subjected.

3.0 SCOPE

Impell's responsibility for the completion of the equipment qualification portion of the Corrective Action Portion (CAP) is to develop and implement design and design control procedures and to develop documentation necessary to demonstrate CPSES Unit 1 and Common compliance with the equipment qualification licensing commitments, including the mechanism by which compliance can be maintained throughout the life of the plant.

The equipment qualification portion of the Corrective Action Program (CAP) implemented for CPSES Unit 1 and Common as summarized in this Project Status Report (PSR) includes:

Seismic Qualification

- Seismic Category I[1] equipment

Environmental Qualification

- Class 1E[2] equipment[3] located in a harsh environment
- Class 1E equipment located in a mild environment
- Active safety-related mechanical equipment[4] located in a harsh environment

The equipment qualification portion of the Corrective Action Program (CAP) contains a design validation portion and a hardware validation portion to assure that the as-built hardware corresponds to the validated design documentation. This Project Status Report (PSR) describes the equipment qualification portion of

---

[1]Systems, structures and components that are designed and constructed to withstand the effects of the Safe Shutdown Earthquake (SSE) and remain functional are designated as Seismic Category I in accordance with NRC Regulatory Guide 1.29 (Reference 15).

[2]The safety classification of the electric equipment and systems that are required for safe reactor shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal, or otherwise are required to prevent significant release of radioactive material to the environment.

[3]The category also includes certain post-accident monitoring equipment as defined by 10CFR50.49b(3).

[4]Mechanical equipment required to actuate or operate; that is, perform mechanical movement (Reference 18).

the Corrective Action Program (CAP) as implemented by Impell for the CPSES Unit 1 and Common. The primary features of the equipment qualification portion of the Corrective Action Program (CAP) are:

1. Establishment of environmental and seismic equipment qualification design criteria which comply with licensing commitments.

2. Development of the Design Basis Documents (DBDs) for equipment qualification, which contain the design criteria.

3. Implementation of design and hardware validations, consisting of analysis, identification and implementation of necessary modifications, and field verifications (as identified in the Post Construction Hardware Validation Program (PCHVP)). Equipment qualification is validated by engineering walkdowns and evaluations. Equipment qualification results, including the identification of necessary modifications, are documented in equipment qualification Design Validation Packages (DVPs).

4. Resolution of the design and hardware-related equipment qualification issues and implementation of corrective actions for closure of these issues. These issues include Comanche Peak Response Team (CPRT) issues, and issues identified during the performance of the Corrective Action Program (CAP) (See Section 4.0).

5. Development of validated design documentation that forms the basis for CPSES equipment qualification configuration control. The validated design documentation and updated procedures/specifications can be utilized by TU Electric to facilitate operation, maintenance and future modifications.

Section 5.1.1 describes the methodology by which the CPSES equipment qualification licensing commitments were identified and the design criteria were established, and design and design control procedures were developed.

Section 5.1.2 describes the design validation process, including the review of qualification documentation, drawings, and calculations.

Section 5.1.3 describes the Post Construction Hardware Validation Program (PCHVP) process and the procedures for engineering walkdowns, inspections and engineering evaluations to be implemented to validate that the as-built equipment is in compliance with the equipment qualification design documentation.

Section 5.2 summarizes the design validation results including the hardware modifications resulting from the validation.

Section 5.3 describes the Quality Assurance (QA) Program implemented for the validation process.

Section 5.4 describes the corrective and preventive actions.

Appendix A describes the resolution of all issues from the Comanche Peak Response Team (CPRT).

Appendix B describes the resolution of issues identified during the performance of the equipment qualification portion of the Corrective Action Program (CAP) which were determined to be reportable under the provisions of 10CFR50.55(e). These issues were identified in Significant Deficiency Analysis Reports (SDARs) initiated by TU Electric.

4.0 SPECIFIC ISSUES

The equipment qualification portion of the Corrective Action Program (CAP) resolved all of the related Comanche Peak Response Team (CPRT) issues and issues identified during the performance of the Corrective Action Program (CAP). This section presents a listing of all equipment qualification related issues addressed in this Project Status Report (PSR). Technical review and resolution of all Comanche Peak Response Team (CPRT) issues are described in Appendix A. Resolutions and corrective actions taken for issues identified by the Corrective Action Program (CAP) which were determined to be reportable under the provisions of 10CFR50.55(e) are described in Appendix B.

Comanche Peak Response Team (CPRT) issues are identified in the Equipment Qualification Generic Issues Report (GIR) (Reference 1). This Generic Issues Report (GIR) has been transmitted to the NRC, CASE, and CYGNA. The Comanche Peak Response Team (CPRT) issues are identified in Issue Resolution Reports (IRRs) DAP-E-M-500 and DAP-E-EIC-503 (References 16 and 17) and are incorporated in Subappendices A1 through A6. Issue A7 is identified in Issue Specific Action Plans (ISAPs) VII.c.1 and VII.c.3 (References 30 and 31).

Comanche Peak Response Team (CPRT) issues are listed below (issue number corresponds to subappendix number in Appendix A):

Issue No.	Issue Title
A1	Identification and Classification Requirements
A2	Environmental Conditions and Requirements
A3	Environmental Documentation
A4	Seismic Documentation
A5	Generic Regulatory Concerns
A6	Maintenance and Surveillance
A7	Flexible Conduit and Cable Slack

The issues identified during the performance of the Corrective Action Program (CAP) which have been determined to be reportable under the provisions of 10CFR50.55(e) are listed below (issue number corresponds to the subappendix number in Appendix B):

Issue No.	Issue Title
B1	SDAR CP-87-121, 6.9 kV/480 V Transformer Bus Bar Clearance and Jumper Cable Slack
B2	SDAR CP-87-132, Limitorque Actuators
B3	SDAR CP-87-122, Fan Coil Unit Nozzle Load Evaluation
B4	SDAR CP-87-122, Heat Exchanger Support Structure and Mid-Lug Modification

B5	SDAR CP-87-122, Lube Oil Inlet Pressure Strainer Clip Angle Modification
B6	SDAR CP-87-122, Hydrogen Purge Exhaust Filter Flange Modification
B7	SDAR CP-87-139, Weidmuller Terminal Blocks

5.0 CORRECTIVE ACTION PROGRAM (CAP) METHODOLOGY AND RESULTS

This section of the Project Status Report (PSR) addresses the program methodology for the equipment qualification portion of the Corrective Action Program (CAP), including the establishment of design criteria in conformance with CPSES licensing commitments, the development of procedures and the implementation of the design validation process and the Post Construction Hardware Validation Program (PCHVP). It also includes the results of the equipment qualification portion of the Corrective Action Program (CAP) and corrective and preventive actions.

5.1 METHODOLOGY AND WORK PERFORMED

The methodology and work performed by Impell in implementing the equipment qualification portion of the Corrective Action Program (CAP) are discussed in the following sections.

5.1.1 Licensing Commitments, Design Criteria and Procedures

Impell identified the licensing commitments for equipment qualification through an extensive review of CPSES licensing documentation (such as the FSAR, the Safety Evaluation Report (SER) and related supplements (SSERs), NRC Regulatory Guides and TU Electric/NRC correspondence). The equipment qualification design criteria were established to assure compliance with the licensing commitments. The design criteria are consolidated in the Design Basis Documents (DBDs) (References 10 through 13). Impell then developed design and design control procedures (See Table 5-1) which include the following:

- Design criteria
- Resolution of Comanche Peak Response Team (CPRT) issues
- Impell experience gained through the performance of equipment qualification programs for several recently licensed United States nuclear power plants
- Regulatory and Professional Society Guidance such as applicable codes and standards

The procedures provide assurance that a consistent and thorough validation of equipment qualification was performed for CPSES Unit 1 and Common.

5.1.1.1 Verification of Design Criteria, Procedures and Resolution of Issues

Technical audits and surveillances have been performed to provide additional assurance that the design criteria are technically correct and embody the equipment qualification licensing commitments and that all Comanche Peak Response Team (CPRT) issues have been resolved. To assure that the equipment qualification related licensing commitments have been identified, and appropriate design criteria have been established, the TU Electric Quality Assurance (QA) Program and the Comanche Peak Response Team (CPRT) conducted overviews. TU Electric Quality Assurance (QA) audits were performed as described in Section 5.3. The Comanche Peak Response Team (CPRT) overview is being performed by the TU Electric Engineering Functional Evaluation (EFE) and TU Electric Technical Audit Program (TAP) as described in Section 5.3.

The TU Electric Technical Audit Program (TAP) is auditing the equipment qualification portion of the Corrective Action Program (CAP) to assure that the design criteria are reconciled with the licensing commitments.

Resolution of the Comanche Peak Response Team (CPRT) issues is described in Appendix A of this Project Status Report (PSR). Resolution of issues identified during the performance of the equipment qualification portion of the Corrective Action Program (CAP) which were determined to be reportable under the provisions of 10CFR50.55(e) is described in Appendix B of this Project Status Report (PSR).

5.1.2 Design Validation Process

Impell's responsibility for the completion of the equipment qualification portion of the Corrective Action Program (CAP) is to develop and implement design and design control procedures and to develop documentation necessary to demonstrate CPSES Unit 1 and Common compliance with the equipment qualification licensing commitments, including the mechanism by which compliance can be maintained throughout the life of the plant.

The subtasks associated with the equipment qualification design validation consisted of:

- Equipment Qualification Master List (EQML) development
- Environmental Qualification
- Seismic Qualification

5.1.2.1 Equipment Qualification Master List (EQML) Development

The Equipment Qualification Master List (EQML) is a listing that identifies electrical and mechanical components in CPSES Unit 1 and Common systems that require environmental and/or seismic qualification.

To develop the Equipment Qualification Master List (EQML), Impell first prepared a report (Reference 2) to identify those safety-related systems that are relied upon to remain functional during and after design basis events. To identify these systems Impell reviewed plant documentation including the following:

- CPSES FSAR Chapter 15 to identify the systems and components required to mitigate CPSES design basis events.
- CPSES Emergency Operating Procedures to identify the systems and components associated with operator actions to respond to, diagnose and recover from an emergency condition.
- Safe Shutdown logics (developed by the Systems Interaction Program (SIP) (Reference 21)) which identify the systems and/or components required to function for high energy line break (HELB) accident mitigation.
- Other licensing commitments to identify other systems and/or components required for, or to assist in, safety-related functions.

This report in conjunction with design and design control procedures (References 27, 28, and 29) was then used to conduct a systematic and comprehensive review of engineering drawings (i.e., flow diagrams, vendor supplied subsystem and component diagrams, electrical one-line diagrams, instrumentation and control diagrams and schematics) to identify those components and subcomponents which require environmental and/or seismic qualification.

Equipment identified through the above process along with the following equipment specific data was then assembled into one document to establish the Equipment Qualification Master List (EQML):

- Procurement specification
- System identification
- Component type
- Component description
- Room number (plant location)
- Manufacturer/Model number
- NUREG-0588, Appendix E, Section 2 categories (Reference 25).

5.1.2.2 Environmental Qualification

The design validation process for the environmental qualification of CPSES Unit 1 and Common equipment was completed in accordance with the design criteria defined in Design Basis Documents (DBDs) (References 11 and 12). This design validation included:

- Class 1E equipment located in a harsh environment[1]
- Class 1E equipment located in a mild environment[2]
- Active safety-related mechanical equipment located in a harsh environment

This process consisted of reviewing, evaluating and assembling the documentation that validates that the safety-related functions of the equipment will not be adversely affected by the environment to which the equipment may be subjected. The environmental parameters considered for this process are:

- Temperature
- Pressure
- Radiation
- Relative humidity
- Chemical spray
- Flooding

---

[1]An environment where safety-related equipment would experience, due to the direct effects of a design basis accident (Loss of Coolant Accident, Main Steam Line Break, High Energy Line Break), any of the following parameters:

a. An ambient pressure increase greater than two pounds per square inch (2 psi) above atmospheric, or

b. An ambient temperature increase greater than five degrees centigrade (5°C or 9°F) above the postulated maximum temperature based on normal and anticipated operational occurrences, or

c. A total integrated radiation exposure dose of 1×10^4 rads gamma or greater, or

d. A relative humidity value of 100%.

[2]An environment, outside the containment, that is not potentially harsh following a design basis accident.

These parameters are documented in the Design Basis Document (DBD) (Reference 13) for each location in the plant. These parameters were developed and validated by other Corrective Action Program (CAP) organizations (SWEC and Ebasco) as shown on Figure 5-1.

During the equipment qualification design validation, Impell considered the following equipment attributes:

- Location
- Orientation
- Identification
- Mounting
- Classification (NUREG-0588, Appendix E, Section 2 category)

These attributes were identified through the review of CPSES Unit 1 and Common design and vendor drawings, the Equipment Qualification Master List (EQML) and engineering walkdowns.

Class 1E Equipment Located in a Harsh Environment

For electrical equipment identified on the Equipment Qualification Master List (EQML) and located in a harsh environment, environmental qualification was validated in accordance with 10CFR50.49. For each procurement specification Environmental Equipment Qualification Summary Packages (EEQSPs) were developed for the equipment make and model number grouping. These packages include an evaluation of the following:

- Test specimen
- Qualified environment
- Qualification methods
- Test sequence
- Margins
- Operability/Performance requirements
- Electrical input

- o Thermal aging
- o Deficiencies/Anomalies
- o Qualification maintenance requirements
- o NRC IE Bulletins, Circulars, Information Notices and Generic Letters

The Environmental Equipment Qualification Summary Packages(EEQSPs) provided the documentation necessary to validate the environmental qualification of Class 1E equipment. Where environmental qualification could not be demonstrated for equipment, the appropriate design change was initiated to relocate, replace, or protect that equipment in order to validate its environmental qualification.

Class 1E Equipment Located in a Mild Environment

The environmental qualification of Class 1E equipment located in a mild environment area was validated through an evaluation of the data obtained from design/purchase specifications, test results, and operational experience. This data is summarized in mild Environmental Equipment Qualification Summary Packages (EEQSPs). These packages contain the following:

- o An evaluation of the equipment to its environmental conditions
- o Determination of the equipment design life (the design life is based on information such as the equipment rating, vendor's design or application or an engineering evaluation for the specific mild environment in which the equipment is installed)
- o Impact of applicable regulatory documents

Active Safety-Related Mechanical Equipment Located in a Harsh Environment

The environmental qualification of active safety-related mechanical equipment located in a harsh environment was validated through the evaluation and consideration of the following:

- o Non-metallic subcomponents
- o The maximum postulated environmental conditions for the equipment location
- o Environmental effects on non-metallic subcomponent material properties

- Thermal aging of non-metallic subcomponents

This evaluation was documented in Equipment Qualification Data Packages (EQDPs).

Identification of Maintenance Requirements

Validated Environmental Equipment Qualification Summary Packages (EEQSPs) and Equipment Qualification Data Packages (EQDPs) identify maintenance requirements necessary to assure that equipment retains its qualification. These requirements include such items as periodic replacement of age susceptible components and maintenance activities specifically outlined in Qualification Test Reports (QTRs) (e.g., replacement of gaskets, o-rings and diaphragms).

To properly document the maintenance requirements, and to facilitate the transmittal of the information to the TU Electric maintenance organization, these packages identify:

- Parts and equipment requiring replacement
- Replacement intervals
- Beginning of life date
- First replacement date

5.1.2.3 Seismic Qualification

The design validation process for the seismic qualification of CPSES Unit 1 and Common equipment has been completed in accordance with the design criteria specified in the Design Basis Document (DBD) (Reference 10). This design validation included the Seismic Category I mechanical and electrical equipment identified on the Equipment Qualification Master List (EQML) and involved an evaluation and consideration of such items as:

- Minimum equipment fundamental frequencies
- Definition of seismic (Amplified Response Spectra (ARS)) and other operational loads (e.g., nozzle loads) in the equipment qualification
- Acceptability of seismic analysis/testing methods and procedures
- Application of seismic and operational load input to the analysis and/or test

- Correlation of the as-qualified configuration to the design configuration

- Application of acceptance codes and standards

- Documentation of test equipment calibration and/or identification of computer programs.

Design validation of the seismic qualification of equipment included the consideration of operational loads coincident with the postulated occurrence of a seismic event. Where equipment was required to perform an active safety-related function, Impell validated that the active safety-related function would not be adversely affected by the seismic loading to which the equipment may be subjected.

The design validation of the seismic qualification of equipment considered equipment location, orientation, support and mounting configuration. In addition, Impell validated that appropriate consideration was given to any attachments or appurtenances that could impact the qualification of the equipment or its appurtenances. This effort included the review and validation of the original seismic qualification calculations, analyses, and test results and the augmentation of the seismic qualification documentation, as necessary, to assure compliance to the design criteria as specified in the Design Basis Document (DBD) (Reference 10).

The seismic qualification of equipment is documented through the completion of Seismic Equipment Qualification Summary Packages (SEQSPs) which provide a summary of the qualification methods and procedures used and results obtained to document the seismic qualification of CPSES Unit 1 and Common equipment. Where seismic qualification could not be demonstrated for equipment, the appropriate design change was initiated to modify or replace that equipment in order to validate its seismic qualification.

Equipment mounting loads identified within the Seismic Equipment Qualification Summary Packages (SEQSPs) were transmitted to the Corrective Action Program (CAP) organization responsible for the design validation of structural attachments as indicated in Figure 5-1.

5.1.2.4 Interfaces

The validation process involves interfaces with TU Electric and with other organizations involved in the Corrective Action Program (CAP). Organizational interfaces shown in Figure 5-1 included those between Impell, TU Electric,

SWEC-PSAS, SWEC, Ebasco, and Westinghouse. Interfaces with these organizations were procedurally controlled to assure:

- Consistency of design criteria
- Completeness of the information incorporated in each Design Validation Package (DVP)
- Proper transfer of design data between interfacing organizations
- Uniform application of design control procedures
- Coordination of corrective and preventive actions

5.1.2.5 Final Reconciliation Process

The purpose of final reconciliation is to consolidate analysis, hardware modification, and inspection documentation to assure consistency of the equipment qualification design documentation (see Figure 1-1). The final reconciliation process is performed in accordance with approved procedures and incorporates the following:

- The Post Construction Hardware Validation Program (PCHVP) results which assure that the design validated configuration agrees with the hardware (see Section 5.1.3).
- Resolution of the equipment qualification related Comanche Peak Response Team (CPRT) issues.
- Confirmation that the interfacing organizations have accepted the Impell results as compatible with their validated design. Interfacing organizations are depicted in Figure 5-1.

Also, the closure of open items, observations and deviations related to equipment qualification that were identified by the TU Electric Technical Audit Program (TAP) and the Engineering Functional Evaluation (EFE) are resolved prior to the completion of final reconciliation. Items from TU Electric Significant Deficiency Analysis Reports (SDARs) (10CFR50.55(e)) are also resolved during the final reconciliation process. At the conclusion of final reconciliation the Design Validation Packages (DVPs) are finalized.

5.1.3 Post Construction Hardware Validation Program (PCHVP)

The Post Construction Hardware Validation Program (PCHVP) (Reference 14) is the portion of the TU Electric Corrective Action Program (CAP) which validates the final acceptance attributes for safety-related hardware. The Post Construction Hardware Validation Program (PCHVP) process is shown diagrammatically in Figure 5-2.

The input to the Post Construction Hardware Validation Program (PCHVP) is contained in the installation specifications. The installation specifications implement the licensing commitments and design criteria of the Design Basis Documents (DBDs), which were developed during the Corrective Action Program (CAP) design validation process.

Final acceptance inspection requirements identified in the validated installation specifications were used to develop the Post Construction Hardware Validation Program (PCHVP) attribute matrix. This matrix is a complete set of final acceptance attributes identified for installed hardware. The Post Construction Hardware Validation Program (PCHVP), by either physical validations or through an engineering evaluation methodology, assures that each of the attributes defined in the attribute matrix is validated.

Physical validation of an attribute is performed by Quality Control (QC) inspection or engineering walkdown, for accessible components. Quality Control (QC) inspections and engineering walkdowns are controlled by appropriate Field Verification Method (FVM) procedures.

The Post Construction Hardware Validate Program (PCHVP) engineering evaluation depicted in Figure 5-2 is procedurally controlled to guide the Corrective Action Program (CAP) responsible engineer through the evaluation of each item on the attribute matrix to be dispositioned by the engineering evaluation method. Dispositions of each attribute will be clearly documented. If the technical disposition of the final acceptance attribute is "not acceptable" or the attribute cannot be dispositioned based on available information, an alternate plan consisting of additional evaluations, testing, inspection/walkdowns or modifications, as necessary, will be developed to demonstrate and document the acceptability of the attribute.

Recommendations from the Comanche Peak Response Team (CPRT) effort comprise a significant portion of the evaluation. A major component of the Comanche Peak Response Team (CPRT) program has been the inspection of a comprehensive, random sample of existing hardware using an independently derived set of inspection attributes. The inspection was performed and the results were evaluated by Third Party personnel in accordance with Appendix E to the Comanche Peak Response Team (CPRT) Program Plan (Reference 22). The scope of the inspection covered the installed safety-related hardware by segregating the hardware into homogeneous populations (by virtue of the work activities which produced the finished product). Samples of these populations were inspected to provide reasonable assurance of hardware acceptability in accordance with Appendix D to the Comanche Peak Response Team (CPRT) Program Plan.

Corrective action recommendations were made to TU Electric based on the evaluated findings when a Construction Deficiency existed, an Adverse Trend existed, or an Unclassified Trend existed, as defined in accordance with Appendix E to the Comanche Peak Response Team (CPRT) Program Plan.

The Post Construction Hardware Validation Program (PCHVP) assures that all Comanche Peak Response Team (CPRT) recommendations are properly dispositioned.

Figure 5-2 illustrates that during the evaluation of a given attribute from the Post Construction Hardware Validation Program (PCHVP) attribute matrix, the initial task of the Corrective Action Program (CAP) responsible engineer is to determine if any of the following statements are true:

a. The attribute was recommended for reinspection by the Comanche Peak Response Team (CPRT)

b. Design validation resulted in a change to design or to a hardware final acceptance attribute that is more stringent than the original acceptance attribute or the Comanche Peak Response Team (CPRT) did not inspect the attribute

c. Design validation resulted in new work, including modification to existing hardware

If the Comanche Peak Response Team (CPRT) had no recommendations and Items b. or c. above do not apply, the attribute under consideration will be accepted. This conclusion is justified by the comprehensive coverage of the Comanche Peak Response Team (CPRT) reinspection and the consistently conservative evaluation of each finding from both a statistical and adverse trend perspective. The attribute matrix is then updated to indicate that neither the engineering walkdown nor Quality Control (QC) inspection of the attribute is necessary. A completed evaluation package is prepared and forwarded to the Comanche Peak Engineering (CPE) organization for concurrence. The evaluation package becomes part of the Design Validation Package (DVP) after Comanche Peak Engineering (CPE) concurrence is obtained.

If any of the three statements above are true, it is assumed that the final acceptance attribute must be further evaluated as follows:

Determine Attribute Accessibility

The Corrective Action Program (CAP) responsible engineer will determine if the attribute is accessible. If the attribute is accessible, a field validation of the item's acceptability will be performed and documented in accordance with an approved Field Verification Method (FVM).

If the Corrective Action Program (CAP) responsible engineer reaches the conclusion that the attribute is inaccessible, an engineering evaluation will be conducted by technical disposition of available information.

After completing the attribute accessibility review, the Corrective Action Program (CAP) responsible engineer will update the attribute matrix, as necessary, to reflect the results of that review.

Technical Disposition

The Corrective Action Program (CAP) responsible engineer identifies the data to be considered during the subsequent technical disposition process. Examples of such items used in this disposition may include, but are not limited to:

- Historical documents (e.g., specifications, procedures and inspection results)
- Comanche Peak Response Team (CPRT) and external issues
- Construction practices
- Quality records
- Test results
- Audit reports
- Authorized Nuclear Inspector (ANI) records
- Surveillance reports
- NCRs, DRs, SDARs, and CARs
- Inspections conducted to date
- Results of Third Party reviews
- Purchasing documents
- Construction packages
- Hardware receipt inspections

After compiling the data identified as pertinent to the attribute, the technical disposition will be performed. The actual steps and sequence of actions required for each technical disposition will differ; however, the tangible results from each technical disposition will be consistent. These results will include as a minimum:

- A written description of the attribute;

- A written justification by the Corrective Action Program (CAP) responsible engineer for acceptance of the attribute;
- A written explanation of the logic utilized to conclude that the attribute need not be field validated;
- A chronology demonstrating that the attribute has not been significantly altered by redesign;
- All documents viewed to support the disposition;
- Concurrence of the acceptance of the attribute's validity by Comanche Peak Engineering (CPE).

If the Corrective Action Program (CAP) responsible engineer concludes that the data evaluated represents evidence of the attribute's acceptability, the conclusion will be documented. The documentation will be reviewed and approved by Comanche Peak Engineering (CPE) and filed in the Design Validation Package (DVP). If the Corrective Action Program (CAP) responsible engineer determines that the data reviewed does not provide evidence of the attribute's acceptability, the documentation will explain why the attribute cannot be accepted and recommend an alternate course of action. The alternate course of action may take various forms such as making the attribute accessible and inspecting it, or testing to support the attribute's acceptability. This alternate plan, after approval by Comanche Peak Engineering (CPE), will be implemented to validate the attribute.

In summary, the Post Construction Hardware Validation Program (PCHVP) is a comprehensive process by which each attribute in the PCHVP attribute matrix is validated to the validated design. The TU Electric Technical Audit Program (TAP) will audit the Post Construction Hardware Validation Program (PCHVP). This audit program is complemented by the Engineering Functional Evaluation (EFE) being performed by an independent team comprised of Stone & Webster, Impell, and Ebasco engineering personnel working under the Stone & Webster Quality Assurance (QA) Program and subject to oversight directed by the Comanche Peak Response Team's (CPRT) Senior Review Team (SRT). The Post Construction Hardware Validation Program (PCHVP) will provide reasonable assurance that the validated design has been implemented for safety-related hardware.

To provide assurance that the as-built hardware complies with the validated design, the Post Construction Hardware Validation Program (PCHVP) for equipment qualification developed a matrix of final acceptance attributes based on the validated installation specifications. A summary of the equipment qualification final acceptance attributes are presented in Table 5-2. The specific final acceptance attributes are contained in the Commodity/Attribute Matrix (Reference 32).

A brief description of the Field Verification Methods (FVMs) implemented in the Post Construction Hardware Validation Program (PCHVP) for CPSES Unit 1 and Common equipment qualification is given below:

- FVM-047
  Field Verification Method (FVM) TE-FVM-EQ-047 (Reference 6) was developed to control the collection of data for Class 1E Limitorque valve actuators.

- FVM-053
  Field Verification Method (FVM) TE-FVM-EQ-053 (Reference 7) was developed to control the collection of as-built data for safety-related equipment conduit entry configurations.

- FVM-057
  Field Verification Method (FVM) CPE-IM-FVM-EQ-057 (Reference 8) was developed to control the collection of as-built data for equipment requiring environmental and/or seismic qualification.

- FVM-103
  Field Verification Method (FVM) CPE-IM-FVM-EQ-103 (Reference 9) was developed to control the collection of as-built data for anchorages for rotating and reciprocating equipment.

5.2 RESULTS

This section discusses the results of the equipment qualification portion of the Corrective Action Program (CAP).

5.2.1 Design Validation Results

The design validation of the CPSES Unit 1 and Common equipment qualification has been completed as described in this Project Status Report (PSR). This effort included:

- Review of 165 specifications and qualification data packages
- Review of more than 3,000 original design drawings
- Development of 150 Environmental Equipment Qualification Summary Packages (EEQSPs)
- Development of 500 Seismic Equipment Qualification Summary Packages (SEQSPs)
- Validation of the qualification of more than 16,500 equipment items
- Resolution of 125 Tenera, L.P. (TERA) Discrepancy Issue Reports (DIRs)
- Development of more than 330 calculations

The results of this design validation effort determined that some hardware modifications were required which included relocation, modification and/or replacement of 500 pieces of equipment.

The design validation effort, in conjunction with the design modifications, results in equipment qualification design and associated documentation that is in conformance with CPSES licensing commitments. The design validation also demonstrates that the safety-related functions of the equipment will not be adversely affected by the environmental and/or seismic conditions to which the equipment may be subjected.

5.2.2 Post Construction Hardware Validation Program (PCHVP) Results

The Post Construction Hardware Validation Program (PCHVP) is being implemented through the verification of the final acceptance attributes for equipment qualification in CPSES Unit 1 and Common as discussed in Section 5.1.3.

5.3 QUALITY ASSURANCE (QA) PROGRAM

All activities of the CPSES Unit 1 and Common equipment qualification portion of the Corrective Action Program (CAP) were performed in accordance with Impell's Quality Assurance (QA) Program (Reference 4). Impell performs nuclear safety-related work in accordance with its Quality Assurance (QA) Program, which complies with 10CFR50, Appendix B, ANSI N45.2 (Reference 23) and appropriate ANSI daughter standards. Impell's Corporate Quality Assurance (QA) Program was reviewed and approved by TU Electric's Quality Assurance (QA) organization. Impell's Quality Assurance (QA) Program has also been inspected by the Nuclear Regulatory Commission on several occasions.

Prior to initiation of work to implement the equipment qualification portion of the Corrective Action Program (CAP), an equipment qualification Project Quality Plan (Reference 5) was developed in accordance with the Impell Corporate Quality Assurance (QA) Program. The Project Quality Plan has been reviewed and accepted by TU Electric Quality Assurance (QA) and serves to control all Impell work performed under the equipment qualification portion of the Corrective Action Program (CAP). The Project Quality Plan includes specific procedures to supplement the Impell Corporate Quality Assurance (QA) Program.

To provide additional assurance in the technical adequacy of design documentation the Impell Corporate Quality Assurance (QA) Program has established a Technical Quality Review (TQR) program. The Technical Quality Review (TQR) consists of a detailed technical assessment by qualified engineers of the reasonableness of the technical work performed. The program has been implemented in Impell offices and at the CPSES site for equipment qualification related work. Technical Quality Reviews (TQRs) are documented and are made part of project records.

In accordance with the Project Quality Plan, detailed equipment qualification project procedures were developed. These procedures controlled the design validation effort and the organization and format of engineering documents. These documents were distributed to Impell supervisory engineers and were readily available to equipment qualification personnel. The issuance of these procedures and their revisions was followed with detailed training programs for the applicable personnel.

The Impell Project Quality Assurance (QA) Manager, who reports to an Impell Corporate Vice President and who has management experience in auditing and Quality Assurance (QA) Program procedure development for engineering activities, was assigned to the project in the earliest stages of the project. This reporting responsibility assures independence of Quality Assurance (QA) functions. Quality Assurance (QA) personnel provide assurance that the Quality Assurance (QA) Program properly addresses all project activities and assists project personnel to understand and properly implement the Quality Assurance (QA) Program.

To date, more than 26,400 man-hours have been expended by Impell in activities directly attributable to the equipment qualification Project Quality Assurance (QA) Program (i.e., training, procedure development, auditing, and the project QA supervisory staff).

The adequacy and implementation of the Impell Quality Assurance (QA) Program was extensively audited and surveilled by Impell's Quality Assurance (QA) Engineering Audit Group and TU Electric's Quality Assurance (QA) Technical Audit Program (TAP) and Engineering Surveillance Group. A total of 29 audits and surveillances were performed as follows:

o	Impell Audit Group	4	audits
		18	surveillances
o	TU Electric - TAP[3]	6	audits
o	TU Electric - Quality Assurance (QA) Engineering Surveillance Group	1	surveillance

The TU Electric audits and surveillances also evaluated the technical adequacy of the engineering product (e.g., qualification packages, calculations, procedural compliance, technical interfaces and specifications). These technical audits have resulted in enhancements to the procedures and methods, and thus, contributed to the overall quality of the CPSES equipment qualification program. A tabulation of the Impell and TU Electric audits and surveillances is presented in Table 5-3.

In addition to the audits and surveillances described above, TU Electric has initiated the Engineering Functional Evaluation (EFE) (Reference 24). The EFE began auditing the equipment qualification portion of the Corrective Action Program (CAP) in May 1987. The Engineering Functional Evaluation (EFE) is an overview program which is performing an independent, in-depth technical evaluation of the Corrective Action Program (CAP) to provide additional assurance that the Corrective Action Program (CAP) is effectively implemented. The

---

[3]The TU Electric Technical Audit Program (TAP) has been in effect since January, 1987. Prior to January 1987, the TU Electric Quality Assurance (QA) Department performed audits of selected engineering service contractors using technical specialists as part of its vendor audit program.

Engineering Functional Evaluation (EFE) is conducted under the SWEC Quality Assurance (QA) Program and is directed by a Program Manager who reports to the SWEC Chief Engineer, Engineering Assurance. The Engineering Functional Evaluation (EFE) is performed by highly qualified and experienced engineers from SWEC, Impell and Ebasco who have not been involved with previous engineering and design work at CPSES. The Engineering Functional Evaluation (EFE) is performed in a formal, preplanned and fully documented manner to provide objective evidence of completion of the planned scope of the evaluation and to provide documentation of its results and conclusions. The Engineering Functional Evaluation (EFE) is comparable in scope, level of effort and personnel qualifications to integrated, independent design inspections and verifications conducted at other nuclear plants.

The audits and surveillances described above represent very detailed and complete assessments of the following:

- Adequacy of the Quality Assurance (QA) Program
- Implementation of the Quality Assurance (QA) Program
- Technical adequacy of the design criteria and procedures
- Implementation of the design criteria and procedures

These audits and surveillances identified items in design criteria, procedures, calculations, and project documentation and training for which action was required to clarify or improve the design validation process and assure continued compliance with procedures. Each item identified was reviewed in detail to determine the extent of the condition, the cause of the condition and any corrective or preventive actions required. Subsequent audits verify that appropriate corrective and preventive actions are implemented to address the previously identified audit items.

In summary, an appropriate level of attention has been given to the quality of all equipment qualification activities; the Impell Quality Assurance (QA) Program is appropriate for the scope of work; project performance has been demonstrated to be in compliance with the Impell Quality Assurance (QA) Program; and appropriate corrective and preventive actions were taken whenever they were required.

5.3.1 Summary of Impell Quality Assurance (QA) Audits and Surveillances

To date, Impell Quality Assurance (QA) has performed 4 audits and 18 surveillances of the Impell equipment qualification design validation program. The following list of subjects describes the depth of auditing and surveilling that has been performed:

- o Adequacy of the project design and design control procedures
- o Technical adequacy and documentation of calculations
- o Non-Conformance Reports (NCRs)
- o Records maintenance
- o Generic Issue Report (GIR)
- o Discrepancy Issue Reports (DIRs)
- o Design Basis Documents (DBDs)
- o Indoctrination and training
- o Licensing activities
- o Corrective Action Requests (CARs)
- o Personnel qualification and experience verification
- o Design modifications

5.3.2 Summary of TU Electric Quality Assurance (QA) Audits and Surveillances

In addition to the Impell Quality Assurance (QA) Audits, Impell was audited by the TU Electric Quality Assurance (QA) Technical Audit Program (TAP) and surveilled by the TU Electric Quality Assurance (QA) Engineering Surveillance Group.

To date, TU Electric's Technical Audit Program (TAP) has performed 6 audits of Impell, and the TU Electric Quality Assurance (QA) Engineering Surveillance Group has performed one surveillance of Impell. These audits and surveillances are essentially equivalent to the Impell audits and surveillances discussed in Section 5.3.1. The list of subjects in Section 5.3.1 is representative of the TU Electric audits and surveillances.

5.4 CORRECTIVE AND PREVENTIVE ACTIONS

Impell has developed Design Basis Documents (DBDs) and procedures to implement the equipment qualification portion of the Corrective Action Program (CAP). The Design Basis Documents (DBDs) contain the design criteria for validating the equipment qualification design of CPSES Unit 1 and Common. The procedures assure compliance with the design criteria and the resolution of the Comanche Peak Response Team (CPRT) issues and any issues identified during the performance of the equipment qualification portion of the Corrective Action Program (CAP). The equipment qualification portion of the Corrective Action Program (CAP) validates that the safety-related function of CPSES Unit 1 and Common equipment will not be adversely affected by the environmental and/or seismic conditions to which they may be subjected.

This validation is documented in the calculations, evaluations, and equipment qualification packages which are contained in the Design Validation Packages (DVPs). This validated design documentation will be provided to TU Electric at the completion of the Corrective Action Program (CAP). The Design Basis Documents (DBDs) and procedures used for validation will also be provided to Comanche Peak Engineering (CPE). The validated design documentation, Design Basis Documents (DBDs) and procedures can provide the basis for configuration control of CPSES systems, structures and components and can be utilized by TU Electric to facilitate operation, maintenance and future modifications in accordance with licensing commitments following issuance of an operating license.

Interfaces between organizations have been identified and addressed in detail within the procedures. Those equipment qualification interfaces are discussed in Section 5.1.2.4.

Practical experience has been provided to Comanche Peak Engineering (CPE) engineers who have worked alongside Impell engineers during the ongoing validation process. Experience gained by Comanche Peak Engineering (CPE) engineers included changes in design documents, and familiarization with procedures followed and regulatory requirements.

TU Electric Comanche Peak Engineering (CPE) is developing a program to assure a complete and orderly transfer of the engineering and design function from Impell to CPE. The program provides for the identification of those tasks presently being performed by Impell which are to be transferred to Comanche Peak Engineering (CPE) and the identification of all procedures, programs, training and staffing requirements. The program is based upon three prerequisites: (a) the Corrective Action Program (CAP) effort to support plant completion is finished for the particular task; (b) the equipment qualification Design Validation Packages (DVPs) are complete; and (c) any required preventive action taken, as discussed in Appendices A and B, is complete.

FIGURE 5-1

CORRECTIVE ACTION PROGRAM (CAP) TECHNICAL INTERFACES
EQUIPMENT QUALIFICATION

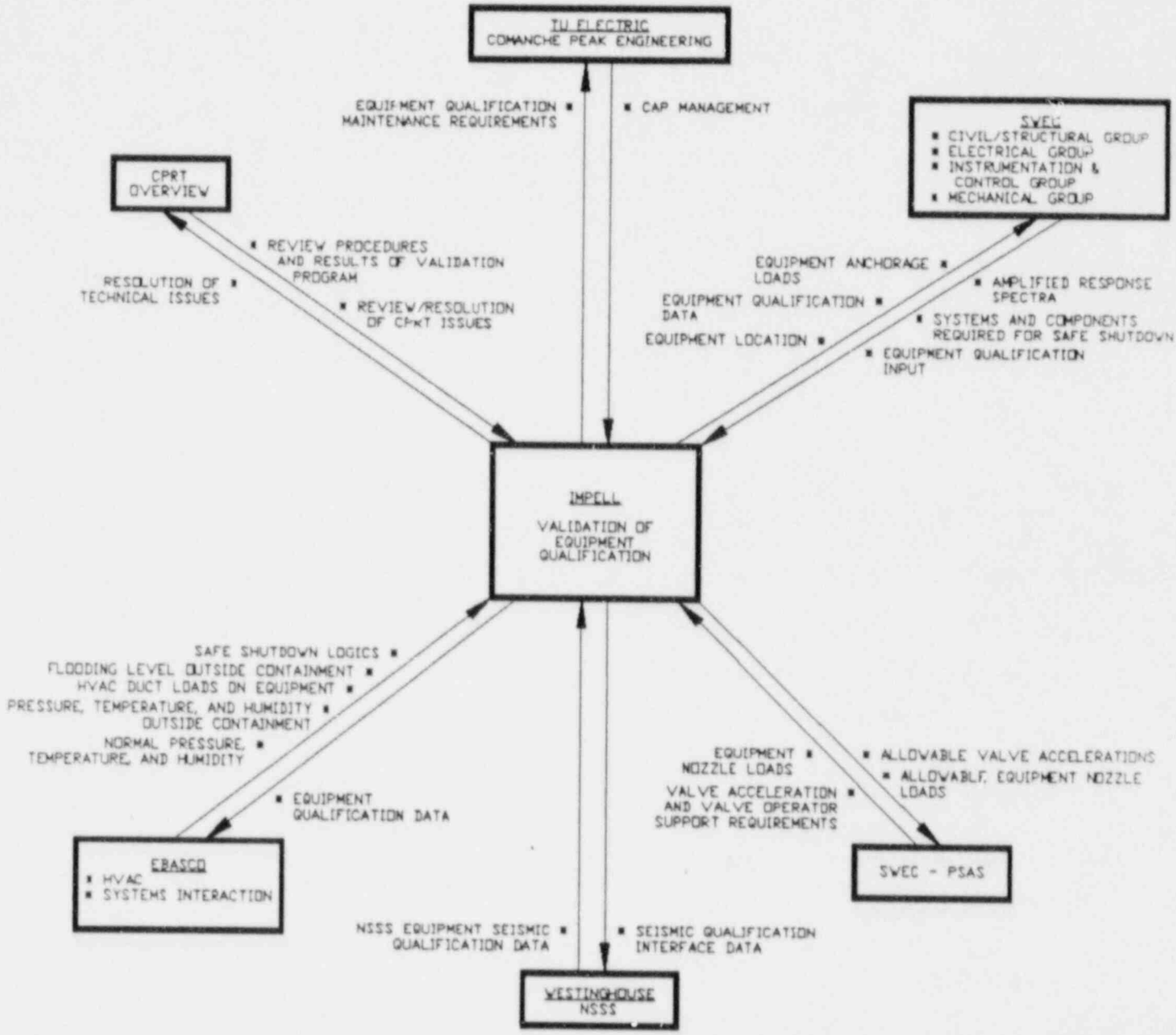


FIGURE 5-2

POST CONSTRUCTION HARDWARE VALIDATION PROGRAM (PCHVP)

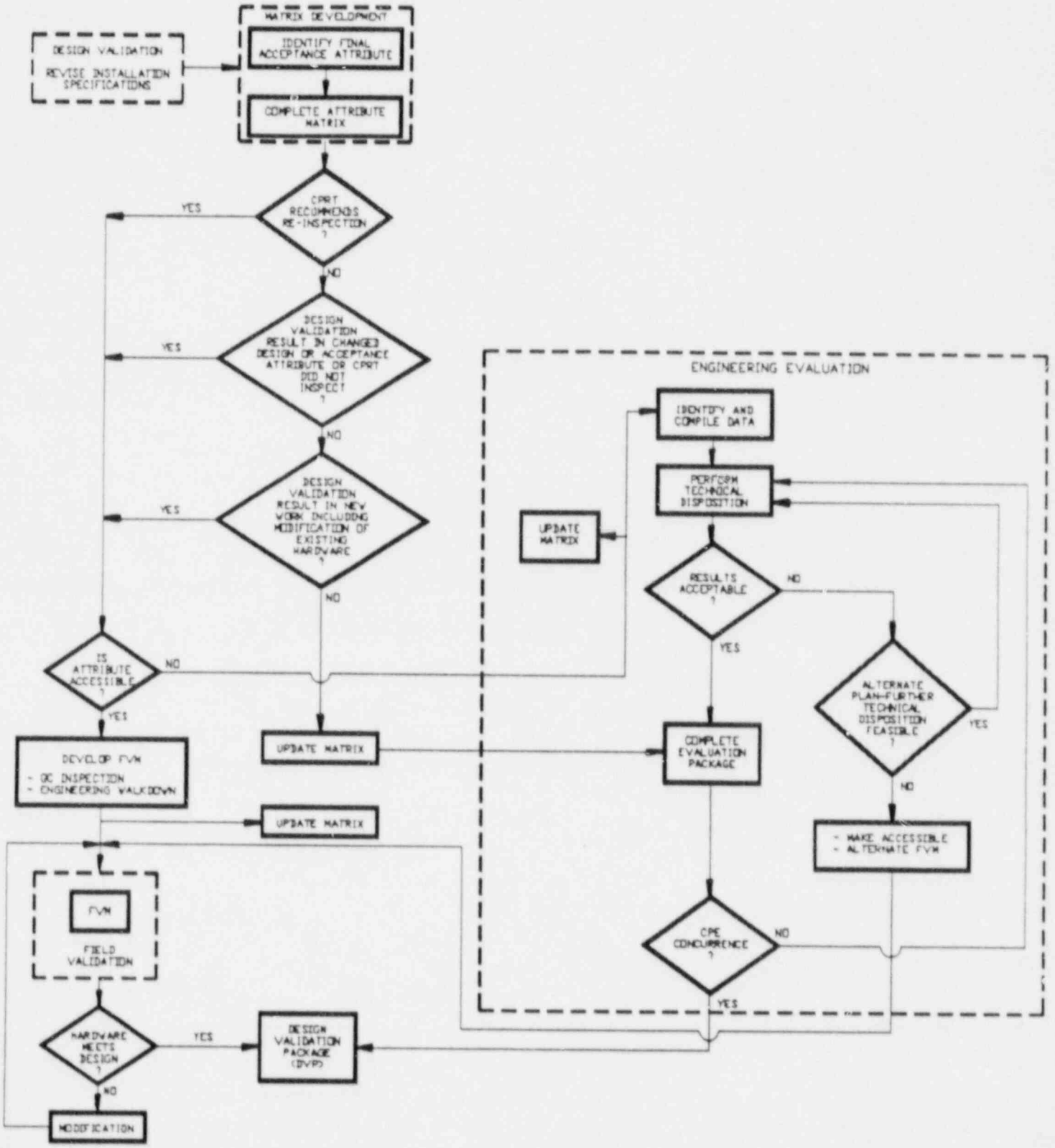


TABLE 5-1
PROCEDURES GOVERNING EQUIPMENT QUALIFICATION VALIDATION

Procedure No.	Title
IMT-AD-03	Preparation of Project Instructions
IMT-AD-04	Personnel Indoctrination and Training
IMT-AD-05	Correspondence Control
IMT-AD-11	Preparation and Review of Specification
IMT-AD-13	Preparation and Review of Design Change Authorizations (DCAs)
IMT-AD-13-1	Preparation and Review of Engineering Change Notices (ECNs)
IMT-AD-13-2	Review and Resolution of Field Change Requests (FCRs)
IMT-AD-14	Review and Processing of Package Process Forms (PPFs) and Design Modification (DMs)
IMT-AD-14-1	Preparation and Review of Design Engineering Packages (DEPs)
IMT-AD-15-1	Preparation and Review of Design Basis Documents (DBDs)
IMT-AD-16	Design Verification of Engineering Documents
IMT-AD-20	Design Control General Requirements
IMT-AD-23	Review and Transmittal of RFIs (Request for Information Clarification)
IMT-AD-24	As-Built Package Preparation (Field Verification)
IMT-AD-26	Processing of Discrepancy Issue Resolution Reports (DIRs)
IMT-AD-27	Review and Update of FSAR

TABLE 5-1
(CONTINUED)

Procedure No.	Title
IMT-AD-28	Design Verification and Inter-disciplinary Review of DCAs and NCRs
IMT-AD-30	Initiation and Review of Corrective Action Requests (CARs)
IMT-AD-31	Preparation and Review of Engineering Task Descriptions
IMT-EQ-01	Equipment Qualification Master List
IMT-EQ-01-1	Development of Equipment Qualification Master List
IMT-EQ-01-2	10CFR50.49(b)(2) Equipment Determination
IMT-EQ-02	Review of Documents from other Utilities
IMT-EQ-03	Review and Processing of NCRs, TDDRs, and SDARs
IMT-EQ-04-1	Seismic Qualification of Mechanical Equipment
IMT-EQ-04-2	Seismic Qualification of Electrical Equipment
IMT-EQ-04-5	Preparation of Equipment Qualification Summary Packages - Seismic
IMT-EQ-04-6	Review and Approval of Vendor Documents for Seismic EQ
IMT-EQ-04-7	Verification of As-built Loads on Equipment and Valves
IMT-EQ-04-9	Evaluation of Equipment Nozzle Load Exceedance
IMT-EQ-04-10	Evaluation of Equipment Nozzle Stiffness
IMT-EQ-05-1	Preparation of Mechanical Equipment Qualification Data Packages (Environmental)
IMT-EQ-05-2	Environmental Qualification of Electrical Equipment

TABLE 5-1
(CONTINUED)

Procedure No.	Title
IMT-EQ-05-4	Preparation of Equipment Qualification Summary Packages - (Environmental) [Harsh]
IMT-EQ-05-5	Environmental Qualification of Safety Related Electrical Equipment Located in Mild Environments
IMT-EQ-13	Instructions for Reporting Deficiencies Pursuant to 10 CFR 21 and 10 CFR 50.55(e)
IMT-EQ-16	Interdisciplinary Review (IDR) Performed by Impell
IMT-EQ-17	Equipment Qualification Program Impact Log
IMT-EQ-18	Preparation Review and Issuance of Equipment Qualification Calculations
IMT-EQ-21	Reporting and Control of Nonconformances (NCRs)
IMT-EQ-22	Processing of Deficiency Reports (DRs)
IMT-EQ-24	Preparation, Control and Issuance of Design Validation Packages (DVPs)
IMT-EQ-26	Commitment Tracking System (CTS)
IMT-EQ-27	Post Construction Hardware Validation Program (PCHVP)

TABLE 5-2
POST CONSTRUCTION HARDWARE VALIDATION PROGRAM (PCHVP)
EQUIPMENT QUALIFICATION

Construction Work Category	Final Acceptance Attribute	PCHVP Attribute Validation Method
Limitorque Valve Operators	Splice identification	TE-FVM-EQ-047 (Reference 6)
	Limit switch compartment T-drain location	TE-FVM-EQ-047
Control Panels and Racks	Conduit entry- configuration	TE-FVM-EQ-053 (Reference 7)
	Conduit entry- presence of structural damage	TE-FVM-EQ-053
Electrical Equipment	Identification	CPE-IM-FVM-EQ-057 (Reference 8)
	Location	CPE-IM-FVM-EQ-057
	Mounting configuration	CPE-IM-FVM-EQ-057
	Orientation	CPE-IM-FVM-EQ-057
Mechanical Equipment	Identification	CPE-IM-FVM-EQ-057
	Location	CPE-IM-FVM-EQ-057
	Mounting configuration	CPE-IM-FVM-EQ-057
	Orientation	CPE-IM-FVM-EQ-057
Mechanical Rotating/ Reciprocating Equipment	Bolting - presence of full bearing surface contact	CPE-IM-FVM-EQ-103 (Reference 9)
	Bolting-coating type	CPE-IM-FVM-EQ-103
	Bolting-configuration	CPE-IM-FVM-EQ-103

TABLE 5-2
(CONTINUED)

Construction Work Category	Final Acceptance Attribute	PCHVP Attribute Validation Method
Mechanical Rotating/ Reciprocating Equipment (Cont'd)	Bolting-presence of corrosion	CPE-IM-FVM-EQ-103
	Bolting-presence of damage	CPE-IM-FVM-EQ-103
	Bolting-grade	CPE-IM-FVM-EQ-103
	Bolting-nut type	CPE-IM-FVM-EQ-103
	Bolting-size and type	CPE-IM-FVM-EQ-103
	Bolting-thread engagement	CPE-IM-FVM-EQ-103
	Bolting-tightness	CPE-IM-FVM-EQ-103
	Bolting-torque	CPE-IM-FVM-EQ-103
	Bolting-washer size	CPE-IM-FVM-EQ-103
	Equipment nameplate I.D.	CPE-IM-FVM-EQ-103
	Hilti Bolt-tightness	CPE-IM-FVM-EQ-103
	Hilti Bolt- presence of torque seal	CPE-IM-FVM-EQ-103
	Hilti Bolt-angularity	CPE-IM-FVM-EQ-103
	Hilti Bolt-presence of full bearing contact	CPE-IM-FVM-EQ-103
	Hilti Bolt-configuration	CPE-IM-FVM-EQ-103
	Hilti Bolt-presence of damage	CPE-IM-FVM-EQ-103
	Hilti Bolt-diameter	CPE-IM-FVM-EQ-103
	Hilti Bolt-marking (length)	CPE-IM-FVM-EQ-103
	Hilti Bolt-projection (length)	CPE-IM-FVM-EQ-103
	Hilti Bolt-thread engagement	CPE-IM-FVM-EQ-103

TABLE 5-2
(CONTINUED)

Construction Work Category	Final Acceptance Attribute	PCHVP Attribute Validation Method
Mechanical Rotating/ Reciprocating Equipment (Continued)	Hilti Bolt-torque	CPE-IM-FVM-EQ-103
	Hilti Bolt-type	CPE-IM-FVM-EQ-103
	Hilti Bolt-washer size	CPE-IM-FVM-EQ-103
	Sliding feet clearance	CPE-IM-FVM-EQ-103

TABLE 5-3
SUMMARY OF AUDITS AND SURVEILLANCES

Audits

Audit Number	Auditing Organization	Date of Audit	Location	Audit Report Transmittal	Audit Response Transmittal
ATP 87-11	TU Electric TAP	Apr 27-May 1,1987	Fort Worth	May 15, 1987	Jun 1, 1987
ATP 87-22	TU Electric TAP	Jun 15-19, 1987	Fort Worth	Jul 15, 1987	Jul 31, 1987
09-1092	Impell QA	Jun 29-Jul 2, 1987	CPSES	Jul 16, 1987	Aug 14, 1987
ATP 87-33	TU Electric TAP	Jul 13-17, 1987	Fort Worth	Aug 4, 1987	Aug 21, 1987
ATP 87-41	TU Electric TAP	Aug 17-Sep 3, 1987	Fort Worth	Sep 25, 1987	Oct 14, 1987
11-1000	Impell QA	Oct 1-2, 1987	Fort Worth	Oct 22, 1987	Nov 7, 1987
11-1002	Impell QA	Oct 8-9, 1987	Fort Worth	Oct 22, 1987	Nov 30, 1987
09-1096	Impell QA	Oct 13, 1987	Lincolnshire	Oct 20, 1987	Nov 5, 1987
ATP-87-61	TU Electric TAP	Oct 26-30, 1987	Fort Worth	Nov 18, 1987	Dec 3, 1987
ATP-87-55	TU Electric TAP	Dec 9-16, 1987	Fort Worth	In Progress	

TABLE 5-3
(CONTINUED)

Surveillances

Surveillance Number	Surveilling Organization	Surveillance Dates	Location	Report Transmittal
S09-1205	Impell QA	Dec 22, 1986	CPSES	Dec 22, 1986
S09-1206	Impell QA	Jan 13, 1987	CPSES	Jan 15, 1987
S09-1207	Impell QA	Jan 14, 1987	CPSES	Jan 16, 1987
S09-1211	Impell QA	Feb 23, 1987	CPSES	Mar 3, 1987
S09-1212	Impell QA	Feb 25, 1987	CPSES	Mar 3, 1987
S09-1213	Impell QA	Mar 11-12, 1987	CPSES	Mar 13, 1987
S09-1214	Impell QA	Mar 23, 1987	CPSES	Jun 23, 1987
S09-1218	Impell QA	May 11, 1987	CPSES	May 12, 1987
S09-1219	Impell QA	May 14-18, 1987	Fort Worth	Jul 9, 1987
S09-1220	Impell QA	May 21-22, 1987	CPSES	May 26, 1987
ES-87-24	TU Electric QA	Jun 15-19, 1987	Fort Worth	Jun 30, 1987
S09-1224	Impell QA	Jul 27-28, 1987	CPSES	Jul 29, 1987

TABLE 5-3
(CONTINUED)

Surveillance Number	Surveilling Organization	Surveillance Dates	Location	Report Transmittal
S09-1225	Impell QA	Jul 30-31, 1987	CPSES	Aug 4, 1987
S09-1226	Impell QA	Jul 24, 1987	CPSES	Jul 29 1987
S09-1228	Impell QA	Aug 14-20, 1987	CPSES	Aug 24, 1987
S09-1230	Impell QA	Aug 28-29, 1987	CPSES	Sep 1, 1987
S09-1232	Impell QA	Sep 21, 1987	CPSES	Sep 28, 1987
S09-1233	Impell QA	Sep 30, 1987	CPSES	Oct 5, 1987
11-S004	Impell QA	Oct 23, 1987	Fort Worth	Oct 26, 1987

6.0 REFERENCES

1. TU Electric Letter No. TXX-6174, W.G. Counsil to U.S. Nuclear Regulatory Commission, Evaluation and Resolution of TERA Equipment Qualification Issue Resolution Reports, January 5, 1987

2. Impell Report 09-0210-064, "Equipment Qualification Masterlist Basis Report", Rev 0, January 30, 1987

3. Impell Report 09-0210-093 "CPSES Design Basis Consolidation Program Plan", Rev 1, October 2, 1987

4. Impell Quality Assurance Manual, Rev 17, July 15, 1985

5. Impell Project Quality Plan for Equipment Qualification, Rev 5, December 14, 1987

6. TU Electric Procedure TE-FVM-EQ-047, "Field Verification Method Limitorque Actuator Walkdowns", Rev 0, December 12, 1986

7. TU Electric Procedure TE-FVM-EQ-053, "Field Verification Method Equipment Conduit Interface Walkdowns", Rev 0, January 21, 1987

8. TU Electric Procedure CPE-IM-FVM-EQ-057, "Field Verification Method Equipment Qualification Walkdowns", Rev 2, September 21, 1987

9. TU Electric Procedure CPE-IM-FVM-EQ-103, "Field Verification Method Rotating Reciprocating Equipment Anchorages Walkdowns", Rev 0, September 1, 1987

10. Comanche Peak Steam Electric Station Design Basis Document, "Seismic Qualification of Equipment", DBD-ME-029, Rev 0, July 28, 1987

11. Comanche Peak Steam Electric Station Design Basis Document, "Environmental Qualification of Safety-Related Mechanical Equipment", DBD-EE-030, Rev 0 July 27, 1987

12. Comanche Peak Steam Electric Station Design Basis Document, "Environmental Qualification of Safety-Related Electrical Equipment", DBD-EE-031, Rev 0 July 27, 1987

13. Comanche Peak Steam Electric Station Design Basis Document, "Postulated Environments for Equipment Qualification", DBD-ME-076, Rev 0, July 31, 1987

14. TU Electric Engineering and Construction Procedure EC 9.04, "Post Construction Hardware Validation Program", Rev 2, September 30, 1987

15. USNRC Regulatory Guide 1.29 "Seismic Design Classification", Rev 2

16. Tenera, L.P. Issue Resolution Report IRR DAP-E-M-500, "Seismic Qualification of BOP Equipment and Components"

17. Tenera, L.P. Issue Resolution Report IRR DAP-E-EIC-503, "Environmental Qualification of Electrical and Mechanical Equipment"

18. TU Electric Letter No. TXX-4233, H.C. Schmidt to U.S. Nuclear Regulatory Commission, Environmental Qualification of Safety-Related Mechanical Equipment in Potentially Harsh Environments, July 20, 1984

19. TU Electric Letter No. TXX-6500, W.G. Counsil to U.S. Nuclear Regulatory Commission, Comanche Peak Programs, June 25, 1987

20. TU Electric Letter No. TXX-6631, W.G. Counsil to U.S. Nuclear Regulatory Commission, Comanche Peak Programs, August 20, 1987

21. Systems Interaction Program (SIP) Project Status Report (PSR), Rev 0, Supplement A of the Mechanical PSR

22. Comanche Peak Response Team Program Plan and Issue - Specific Action Plans, Appendix D, CPRT Sampling Policy, Applications and Guidelines, Rev 1, January 31, 1986, and Appendix E, Resolution of Discrepancies Identified by the CPRT, Rev 3, June 18, 1987

23. American National Standards Institute, ANSI N45.2, "Quality Assurance Program Requirements for Nuclear Facilities", 1977

24. TU Electric Letter No. TXX-6676, W.G. Counsil to U.S. Nuclear Regulatory Commission, Comanche Peak Programs, September 8, 1987

25. NUREG 0588, Rev 1, "Interim Staff Position on Environmental Qualification of Safety Related Electrical Equipment", July, 1981

26. Section 3.2, CPSES FSAR

27. Impell Procedure IMT-EQ-01, "Equipment Qualification Master List", Rev 1, March 6, 1987

28. Impell Procedure IMT-EQ-01-1, "Development of Equipment Qualification Master List", Rev 2, July 22, 1987

29. Impell Procedure IMT-EQ-01-2, "10CFR50.49b(2) Equipment Determination", Rev 1, March 6, 1987

30. Tenera, L.P., Issue Specific Action Plan, Conduit, ISAP VII.c.1, Rev 0, March 27, 1987

31. Tenera, L.P., Issue Specific Action Plan, Cables, ISAP VII.c.3, Rev 0, April 15, 1987

32. CPSES Commodity/Attribute Matrix, TU Electric PCHV-CAM-001, Rev 2, October 15, 1987

APPENDIX A

COMANCHE PEAK RESPONSE TEAM (CPRT) ISSUES

This appendix contains a comprehensive summary of the Impell evaluation, resolution, and corrective and preventive actions for all Comanche Peak Response Team (CPRT) issues which are related to the environmental and/or seismic qualification of CPSES Unit 1 and Common equipment. Specific reference to the criteria, procedures and engineering evaluations which resolved the issues are provided.

The Comanche Peak Response Team (CPRT) issues identified during the Tenera, L.P. (TERA) assessment of the equipment qualification program are addressed in two Issue Resolution Reports (IRRs), DAP-E-EIC-503 and DAP-E-M-500, dealing with the environmental and seismic qualification aspects of the program, respectively. These two Issue Resolution Reports (IRRs) identified issues relating to the documentation which assures that CPSES Unit 1 and Common electrical and mechanical equipment conforms to the CPSES licensing commitments and design criteria. Issue A7 is identified in Issue Specific Action Plans (ISAPs) VII.c.1 and VII.c.3.

Each subappendix includes: a definition of the issue; issue resolution; and corrective and preventive action. The preventive action is embodied in the procedures developed and used in the equipment qualification portion of the Corrective Action Program (CAP). These procedures resolve all Comanche Peak Response Team (CPRT) issues and implementation of these preventive actions can assure that the design and hardware for CPSES Unit 1 and Common will continue to comply with the licensing commitments throughout the life of the plant as described in Section 5.4.

Comanche Peak Response Team (CPRT) issues contained in Appendix A are listed below:

Issue No.	Issue Title
A1	Identification and Classification Requirements
A2	Environmental Conditions and Requirements
A3	Environmental Documentation
A4	Seismic Documentation
A5	Generic Regulatory Concerns
A6	Maintenance and Surveillance
A7	Flexible Conduit and Cable Slack

SUBAPPENDIX A1

IDENTIFICATION AND CLASSIFICATION REQUIREMENTS (IRRs DAP-E-M-500 and DAP-E-EIC-503)

1.0 Definition of The Issue

The issue was that insufficient documentation existed to assure that all safety-related equipment requiring environmental and/or seismic qualification was identified.

2.0 Issue Resolution

The issue was resolved by generating the Equipment Qualification Master List (EQML) (Reference 4.3) which identifies the electrical and mechanical components in CPSES Unit 1 and Common systems which require environmental and/or seismic qualification. A report (Reference 4.2) was generated identifying those safety-related systems relied upon to remain functional during and after design basis events. These systems were then reviewed in accordance with design procedures (References 4.4, 4.5 and 4.6) to identify those components and subcomponents which require environmental and/or seismic qualification. Components and subcomponents identified were documented in the Equipment Qualification Master List (EQML).

3.0 Corrective and Preventive Action

- No additional issues were identified during the review and resolution of this issue.
- This issue was determined not to be reportable under the provisions of 10CFR50.55(e).

3.1 Corrective Action

The Equipment Qualification Master List (EQML) was developed as the CPSES Unit 1 and Common document which identifies equipment requiring environmental and/or seismic qualification.

3.2 Preventive Action

The Equipment Qualification Master List (EQML) was developed. Procedure ECE-5.09-01 (Reference 4.1) requires that plant changes to safety-related systems and equipment be reviewed for seismic and environmental requirements and assures that equipment requiring qualification be identified and added to the Equipment Qualification Master List (EQML).

4.0 References

4.1 TU Electric Engineering and Construction Procedure ECE 5.09-01,"Design Verification and Inter-Disciplinary Review", Rev 2

4.2 Impell Report 09-0210-064, "Equipment Qualification Master List Basis Report", Rev 0, January 30, 1987

4.3 Equipment Qualification Master List, Rev 0, August 31, 1987

4.4 Impell Procedure, IMT-EQ-01, "Equipment Qualification Master List", Rev 1, March 6, 1987

4.5 Impell Procedure, IMT-EQ-01-1, "Development of Equipment Qualification Master List", Rev 2, July, 22, 1987

4.6 Impell Procedure, IMT-EQ-01-2, "10CFR50.49b(2) Equipment Determination", Rev 1, March 6, 1987

SUBAPPENDIX A2

ENVIRONMENTAL CONDITIONS AND REQUIREMENTS (IRR DAP-E-EIC-503)

1.0 Definition of the Issue

The issues were as follows:

1.1 No single comprehensive document existed that contained the environmental parameters (i.e., temperature, pressure, humidity, flooding, radiation and chemical spray) and referenced the supporting calculations utilized to develop these parameters.

1.2 Inadequate calculations existed for determining the CPSES Unit 1 and Common pressure, temperature, humidity, chemical spray and flooding parameters.

1.3 Inadequate calculations existed for determining radiation environments.

2.0 Issue Resolution

2.1 Impell resolved this issue by developing a Design Basis Document (DBD) (Reference 4.1) which documents the environmental parameters (i.e., temperature, pressure, humidity, flooding, radiation and chemical spray) and references the supporting calculations.

2.2 The resolution of this issue is addressed in the Mechanical Project Status Report (PSR), the Systems Interaction Program (SIP) Project Status Report (PSR) (Supplement A of the Mechanical Project Status Report (PSR)) and in the Heating, Ventilation and Air Conditioning (HVAC) Project Status Report (PSR).

2.3 The resolution of this issue is addressed in the Mechanical Project Status Report (PSR).

3.0 Corrective and Preventive Action

- No additional issues were identified during the review and resolution of issue 1.1.

- Issue 1.1 was determined not to be reportable under the provisions of 10CFR50.55(e).

3.1 Corrective Action

Impell developed a Design Basis Document (DBD) (Reference 4.1) which documents the environmental parameters (i.e., temperature, pressure, humidity, flooding, radiation and chemical spray) and references the supporting calculations.

3.2 Preventive Action

A Design Basis Document (DBD) (Reference 4.1) was developed consolidating and documenting environmental parameters. Impell procedures (References 4.2 and 4.3) require that the Design Basis Document (DBD) be revised to include any applicable changes in the design criteria (environmental parameters).

4.0 References

4.1 Design Basis Document, DBD-ME-076 "Postulated Environments for Equipment Qualification", Rev 1

4.2 Impell Procedure, IMT-AD-15-1, "Preparation and Review of Design Basis Documents" Rev 1

4.3 Impell Procedure IMT-EQ-16, "Inter-Disciplinary Review (IDR) Performed by Impell", Rev 1

SUBAPPENDIX A3

ENVIRONMENTAL DOCUMENTATION (IRR DAP-E-EIC-503)

1.0 Definition of the Issue

The issue was that inadequate documentation existed to demonstrate the environmental qualification of Class 1E equipment located in a harsh environment.

2.0 Issue Resolution

The issue was resolved by developing Environmental Equipment Qualification Summary Packages (EEQSPs) to document the environmental qualification of Class 1E equipment located in a harsh environment. These packages were prepared in accordance with design criteria as specified in the Design Basis Document (DBD) (Reference 4.1) which includes the criteria of IEEE-323 (Reference 4.2). These packages include an evaluation of the following:

- Test specimen (validation of the as-built equipment configuration is being performed as part of the Post Construction Hardware Validation Program (PCHVP))
- Qualified environment
- Qualification methods
- Test sequence
- Margins
- Operability/Performance requirements
- Electrical input
- Thermal aging
- Deficiencies/Anomalies
- Qualification maintenance requirements
- NRC IE Bulletins, Circulars, Information Notices and Generic Letters

These packages provide adequate documentation validating the environmental qualification of Class 1E equipment located in a harsh environment.

3.0 Corrective and Preventive Action

- o No additional issues were identified during the review and resolution of this issue.

- o This issue was determined not to be reportable under the provisions of 10CFR50.55(e).

3.1 Corrective Action

Environmental Equipment Qualification Summary Packages (EEQSPs) were developed which provide adequate documentation validating the environmental qualification of Class 1E equipment located in a harsh environment.

3.2 Preventive Action

Impell developed design and design control procedures (References 4.3 and 4.4) which provide specific guidelines for documenting the environmental qualification of Class 1E equipment located in a harsh environment. These procedures provide the basis and the methodology to assure that environmental qualification is performed in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1).

4.0 References

4.1 Design Basis document, DBD-EE-031 "Environmental Qualification of Safety-Related Electrical Equipment", Rev 1

4.2 IEEE Standard 323" IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations", 1974

4.3 Impell Procedure, IMT-EQ-05-2,"Environmental Qualification of Electrical Equipment", Rev 3

4.4 Impell Procedure, IMT-EQ-05-4" Preparation of Equipment Qualification Summary Packages", Rev 3

SUBAPPENDIX A4

SEISMIC DOCUMENTATION
(IRR DAP-E-M-500)

1.0 Definition of the Issue

The issue was that inadequate documentation existed to demonstrate the seismic qualification of Seismic Category I electrical and mechanical equipment

2.0 Issue Resolution

The issue was resolved by developing Seismic Equipment Qualification Summary Packages (SEQSPs) to document the seismic qualification of Seismic Category I equipment. These packages were prepared in accordance with the design criteria defined in the Design Basis Document (DBD) (Reference 4.1) and include an evaluation of:

- Minimum equipment fundamental frequencies
- Definition of seismic (Amplified Response Spectra (ARS) and other operational Loads (e.g., nozzle loads) in the equipment qualification
- Acceptability of seismic analysis/testing methods and procedures
- Correlation of the as-qualified configuration to the design configuration
- Correlation of as-built configuration to the design configuration (this validation is being performed as part of the Post Construction Hardware Validation Program (PCHVP))
- Application of seismic and operational load input to the analysis and/or test
- Application of acceptance codes and standards
- Documentation of test equipment calibration and/or identification of computer programs

The Seismic Equipment Qualification Summary Packages (SEQSPs) provide adequate documentation validating the seismic qualification of Seismic Category I electrical and mechanical equipment.

3.0 Corrective and Preventive Action

- o No additional issues were identified during the review and resolution of this issue.

- o This issue was determined not to be reportable under the provisions of 10CFR50.55(e).

3.1 Corrective Action

Seismic Equipment Qualification Summary Packages (SEQSPs) were developed which provide adequate documentation validating the seismic qualification of Seismic Category I electrical and mechanical equipment.

3.2 Preventive Action

Impell developed design and design control procedures (References 4.2, 4.3 and 4.4) which provide specific guidelines for documenting the seismic qualification of Seismic Category I electrical and mechanical equipment. These procedures provide the basis and methodology to assure that seismic qualification is performed in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.1).

4.0 References

4.1 Design Basis Document, DBD-ME-029, "Seismic Qualification of Equipment, Rev 0

4.2 Impell Procedure, IMT-EQ-04-1, "Seismic qualification of Mechanical Equipment", Rev 1

4.3 Impell Procedure, IMT-EQ-04-2, "Seismic Qualification of Electric Equipment", Rev 0

4.4 Impell Procedure, IMT-EQ-04-5, "Preparation of Equipment Qualification Summary Packages - Seismic", Rev 3

SUBAPPENDIX A5

GENERIC REGULATORY CONCERNS
(IRR DAP-E-EIC-503)

1.0 Definition of the Issue

The issue was that inadequate documentation existed to demonstrate that regulatory documents (i.e., NRC IE Bulletins, Information Notices and NRC Generic Letters) applicable to equipment qualification have been evaluated.

2.0 Issue Resolution

Impell resolved this issue by identifying in a report (Reference 4.1) existing NRC IE Bulletins, Information Notices and NRC Generic Letters with potential impact on equipment qualification. Those regulatory documents identified were appropriately evaluated and documented within the applicable Environmental and/or Seismic Equipment Qualification Summary Packages (EEQSPs/SEQSPs).

3.0 Corrective and Preventive Action

- No additional issues were identified during the review and resolution of this issue.
- This issue was determined not to be reportable under the provisions of 10CFR50.55(e).

3.1 Corrective Action

This issue was corrected through the identification and evaluation of applicable regulatory documents for impact on equipment qualification. These evaluations were documented within the appropriate Environmental and/or Seismic Equipment Qualification Summary Packages (EEQSPs/SEQSPs).

3.2 Preventive Action

Impell developed a design control procedure (Reference 4.2) to assure that incoming regulatory correspondence with potential impact on the equipment qualification program is evaluated. Any impact is documented (References 4.3 and 4.4) in the applicable Environmental and/or Seismic Equipment Qualification Summary Packages (EEQSPs/SEQSPs).

4.0 References

4.1 Impell Report 09-0210-065, "Potential Impact of NRC IE Notices, Bulletins, and Circulars on Equipment Qualification", Rev 0, December 31, 1986

4.2 Impell Procedure IMT-EQ-17 "Equipment Qualification Impact Log", Rev 2

4.3 Impell Procedure IMT-EQ-04-5 "Preparation of Equipment Qualification Summary Packages - Seismic", Rev 3, June 30, 1987

4.4 Impell Procedure IMT-EQ-05-4 "Preparation of Equipment Qualification Summary Packages - Environmental (Harsh), Rev 3, October 26, 1987

SUBAPPENDIX A6

MAINTENANCE AND SURVEILLANCE
(IRR DAP-E-EIC-503)

1.0 Definition of Issuc

The issue was that a lack of documented evidence existed to show that maintenance requirements pertaining to environmental qualification were included in the environmental qualification program and that inadequate bases existed for the establishment of maintenance intervals (i.e.,intervals were not tied to a calendar date).

2.0 Issue Resolution

This issue was resolved in conjunction with the development of the Environmental Equipment Qualification Summary Packages (EEQSPs) and the Equipment Qualification Data Packages (EQDPs). These packages identify and describe the maintenance requirements, and tie maintenance intervals to calendar dates. This process identifies the requirements necessary to assure that the equipment will be maintained in a qualified condition throughout the life of the plant.

3.0 Corrective and Preventive Action

- No additional issues were identified during the review and resolution of this issue

- This issue was determined not to be reportable under the provisions of 10CFR50.55(e).

3.1 Corrective Action

Impell identified and described in the Environmental Equipment Qualification Summary Packages (EEQSPs) and in the Equipment Qualification Data Packages (EQDPs) the maintenance requirements and intervals required to assure that the equipment will be maintained in a qualified condition throughout the life of the plant.

3.2 Preventive Action

Impell developed a design control procedure (Reference 4.1) which require the identification and documentation of environmental qualification maintenance related requirements.

4.0 References

4.1 Impell Procedure IMT-EQ-05-4," Preparation of Equipment Qualification Summary Packages", Rev 2

SUBAPPENDIX A7

FLEXIBLE CONDUIT AND CABLE SLACK (ISAP VII.c.1 AND ISAP VII.c.3)

1.0 Definition of Issue

The issue was that the design documents specified a minimum amount of slack for cable transitions and for certain configurations of flexible conduit. However, many situations existed for as-installed cable or flexible conduit where the amount of slack was indeterminate. Furthermore, in cases where slack could be measured, instances were found where the as-installed slack was less than the design specified slack.

2.0 Issue Resolution

A program was implemented to evaluate the adequacy of the as-installed cable and flexible conduit. This program consisted of first performing a walkdown to determine the as-installed configuration of safety-related cable and flexible conduit. Next, acceptance criteria to assure that functional operability of the cable (including cable in flexible conduit) is maintained, were developed for cable and flexible conduit based on vendor data. Finally, evaluations of the as-installed configurations were performed with respect to the acceptance criteria.

The cable slack evaluation (Reference 4.1) determined that the two inch design requirement for cable slack was unnecessary. As a result, the electrical installation specification (Reference 4.3) was revised to eliminate the two inch slack requirement.

The flexible conduit evaluation (Reference 4.2) determined that the as-installed configuration for flexible conduit meets the acceptance criteria which assures functional operability.

3.0 Corrective and Preventive Action

- No additional issues were identified during the review and resolution of this issue.
- This issue was determined not to be reportable under the provisions of 10CFR50.55(e).

3.1 Corrective Action

The corrective action implemented was to delete the two inch slack requirement from the electrical installation specification (Reference 4.3). No rework of cable was necessary.

No corrective action was required for flexible conduit. The present design requirement is adequate and the as-installed flexible conduit was determined to be acceptable.

3.2 Preventive Action

The two inch requirement for cable slack was deleted from the electrical installation specification (Reference 4.3). The revised construction procedure (Reference 4.4) and Quality Control (QC) inspection procedures (References 4.5 and 4.6) were reviewed to assure that they were consistent with the electrical installation specification (Reference 4.3).

4.0 References

4.1 "Project Report, Cable Slack Evaluation for Comanche Peak Steam Electric Station", Impell Report No. 09-0210-78, Rev 0, May 10, 1987

4.2 "Project Report, Flexible Conduit Slack Evaluation for Comanche Peak Steam Electric Station", Impell Report No. 09-0210-104. Rev 0, October 23, 1987

4.3 CPSES Installation Specification, 2323-ES-100, Electrical Installation Specification

4.4 CPSES Construction Procedure, 35-1195-EEI-7, Cable Pulling

4.5 CPSES Quality Control Inspection Procedure, QI-QP-11.3-26, Electrical Cable Installation Inspection

4.6 CPSES Quality Control Inspection Procedure, QI-QP-11.3-28, Class 1E Cable Terminations

APPENDIX B

ISSUES IDENTIFIED DURING THE PERFORMANCE OF THE CORRECTIVE ACTION PROGRAM (CAP)

This appendix describes the details of the resolution of issues identified during the performance of the equipment qualification portion of the Corrective Action Program (CAP) that have been determined to be reportable under the provisions of 10CFR50.55(e). Included in this appendix are equipment qualification related Significant Deficiency Analysis Reports (SDARs) initiated by TU Electric. Specific references to the criteria, procedures, engineering evaluations, and design changes which have resolved the issue are provided.

To report the resolution of issues identified during the performance of the Corrective Action Program (CAP), an individual subappendix was developed for each issue. Each subappendix includes: a definition of the issue; issue resolution; and corrective and preventive actions.

The preventive action is embodied in the procedures and Design Basis Documents (DBDs) developed and used in the equipment qualification portion of the Corrective Action Program (CAP). These procedures and Design Basis Documents (DBDs) resolve the equipment qualification Corrective Action Program (CAP) issues. Implementation of these preventive actions can assure that the design and hardware for CPSES Unit 1 and Common will continue to comply with the licensing commitments throughout the life of the plant as described in Section 5.4.

Impell has reviewed the Safety Evaluation Report (SER) and its Supplements (SSERs) and determined that the equipment qualification design criteria, design procedures, and equipment qualification validated hardware design are consistent with the Nuclear Regulatory Commission (NRC) staff positions stated in the SER and its Supplements (SSERs).

The Corrective Action Program (CAP) issues contained in Appendix B are listed below:

Issue No.	Issue Title
B1	SDAR CP-87-121, 6.9 kV/480 V Transformer Bus Bar Clearance and Jumper Cable Slack
B2	SDAR CP-87-132, Limitorque Actuators
B3	SDAR CP-87-122, Fan Coil Unit Nozzle Load Evaluation

B4	SDAR CP-87-122, Heat Exchanger Support Structure and Mid-Lug Modification
B5	SDAR CP-87-122, Lube Oil Inlet Pressure Strainer Clip Angle Modification
B6	SDAR CP-87-122, Hydrogen Purge Exhaust Filter Flange Modification
B7	SDAR CP-87-139, Weidmuller Terminal Blocks

SUBAPPENDIX B1

SDAR CP-87-121, 6.9 kV/480V TRANSFORMER BUS BAR CLEARANCE AND JUMPER CABLE SLACK

1.0 Definition of the Issue

The issues were that:

1.1 Insufficient clearance existed between the 480 V bus bars and the 6.9 kV/480 V transformer cabinets to accommodate displacements as a result of a seismic event.

1.2 Insufficient slack existed in the 6.9 kV jumper cable between the transformer and the transformer cabinet to accommodate displacements as a result of a seismic event.

2.0 Issue Resolution

The transformer vendor has been directed to perform the required analyses to demonstrate seismic qualification of the transformers, and to provide the completed seismic qualification documentation to TU Electric.

3.0 Corrective and Preventive Action

- No additional issues were identified during the review and resolution of the issues.

- These issues were determined to be reportable under the provisions of 10CFR50.55(e). They were reported as Significant Deficiency Analysis Report (SDAR) CP-87-121, in letter number TXX-88025, dated January 6, 1988 from TU Electric to the NRC.

3.1 Corrective Action

The transformer vendor has been directed to perform the required analyses to demonstrate seismic qualification of the transformers, and to provide the completed seismic qualification documentation to TU Electric.

3.2 Preventive Action

The equipment vendor has been notified of these issues. Design procedures (References 4.1 and 4.2) were developed to assure that equipment is qualified in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.3).

4.0 References

4.1 Impell Procedure IMT-EQ-04-2, "Seismic Qualification of Electrical Equipment", Rev 0, January 15, 1987

4.2 Impell Procedure IMT-EQ-04-5, "Preparation of Equipment Qualification Summary Packages - Seismic", Rev 3, June 30, 1987

4.3 Comanche Peak Steam Electric Station Design Basis Document, "Seismic Qualification of Equipment", DBD-ME-029, Rev 0, July 28, 1987

SUBAPPENDIX B2

SDAR-CP-87-132, LIMITORQUE ACTUATORS

1.0 Definition of the Issue

The issue was that terminal blocks and crimp splices used in Limitorque actuators were not environmentally qualified.

2.0 Issue Resolution

The issue was resolved by developing a design change to replace the unqualified terminal blocks and crimp splices with qualified terminal blocks and crimp splices. This design change is being implemented.

3.0 Corrective and Prevention Action

- No additional issues were identified during the review and resolution of this issue.

- This issue was determined to be reportable under the provisions, of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-87-132, in letter number TXX-88027, dated January 5, 1988 from TU Electric to the NRC.

3.1 Corrective Action

A design change was developed to replace the unqualified terminal blocks and crimp splices with qualified terminal blocks and crimp splices.

3.2 Preventive Action

The equipment vendor has been notified of this issue. Design procedures (References 4.1 and 4.2) were developed to assure that equipment is qualified in accordance with the design criteria as specified in the Design Basis Documents (DBDs) (Reference 4.3). These design procedures assure that vendor supplied equipment is in conformance with procurement specifications.

4.0 References

4.1 Impell Procedure IMT-EQ-05-2, "Environmental Qualification of Electrical Equipment", Rev 3, October 26. 1987

4.2 Impell Procedure IMT-EQ-05-4, "Preparation of Equipment Qualification Summary Packages - (Environmental) [Harsh]", Rev 3, October 26, 1987

4.3 Comanche Peak Steam Electric Station Design Basis Document, "Environmental Qualification of Safety-Related Electrical Equipment", DBD-EE-030, Rev 0 July 27, 1987

SUBAPPENDIX B3

SDAR CP-87-122, FAN COIL UNIT NOZZLE LOAD EVALUATION

1.0 Definition of the Issue

The issue was that the current fan coil unit procurement specification provides interaction equations intended to evaluate the acceptability of the nozzle loads on the fan coil units. These equations do not include the effect of seismic inertia and thererfore the allowable coil nozzle loads are exceeded.

2.0 Issue Resolution

The issue was resolved by developing a design change to provide a flexible connection between the fan coil unit nozzle flange and the attached piping. This flexible connection accommodates any seismic inertia effects, thus assuring that the fan coil nozzle allowable loads are not exceeded. This design change is being implemented.

3.0 Corrective and Preventive Action

- No additional issues were identified during the review and resolution of this issue.

- This issue was determined to be reportable under the provisions of 10CFR50.55(e). It was reported as significant Deficiency Analysis Report (SDAR) CP-87-122, in letter number TXX-88026, dated January 5, 1988 from TU Electric to the NRC.

3.1 Corrective Action

A design change was developed to provide a flexible connection between the fan coil unit nozzle flanges and the attached piping to accommodate any seismic inertia effects.

3.2 Preventive Action

Design procedures (References 4.1 and 4.2) were developed to assure that equipment is qualified in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.3). In addition, the fan coil unit procurement specification has been revised to delete the interaction equations, and include the requirement for flexible connections to the attached piping.

4.0 Reference

4.1 Impell Procedure IMT-EQ-04-1, "Seismic Qualification of Mechanical Equipment", Rev 1, July 12, 1987

4.2 Impell Procedure IMT-EQ-04-5, "Preparation of Equipment Qualification Summary Packages - Seismic", Rev 3, June 30, 1987

4.3 Comanche Peak Steam Electric Station Design Basis Document, "Seismic Qualification of Equipment", DBD-ME-029, Rev 0, July 28, 1987

SUBAPPENDIX B4

SDAR CP-87-122, HEAT EXCHANGER SUPPORT STRUCTURE AND MID-LUG MODIFICATION

1.0 Definition of the Issue

The issue was that the original support configuration for the Containment Spray Heat Exchanger results in failure in the mid-lug and of the heat exchanger shell at the mid-lug during a seismic event.

2.0 Issue Resolution

This issue was resolved by developing a design change to modify the support structure at the top of the Containment Spray Heat Exchanger to provide adequate restraint (i.e., rigidity) in the horizontal direction and to modify the mid-lug connection to provide adequate support during a seismic event. This design change is being implemented.

3.0 Corrective and Preventive Action

- No additional issues were identified during the review and resolution of this issue.
- This issue was determined to be reportable under the provisions of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-87-122, in letter number TXX-88026, dated January 5, 1988 from TU Electric to the NRC.

3.1 Corrective Action

The top support structure of the Containment Spray Heat Exchanger is being modified to provide adequate restraint (i.e. rigidity) in the horizontal direction. The mid-lug connection is being modified to provide adequate support.

3.2 Preventive Action

Design procedures (References 4.1 and 4.2) were developed to assure that equipment is qualified in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.3).

4.0 References

4.1 Impell Procedure IMT-EQ-04-1, "Seismic Qualification of Mechanical Equipment", Rev 1, July 12, 1987

4.2 Impell Procedure IMT-EQ-04-5, "Preparation of Equipment Qualification Summary Packages - Seismic", Rev 3, June 30, 1987

4.3 Comanche Peak Steam Electric Station Design Basis Document, "Seismic Qualification of Equipment" DBD-ME-029, Rev 0, July 28, 1987

SUBAPPENDIX B5

SDAR CP-87-122, LUBE OIL INLET PRESSURE STRAINER CLIP ANGLE MODIFICATION

1.0 Definition of the Issue

The issue was that the original clip angles provided at the base of the lube oil inlet pressure strainer for the Diesel Generator lube oil system may fail due to nozzle loads under a seismic event.

2.0 Issue Resolution

The issue was resolved by developing a design change to add clip angles to reduce the stress level per clip angle and thus accommodate the nozzle loads during a seismic event. This design change is being implemented.

3.0 Corrective and Preventive Action

- No additional issues were identified during the review and resolution of this issue.

- This issue was determined to be reportable under the provisions, of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-87-122, in letter number TXX-88026, dated January 5, 1988 from TU Electric to the NRC.

3.1 Corrective Action

A design change was developed to add clip angles at the base of the lube oil inlet pressure strainer to reduce the stress level per clip angle and thus accommodate the nozzle loads during a seismic event.

3.2 Preventive Action

Design procedures (References 4.1 and 4.2) were developed to assure that equipment is qualified in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.3).

4.0 References

4.1 Impell Procedure IMT-EQ-04-1, "Seismic Qualification of Mechanical Equipment", Rev 1, July 1?, 1987

4.2 Impell Procedure IMT-EQ-04-5, "Preparation of Equipment Qualification Summary Packages - Seismic", Rev 3, June 30, 1987

4.3 Comanche Peak Steam Electric Station Design Basis Document, "Seismic Qualification of Equipment", DBD-ME-029, Rev 0, July 27, 1987

SUBAPPENDIX B6

SDAR CP-87-122, HYDROGEN PURGE EXHAUST FILTER FLANGE MODIFICATION

1.0 Definition of the Issue

The issue was that the Hydrogen Purge Exhaust Filter inlet nozzle flange and flange stiffner weld may fail as the result of the piping loads defined in the procurement specification.

2.0 Issue Resolution

The issue was resolved by developing a design change to modify the inlet piping to the Hydrogen Purge Exhaust Filter nozzle flange by adding a flexible connection between the inlet piping and the Hydrogen Purge Exhaust Filter inlet nozzle flange.

3.0 Corrective and Preventive Action

- No additional issues were identified during the review and resolution of this issue.

- This issue was determined to be reportable under the provisions, of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-87-122, in letter number TXX-88026, dated January 5, 1988 from TU Electric to the NRC.

3.1 Corrective Action

A design change was developed to modify the inlet piping to the Hydrogen Purge Exhaust Filter nozzle flange by adding a flexible connection between the inlet piping and the Hydrogen Purge Exhaust Filter inlet nozzle flange.

3.2 Preventive Action

Design procedures (References 4.1 and 4.2) were developed to assure that equipment is qualified in accordance with the design criteria as specified in the Design Basis Document (DBD) (Reference 4.3). These design procedures assure that vendor supplied equipment is in conformance with the procurement specifications.

4.0 References

4.1 Impell Procedure IMT-EQ-04-1, "Seismic Qualification of Mechanical Equipment", Rev 1, July 12, 1987

4.2 Impell Procedure IMT-EQ-04-5, "Preparation of Equipment Qualification Summary Packages - Seismic", Rev 3, June 30, 1987

4.3 Comanche Peak Steam Electric Station Design Basis Document, "Seismic Qualification of Equipment", DBD-ME-029, Rev 0, July 27, 1987

SUBAPPENDIX B-7

SDAR CP-87-139, WEIDMULLER TERMINAL BLOCKS

1.0 Definition of the Issue

The issue was that environmentally unqualified Weidmuller terminal blocks were used in instrumentation applications inside the Containment Building.

2.0 Issue Resolution

The issue was resolved by developing a design change to remove the unqualified Weidmuller terminal blocks and replace them with qualified splices.

3.0 Corrective and Preventive Action

- No additional issues were identified during the review and resolution of this issue.

- This issue was determined to be reportable under the provisions, of 10CFR50.55(e). It was reported as Significant Deficiency Analysis Report (SDAR) CP-87-139, in letter number TXX-88028, dated January 5, 1988 from TU Electric to the NRC.

3.1 Corrective Action

The Weidmuller terminal blocks inside the Containment Building used in instrumentation applications are being removed and replaced with qualified splices.

3.2 Preventive Action

Design procedures (References 4.1 and 4.2) were developed to assure that equipment is qualified in accordance with the design criteria as specified in the Design Basis Documents (DBDs) (References 4.3 and 4.4).

4.0 References

4.1 Impell Procedure IMT-EQ-05-2, "Environmental Qualification of Electrical Equipment", Rev 3, October 26, 1987

4.2 Impell Procedure IMT-EQ-05-4, "Preparation of Equipment Qualification Summary Packages - Environment [Harsh]", Rev 3, October 26, 1987

4.3 Comanche Peak Steam Electric Station Design Basis Document, "Environmental Qualification of Safety Related Electrical Equipment", DBD-EE-031, Rev 0, July 31, 1987

4.4 Comanche Peak Steam Electric Station Design Basis Document, "Postulated Environments for Equipment Qualification", DBD-ME-076, Rev 0, July 31, 1987