

JAN 3 1986

David Teras

MEMORANDUM FOR: Larry C. Shao, Manager, Engineering Group
Comanche Peak Project

Jose A. Calvo, Manager, System/Operational Group
Comanche Peak Project

FROM: David Teras, Piping & Pipe Supports Leader
Comanche Peak Project

SUBJECT: INPUT TO SER SUPPLEMENT RELATED TO COMANCHE PEAK CPRT
PROGRAM PLAN (REV. 3)

Reference: Memorandum from L. Shao/J. Calvo to E. Marinos, et al,
dated November 27, 1985.

Per the above-referenced memorandum, a draft safety evaluation report relating to the CPRT Program Plan in the piping and pipe support area has been completed and is being submitted for your review. This draft SER includes input from the Teledyne and ETEC consultants. The SER input for the piping and supports area covers several sections of the outline and includes the following sections:

- Appendix A - 2.0 (partial input)
- 3.0 (partial input)
- 4.5
- 4.6 (partial input)
- 5.3 (partial input)
- 5.5
- 6.0 (partial input)

Appendix B - 4.4 (partial input)

In addition, the list of outstanding and confirmatory items provided below should be included in Sections 4.0 and 5.0 of the main text.

The following items are considered outstanding and require satisfactory resolution in order to reach a final conclusion concerning the adequacy of the CPRT Program Plan in the piping and pipe supports area:

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Outstanding Issues

Appendix A

- 4.5.3 The staff requires a root cause/generic implication evaluation to be performed for all piping and pipe support hardware modifications.
- 4.5.3 The third-party to complete and provide checklists for the review of piping analysis implementation and support design implementation.
- 4.5.3 Lack of third-party procedures for the review of the SWEC construction/as-built effort.
- 4.6 The staff is awaiting the transmittal of the final Cygna report in order to assess the need for additional participation by Cygna.
- 5.3 The staff requires further information regarding the root cause of the errors found in active valves deviating from FSAR commitments and its significance with respect to the adequacy of the design process.
- 5.5.3 The staff is awaiting the submittal of SWEC Project Procedures CPPP-6 and CPPP-7 for reviewing the resolution of the special technical concerns.
- 5.5.3 Justification for excluding some Class 5 piping from reanalysis effort.
- 5.5.3 Justification for lack of interface between Gibbs & Hill and SWEC in the piping system design.
- 5.5.3 Small bore piping requalification to addressed in SWEC Project Procedure CPPP-15 and submitted for staff review.
- 5.5.3 Justification for excluding some Class 5 pipe supports from reevaluation effort.
- 5.5.3 The staff is awaiting submittals by the applicant regarding procedures and design criteria for pipe stress and pipe support design.
- 5.5.3 The applicant to justify the as-built tolerances used by SWEC in the CPPP-5 as-built walkdown.
- 5.5.3 The applicant to expand the scope of the stress reconciliation walkdown to reconcile the concerns found in CPPP-8.

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- 5.5.3 The staff requires further information concerning the adequacy of the piping penetrations and its design consideration in pipe stress reanalysis.
- 5.5.3 The applicant to justify the differences in tolerances used by the QA/QC Construction Adequacy Program and the SWEC as-built walkdowns.
- 5.5.3 The applicant to provide an evaluation addressing the integration of the various as-built walkdowns and reinspections and their significance on the conclusions regarding the overall plant as-built condition.
- 6.3 ASME Class 1 auxiliary branch lines to be included in the DAP self-initiated scope of review.

The following items are considered to be confirmatory and require verification during the implementation of the Program Plan:

Confirmatory Issues

Appendix A

- 4.5.3 and The staff will continue to monitor the status of external source issues identified in the issue tracking system by 4.6 TERA.
- 4.5.3 The third-party to review Project/SWEC documentation for compliance with ASME Section III, paragraph NA-1140 concerning the use of later Code editions and Code Cases.
- 4.5.3 The third-party to include a portion of the auxiliary feedwater piping system in their review of the SWEC piping reanalysis effort.

s/D. Terao
 David Terao
 Comanche Peak Project

- cc: E. Marinos
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5. Self-Initiated Evaluation

5.5 Piping and Supports Design Activities

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5.5.1 Introduction

A number of external source issues have been raised in the area of piping analysis and pipe support design. These external source issues have resulted from several sources; the primary sources being the Cygna Independent Assessment Program, the ASLB hearings, and the NRC staff reviews. As a result, the applicant has initiated a special piping and pipe support requalification program which will result in a significant level of reanalysis and reevaluation of the CPSES piping and pipe support designs. Stone & Webster Engineering Corporation (SWEC) has been contracted by the applicant to perform this requalification program. In addition, a third-party overview of this effort is being conducted by TERA Corporation (TERA) to provide assurance that the objectives of the Design Adequacy Program in the piping and pipe support area are being achieved. The CPRT Program Plan describes the piping and pipe support program and overview in DSAP IX.

In this section of the SER, we will discuss the staff review and evaluation of the SWEC piping and pipe support requalification program. The staff review and evaluation of the TERA effort is provided in Appendix B, Section 4.5 of this SER.

The staff has reviewed the CPRT Program Plan DSAP IX Attachment 2 and Appendix F Section II.F which describe the SWEC piping and support effort and the SWEC interface with other organizations, respectively. In addition, the staff has performed several audits at the SWEC offices and at the CPSES site to further understand the depth and breadth of the effort. Our review focussed on the adequacy of the scope and the completeness of action plan details in addressing the technical concerns associated with piping and pipe support design which have been raised in external sources as well as in self-initiated reviews.

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5.5.2 CPRT Approach**DRAFT**

The scope of the SWEC program for the requalification of piping and pipe supports include:

- 100% of all ASME Code Class 2 and 3 piping larger than 2 inches (large bore) excluding portions within the boundary of Westinghouse Class 1 auxiliary branch line stress problems,
- 100% of all ASME Code Class 1, 2, and 3 large bore pipe supports,
- small bore piping and pipe supports on a sampling basis,
- all Class 5 piping and pipe supports within ASME Code Class 2 and 3 stress analysis problem boundary, and
- all Class 5 supports within the ASME Code Class 1 stress problems.

The CPRT Program Plan in DSAP IX Attachment 2 describes the outline of the SWEC Action Plan. The SWEC Action Plan consists of the following six elements:

1) Development of Comanche Peak Pipe Stress and Pipe Support Design Criteria

The Design criteria and procedures to be used for the pipe stress and support requalification effort by SWEC will be included in procedures listed below:

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<u>Procedure</u>	<u>Title</u>	<u>Issue Date</u>
CPPP-1	Management Plan for Project Quality, Rev. 2	12/02/85
CPPP-2	Project Organization Charts, Rev. 0	12/02/85
CPPP-3	Document Control Procedure, Rev. 2	11/25/85
CPPP-4	Project Records Management Procedure, Rev. 1	11/25/85
CPPP-5	Field Walk Procedure, Rev. 1	10/18/85
CPPP-6	Pipe Stress/Support Requalification Procedure - Unit No. 1, Rev. 1	10/31/85
CPPP-7	Design Criteria for Pipe Stress and Pipe Supports, Rev. 1	11/04/85
CPPP-8	Support System Verification Walkdown Procedure, Rev. 0	10/28/85
CPPP-9	Pipe Stress/Support As-Built Procedure - Unit No. 2, Rev. 1	11/01/85
CPPP-10	Power Division Procedure for Documented Review of Plant Operating Mode Conditions, Rev. 0	10/31/85
CPPP-11	Administrative Control of Calculations, Rev. 0	11/27/85
CPPP-12	Cost and Schedule Control Procedure, Rev. 0	10/11/85
CPPP-13	Site Construction Support Activities, Rev. 0	10/11/85
CPPP-14	Procedure for the Preparation and Control of Project Procedures, Rev. 1	11/05/85
CPPP-15	Small Bore Stress/Support Requalification Procedure	
PM's	Project Memoranda	
PM-001	Pipe Support Computer Program Usage	11/01/85
PM-002	Design Criteria for Pipe Stress and Pipe Supports	11/04/85
PM-003	Design Information Request Procedure	11/18/85
PM-004	Embedment Plate Evaluation	12/02/85
PM-005	Valve Modeling	12/03/85
PM-006	Use of Code Case N-411 for CPSES Stress Requalification	12/13/85

The major details, however, are contained in procedure CPPP-5, CPPP-6, CPPP-7 and CPPP-8.

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They will be issued to the NRC staff for review. At this time none have been released. These procedures will reflect all CPSES FSAR commitments and the ASME Section III Code of Record (with NRC approval changes). In the process of the requalification effort, it is expected some changes to this FSAR and ASME Section III Code of Record will be requested by TUGCO. These changes (some previously approved by the NRC for use on previous SWEC-designed plants) might include permission to use the following documents:

NUREG=0484
Code Case N-392
Code Case N-411
Code Case N-413

In addition, Procedures CPPP-6 and -7 will include any specific methods required for the proper treatment of all external source issues which are not covered by the standard SWEC procedures and which are unique to the CPSES plant. At this time, Procedures CPPP-6 and -7 do not include all of the methods required for the resolutions of these issues.

When all work is completed, revisions to these procedures will be incorporated. It is not intended that all of the backup detail or supporting SWEC calculations will be included in the procedures. This detail will be available for review at the SWEC offices.

TUGCO has requested (W.G. Council letter dated 11/18/85 to V. Noonan) approval for the use of Code Case N-411 from the NRC. This request is presently under consideration at the NRC.

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2) Verification of As-Built Information

Since the as-built data will be used as input for the SWEC requalification effort, it is important to develop confidence in its accuracy.

The process being used to develop this confidence involves walkdowns performed by SWEC, a reliance of previous work by TUGCO, and other work by the CPRT.

The walkdowns by SWEC include:

- a) CPPP-5 Field Walkdown
- b) CPPP-8 Walkdown
- c) SWEC "Stress Reconciliation Walkdown"

Previous work by TUGCO includes their 1) "General Program for As-Built Piping Verification" and 2) "Penetration Schedule".

The activities by CPRT to be considered here include the QA/QC Construction Adequacy Walkdown, specifically those for samples related to piping and supports.

CPPP-5 Walkdown - the purpose of this walkdown by SWEC was to establish confidence in the adequacy of dimensions and functions shown on the as-built drawing to support the initiation of the piping analysis effort. This walkdown is described in SWEC procedure CPPP-5 and the results will be

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published in a walkdown report. The walkdown was performed at the site during the weeks of . The walkdown consisted of the field verification of random samples of four attributes selected by SWEC. The attributes selected included valve location, pipe support location, pipe support function and support orientation. The procedure and the walkdown report are expected to be issued on _____. Preliminary results indicated the need for a 100% walkdown of the support and valve orientation attribute. This 100% attribute walkdown has now been completed by TUGCO.

CPPP-8 Walkdown - This is a Piping and Support System Engineering Walkdown. The objectives of the walkdown are:

- (1) To determine whether there are technical configuration issues, other than existing technical findings from previous reviews, that should be evaluated relative to the functional behavior of the system,
and
- (2) for experienced SWEC personnel to become familiar with the physical aspects of the design and determine whether additional, or refinements of, design inputs, guidelines, or procedures are necessary for the pipe stress and supports requalification effort.

The walkdown was performed on a total of 70 stress problems out of the approximately 360 which are within the scope of the SWEC requalification effort.

The walkdown was performed by teams of SWEC pipe stress analysts and pipe support designs during the

weeks of _____. The data is presently being evaluated and additional verification walkdowns will be performed at the site as needed. The final report for this effort is expected to be issued in late January, 1986.

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SWEC Stress Reconciliation Walkdown - This, as in other nuclear plants, will be performed by pipe stress analysts with the completed piping stress analyses. The item of most concern here (with respect to as-built information) is gaps and interferences.

TUGCO General Program for As-Built Piping Verification - These represent the walkdowns performed by TUGCO to satisfy the general intent of NRC IE Bulletin 79-14. The TUGCO procedures used included CP-QP-11.3, Rev. 6, QI-QP-11.13-1, Rev. 8, CP-EI-4.5-1, Rev. 9 and TNE-DC-24-1, Rev. 0.

Penetration Schedule - The penetration schedule is a detailed computer listing describing all of the penetrations in the plant. The schedule lists the type of sealant, type of penetration, openings and a number of other parameters. The stress analyst can obtain all required info relative to clearances etc. at penetrations having this available.

QA/QC Construction Adequacy Walkdowns - The piping configuration and pipe supports sample walkdowns (See Appendix B, Paragraphs 5.3.3 and 5.4.4 of this report) along with all of the above will also provide verification of the as-built information (See CPPP-8, Rev. 0, Paragraph 1.0).

3. Review and Verification of Systems Design Input, Seismic Acceleration and Fluid Transients

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SWEC will review all drawings and specifications for systems within this scope. The specifications will be reviewed to assure compliance with licensing commitments and that all operating modes and conditions are identified appropriately. Existing fluid transient loads will be reviewed and new loadings generated, if required. SWEC Procedure CPPP-10 describing the operating conditions for the plant has been prepared and includes some of the above data.

A third party review of this activity will also be performed. A procedure review will be performed to verify that the SWEC procedures are adequate to perform their intended purpose. This procedure review will focus on, among other things, the definition and verification of design input.

4. Verification of Existing Pipe Support Design Documents

The CPRT Program Plan in DSAP IX Attachment 2 states that the existing pipe support calculations will be reviewed to determine their technical adequacy. SWEC originally intended to review existing large bore support calculations on a sampling basis to determine their acceptability by using a load comparison method. However, in the November 22, 1985 letter, the approach changed to evaluating all large bore pipe supports individually. SWEC Project Procedures CPPP-6 and CPPP-7 describe the approach to be used, the design criteria to be satisfied, and the extent of the review required for the pipe support requalification effort. Thus, this Action Plan

element has been incorporated into Action Plan Element #1.

5. Resolution of Special Technical Concerns

(By Dave Terao)

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6. Reanalysis of Piping Systems and Reevaluation of Pipe Support Designs

(By Dave Terao)

5.5.3 Staff Evaluation

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1) Development of Comanche Peak Pipe Stress and Pipe Support Design Criteria

Due to the fact that the major details of the SWEC requalification effort are contained in the SWEC project procedures CPPP-5, CPPP-6, CPPP-7, and CPPP-8 and since these have not yet been made available to the staff for thorough review, the task of evaluation has been and continues to be very difficult. The primary method of evaluation has been through audits which have been performed both at the SWEC offices and at the CPSES site. During these audits, draft copies of the procedures were available for review.

This item is an open item. The staff will consider this further in a supplement to this SER.

2) Verification of As-Built Information

During staff audits at the SWEC offices and at the CPSES site, CPPP-5, the CPPP-5 walkdown report, CPPP-8, the TUGCO as-built procedures, the penetration schedule and the QA/QC piping and pipe supports samples were discussed and partially reviewed. In addition, the staff and its consultants performed verification of the -5 and -8 walkdowns.

The following questions and/or comments remain as open items:

- a) For the CPPP-5 walkdown - the valve and support location tolerances used by SWEC range from +/- 3" to +/- 12" depending on the dimension used on the drawing. Typically, a tolerance for such a dimension is a function of the diameter of the piping system. In this case, there is no relationship. Using this CPPP-5 approach, a valve or support could be mislocated more on a 3" line

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than on a 30" line and is within the acceptability limits established in CPPP-5. This does not make sense from a pipe stress point of view. The 12" tolerance should be justified by SWEC for small diameter piping as a minimum.

- b) For the CPPP-8 walkdown, until the final walkdown report is issued, the evaluation of this task cannot be completed. However, a preliminary review of a portion of the data indicates several discrepancies with snubber/strut installations such as improper alignment and interferences with the rear bracket. It was also noted that there were improper clearances between the pipe and support member at some locations.
- c) SWEC Stress Reconciliation Walkdown Procedure CPPP-6 indicates that a final field walkdown will be performed at the completion of the requalification effort. The purpose of this walkdown is to verify that sufficient clearance exists between the piping systems and nearby structures. Based on the preliminary conclusions from the CPPP-8 walkdown data, the scope of the stress reconciliation walkdown should be expanded to reconcile concerns such as are noted above in b.
- d) TUGCO Penetration Schedule - During an audit at the CPSES site, the content of this schedule was discussed with TUGCO employees. It appears that the information required by the pipe stress analysis is available in this schedule. The apparent lack of reference of this penetration schedule, however, in the SWEC Procedure CPPP-7, is of concern to the staff. In addition, the staff plans a walkdown to verify the accuracy of the data in the penetration schedule in the near future. Due to the above, the staff considers this to be an open item and will consider it in a supplement to this SER.

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- e) QA/QC Construction Adequacy Walkdown - During audits at the site, it was determined that there is a difference of tolerances used within this walkdown versus those used by SWEC in the CPPP-5 walkdown. In addition, it is not clear to the staff that the tolerances used here for gaps (e.g., on box frame supports) would be acceptable for the SWEC pipe stress requalification effort. It is recommended that all tolerances here be reviewed by SWEC and their acceptance documented. Until this is available for review by the staff, this remains an open item and the staff will consider it in a supplement to this SER.

Since, as described above, the total verification of the as-built drawings is a function of a compilation of a number of walkdowns and work by at least three organizations, it is recommended that one document be prepared to compile and integrate all of this information. Without such a document, it is not clear to the staff if all of this information is compatible and it is not clear that it will lead to the proper conclusions.

In addition, since the need for the 100% walkdown of valve and strut orientation came about in CPPP-5 as a result of the failure of one of the four attributes chosen by SWEC, and since this failure effects any conclusion relative to the accuracy of the as-built data, it is recommended that a statement regarding this failure and its effect on the accuracy of the as-built data be included in this document. The comparison of the 100% TUGCO re-walkdown with the existing as-built data would be helpful in reaching a conclusion.

Until all of the documents noted above are available for thorough review by the staff, all of the concerns noted above are satisfactorily resolved, the verification of as-built data remains as an open item.

5.5.4

(This will be very brief and presented in general terms with reference to the detail provided in 5.5.3.)

These words have been written by Dave Terao.

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Paragraph 6 - Exclusion of Vendors and Other Organization Activities

(Note: This paragraph deals only with the piping and should be incorporated into a more comprehensive section of this topic).

The Class 1 piping is not within the SWEC scope but is the responsibility of Westinghouse. The loads from the SWEC analysis of the Class 2 and 3 piping imposed on the Class 1 piping as well as the requalification results of Class 1 supports (including pipe support stiffness) will be transmitted to Westinghouse. These interfaces are described in procedure CPPP-6 and are considered to be satisfactory by the staff.

Appendix A

Staff Evaluation of the CPRT Design Adequacy

2. CPRT Process for Evaluation

In the piping and supports discipline, the CPRT Program Plan in DSAP IX Attachment 2 describes a piping and pipe support requalification program to be performed by Stone & Webster Engineering Corporation (SWEC). The CPRT Program Plan states that the SWEC effort will be overviewed by TUGCO Project assisted by R. L. Cloud Associates (RLCA), Gibbs & Hill, and CPRT.

The SWEC requalification effort is under the direction of the applicant (TUGCO Project). The TUGCO Project is responsible for reviewing the technical and administrative aspects of SWEC's work in the typical client/contractor interface. RLCA is a consultant to TUGCO Project and assists in technical reviews of procedures and issue resolutions.

Gibbs & Hill has no overview responsibility of the SWEC effort although they are responsible for providing design input to SWEC and reviewing the results of SWEC's effort for potential impact on design activities under their responsibility.

The CPRT third-party (TERA Corporation) have full responsibility for the overview of the TUGCO Project and SWEC actions related to piping and pipe supports. Furthermore, the CPRT third-party is responsible for the identification, review, and tracking of all technical issues and for the verification of the adequacy of design criteria and standards used for the piping and support requalification program. The CPRT has formed a multi-discipline Design Adequacy Review Team (DART) to perform this design review.

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Appendix A

Staff Evaluation of the CPRT Design Adequacy

3. Staff Review and Evaluation Approach

The NRC staff review of the CPRT Design Adequacy Program in the piping and support area involves a multi-organization review. The design activities associated with the SWEC piping and pipe support requalification program are being reviewed by the NRC Office of Nuclear Reactor Regulation (NRR). A special NRC Comanche Peak Project Task Force has been established to perform this staff review. The NRR Comanche Peak Task Force is responsible for reviewing and evaluating the TUGCO and SWEC actions associated with the piping and pipe support requalification program as described in DSAP IX Attachment 2. NRR audits will be performed periodically to review the adequacy of the breadth and depth of the program and to verify proper implementation of the program.

The third-party overview activities associated with the CPRT (DART) effort are being reviewed by the NRC Office of Inspection & Enforcement (IE). This DAP Evaluation Team is responsible for inspecting the third-party reviews conducted by TERA in accordance with DSAP's VIII through XI of the CPRT Program Plan. (The scope of the DAP will be reviewed and approved by NRR with input from IE.) IE inspections will be phased to cover the various phases of TERA's work (e.g., checklist development, DSAP implementation, final report preparation, and corrective action implementation.) IE inspection reports will be issued and used as a basis for developing safety evaluation reports on the Design Adequacy Program.

Appendix A4. External Source Issues4.5 Piping and Supports Issues4.5.1 Introduction

A number of external source issues have been raised in the area of piping analysis and pipe support design. These external source issues have resulted from several sources; the primary sources being the Cygna Independent Assessment Program (Phases 1-4), the ASLB hearings and related filings, and the NRC staff reviews. As a result, the CPRT initiated a special piping and pipe support requalification program under the direction of TUGCO projects which has resulted in a significant level of reanalysis and reevaluation of the CPSES piping and pipe support designs. Stone & Webster Engineering Corporation (SWEC) has been retained by the applicant to perform this requalification program. In addition, a third-party overview of this effort is being conducted by TERA Corporation (TERA) to provide assurance that the objectives of the Design Adequacy Program in the piping and pipe support area are being achieved. The discipline specific action plan (DSAP) for the piping and pipe support requalification and overview program is described in the CPRT Program Plan in Item Number IX.

In this section of the SER, we will discuss the staff review and evaluation of the TERA overview effort. The staff review and evaluation of the SWEC piping and pipe support requalification program is provided in Appendix A, Section 5.5 of this SER.

The staff has reviewed the CPRT Program Plan DSAP IX and the applicable portion of Appendices E and F pertaining to piping and pipe support issues. In addition, the staff has performed several audits at the TERA offices to further understand the scope of the TERA effort. Our review focused on the adequacy of the scope and the completeness of the CPRT Program Plan details in addressing the technical concerns associated with piping and pipe support design which have been raised by external sources and self-initiated reviews.

4.5.2 CPRT Approach

The scope of the TERA third-party review is described in the CPRT Program Plan DSAP IX and Appendices E and F and consists of three major activities:

- (1) identification, review, and tracking of all external source and self-initiated issues;
- (2) verification that all design criteria and applicable standards are addressed in project procedures; and,
- (3) overview of SWEC piping and pipe support requalification program.

1. Identification Review, and Tracking of Issues

The CPRT Program Plan describes the third-party area of review related to the identification, review, and tracking of external source and self-initiated issues. The process includes not only issues related to the piping and pipe support discipline but also issues related to mechanical systems and components, electrical and instrumentation/control, and civil/structural disciplines.

In identifying the external source issues, the third-party is reviewing related documents such as the Cygna Independent Assessment Program (Phases 1-4), including related meeting transcripts, the ASLB hearing transcripts and related filings, the NRC staff reviews including inspections performed by Region IV, the Special Inspection Team (SIT), the Construction Appraisal Team (CAT), the Special Review Team (SRT), and the Technical Review Team (TRT), and the INPO Self-Initiated Evaluation.

The third-party is reviewing each identified issue and determines its significance with respect to the requalification program. Upon resolution of the issue by the responsible organization, the third-party reviews and evaluates the resolution and performs an investigation of root cause and generic implication.

The issues and their status are tracked by the third-party on a computer system that tracks the applicable activity for each issue

(2) Verification of Criteria and Standards

The third-party has verified that the commitments used to establish the piping and support design criteria and standards are adequately addressed in procedures and project documents. The commitments include satisfying FSAR, design specifications, and ASME Code requirements. For each criteria source and standard identified, the affected scope within the piping analysis/support design requalification program was delineated. The criteria was used in the development of checklists for the review of specific program areas.

(3) Overview of SWEC Requalification Effort

The third-party overview of the SWEC piping and supports requalification program consists of three major activities.

First, the third-party will be involved in a review of the SWEC project procedures to be used for the performance of the six major activities described in Section 5.5.2 of this SER. The third-party will verify that the procedures are adequate to achieve their intended purpose.

Second, the third-party will be involved in a review of selected piping analysis and support designs performed by SWEC. The third-party review will use written procedures and checklists to assure compliance with established requirements.

Third, the third-party will review the SWEC activities associated with the verification of as-built information to be used in the piping and supports requalification program.

4.5.3 Staff Evaluation

1. Identification, Review, and Tracking of Issues

The staff has reviewed and evaluated the third-party involvement in the identification, review, and tracking of issues. The CPRT stated in their November 22, 1985 letter that the third-party will provide reasonable assurance that all identified issues are resolved by reviewing SWEC procedures and selected implementation documentation in conjunction with identification, review, and tracking of all issues until closure. SWEC procedures and implementing work will be reviewed to checklists which explicitly identify the issues in order to assure that they are adequately addressed. For yet unidentified issues, the third-party will review scope and depth of the SWEC piping and supports requalification effort to ensure their comprehensiveness. The third-party role in the resolution of newly identified issues is to document the issues, track them, identify them to SWEC, review SWEC's proposed resolution, review SWEC's implementation, and ensure that they are resolved.

Based on our review of the scope of the third-party issues, the staff finds an adequate process exists to identify all external source issues. The issues as they are identified are logged into a computer and their status is tracked based on a periodic updating of the issue evaluation. The identification of external and internal issues is an on-going process. Based on the scope of the external source issues including all issues identified by Cygna, the ASLB, the intervenor, and the NRC staff irrespective of their previous disposition, the staff concludes that the scope is all-encompassing and, thus, acceptable. The staff will continue to monitor the issue tracking system to assure all external source issues are identified. The staff considers this to be a confirmatory issue and will report our findings in a supplement to the SER.

The staff reviewed the extent to which root cause and generic implication evaluations will be performed. Root cause and generic implication evaluations will be performed on:

- (a) external source issues,
- (b) TERA - identified discrepancies in SWEC interfaces
- (c) TERA - identified discrepancies in the SWEC overview, and
- (d) SWEC - identified discrepancies from yet unidentified issues.

Based on our review, it was not evident that a process existed for identifying discrepancies (or deviations) in external source issues by SWEC. The SWEC requalification effort will assure that ASME Code requirements will ultimately be satisfied for all piping and supports although it is recognized that modifications can be made to existing hardware. It is not clear to the staff that a root cause and generic implication evaluation can be adequately performed for external source issues without input from SWEC regarding the impact of such issues on hardware design. Although the staff recognizes that not all hardware modifications will be attributed to discrepancies or deviations, the staff requires that a root cause and generic implication evaluation be performed for all hardware modifications in order to document the reasons for such modifications. The staff considers this to be an open issue and will report our findings in a supplement to the SER.

2. Verification of Criteria and Standards

The staff reviewed the procedure used by TERA for the design criteria and standards verification. The staff finds a sufficient process exists to assure that all relevant design criteria and standards are addressed in design procedures. The TERA process involved a review of FSAR commitments, design specifications, ASME Code requirements, and other industry standards (e.g., ANSI, AISC, and MSS) in accordance with design adequacy procedure DAP-1.

In conjunction with a staff audit of the TERA scope, the staff raised a concern regarding the TERA acceptance of certain design criteria. The staff found that several design criteria are based on paragraphs from an edition of the ASME Code later than the edition stated in the FSAR. Recently, the staff stipulated certain requirements for the use of later

Code editions and new ASME Code Cases (e.g., Code Case N-411). The staff discussed with TERA the basis to be used for the acceptance of portions of later Code editions. TERA responded by committing to review Project/SWEC documentation for compliance with ASME Section III paragraph NA-1140 for the Code edition of record. Because the FSAR states that conditionally approved Code Cases will show justification for their use in the design specification or the Brown & Root QA Manual, the commitment by TERA to review the applicable documents for compliance with NA-1140 is appropriate. Thus, the staff finds the scope of review for the design criteria to be acceptable contingent upon a satisfactory finding by TERA in its implementing review of the project documents. The staff considers this to be a confirmatory issue and will report our findings in a supplement to the SER.

3. Overview of SWEC Requalification Effort

The staff reviewed the checklists to be used by TERA in their overview of the SWEC piping and pipe support requalification effort. The staff found the development of only one out of three checklists have been completed to date. The completed checklist pertained to the review of SWEC procedures. The checklists to be used for the review of piping analysis implementation and support design implementation were not available for staff review.

The staff review of the checklist for procedure review (Checklist Number DAP-CL-P-001, Revision 0, dated 10-25-85) found the checklist to be a sufficient method to assure that the design criteria (identified in accordance with DAP-1), external source issues (identified in the computer tracking system), and standard QA requirements (ANSI N45.2.11) are addressed in design procedures. However, unlike typical checklists (e.g., Cygna checklists) which are used to verify the adequacy and completeness of the design documents being reviewed, the procedure review checklist was found to be more of an inventory checklist which is used to assure that all design criteria, external source issues, and standard QA requirements are being addressed by at least one of several procedures. The procedure review checklist does not address the adequacy or completeness of the

procedures with respect to the engineering assumptions and design input to be used for analysis. The staff was informed that these items would be included in the checklists for the review of the implementation of piping analysis and pipe support design. Thus, the staff cannot reach any conclusion regarding the depth of the TERA review of the SWEC piping and support requalification effort without reviewing the applicable checklists. The staff considers this to be an open item and will report our findings in a supplement to the SER.

The staff review of the third-party overview of the SWEC construction/as-built review finds that no TERA procedures were available at the time of the staff audit. Thus, it is not clear to the staff what actions are being planned by TERA for their overview of the SWEC construction/as-built review. The staff considers this to be an open item and will report on this item further in a supplement to the SER.

The DAP scope of work under DSAP X, "Mechanical Systems and Components," and DSAP XI, "Electrical/I&C Systems and Components Discipline," will include a self-initiated review of the auxiliary feedwater (AFW) system. However, the scope of work did not include piping and pipe support design. The basis for excluding piping and pipe support design from the self-initiated review of the AFW system was that the SWEC reanalysis effort included all ASME Class 2 and 3 piping systems (including the AFW system). Furthermore, the basis included a TERA review of a selected sample of the SWEC piping stress analysis. Although the SWEC reanalysis of the AFW piping system will adequately address the concerns associated with the previous Gibbs & Hill analyses, the scope of the self-initiated review of the AFW system under DSAP X and DSAP XI does not fully address the adequacy of the implementation of the interface requirements between the mechanical systems and the SWEC piping reanalysis (e.g., design considerations for water-hammer evaluation). The staff noted that the TERA review of a sample of the SWEC piping reanalysis did not specifically include the AFW piping system. During the staff audit, TERA committed to include a portion of the AFW piping system in their selected sample of the

SWEC piping reanalysis review. Contingent upon the inclusion of a portion of the AFW piping and supports in the TERA scope of review, the staff finds that the scope of the TERA overview of the SWEC piping and supports requalification effort is acceptable. The staff considers this item to be confirmatory and will report their findings in a supplement to the SER.

4.5.4 Conclusions

Based upon the staff review of the CPRT Program Plan, the staff review of the CPRT response to staff questions provided in the November 22, 1985 letter, and staff audits performed to date, and contingent upon acceptable resolutions of the above open and confirmatory items, the staff concludes the following.

The scope and depth of the third-party (TERA) effort provides an adequate program for the resolution of the identified external source issues and for the identification and resolution of yet unidentified issues which would result from self-initiated reviews. The staff finds the CPRT Program Plan in DSAP IX and Appendices E and F provides reasonable assurance that all safety significant piping and pipe support deficiencies have been identified and resolved. However, proper implementation of the program must be conducted in order to conclude that the objective of the Plan has been achieved. The staff review and evaluation of the implementation of the program will be addressed in a supplement to the SER.

Appendix A

4. External Source Issues

4.6 Closed External Source Issues

In the piping and supports area, the third-party (TERA) is responsible for the identification, review, and tracking of all external source issues. The CPRT approach is described in Section 4.5.2 of this SER. The staff has audited the status of the issues resolutions at the offices of TERA Corporation on October 10, 1985 and December 10, 1985. The computer status report at that time indicated that there were no discrepancies, observation, nor deviations in the piping and supports discipline. The reason, however, was that all issues identified were considered open at the time. The staff will continue to monitor the status of the external issues and will report our findings on the resolution of the issues as they are completed. The staff considers this to be a confirmatory issue.

The staff review of the CPRT Program Plan external source issues noted that the issues raised by the Cygna Energy Services Independent Assessment Program (Phases 1 through 4) will be included in the DAP scope of work. It is the staff's understanding that the CPRT (DART) effort will specifically respond to and address each issue. However, at this time Cygna has not received the SWEC design criteria and procedures nor the TERA checklists which would indicate how resolution of the Cygna Issues will be incorporated into the piping and pipe support reanalysis effort. Furthermore, the staff is awaiting the transmittal of the final Cygna report in order to assess the need for additional participation by Cygna. The staff considers this to be an open issue.

Appendix A

5. Self-Initiated Evaluation

5.3 Mechanical Systems and Components Design Activities

The staff raised a concern regarding an issue pertaining to whether active valves were designed in accordance with FSAR commitments. Because the Plan intends to provide complete coverage of all areas with safety significance, the staff requires the consideration of the issue of active valves in the Plan's root cause/generic implication evaluation. The CPRT's response to the staff concern did not specifically address the issue of activity valves nor did it provide any commitment to evaluate the significance of the errors. The staff requires that the CPRT specifically review whether there exists any procedure to document deficiencies in specifications detected by vendors, whether there exists any documentation of or prompt follow-up of such deficiencies such as those identified with active valves, and why the system to control the quality of design documents did not detect that the specifications had deviated from FSAR commitments. The staff considers this to be an open item.

Appendix A

5. Self-Initiated Evaluation

5.5 Piping and Supports Design Activities

5.5.1 Introduction

A number of external source issues have been raised in the area of piping analysis and pipe support design. These external source issues have resulted from several sources; the primary sources being the Cygna Independent Assessment Program, the ASLB hearings, and the NRC staff reviews. As a result, the applicant has initiated a special piping and pipe support re-qualification program which will result in a significant level of reanalysis and reevaluation of the CPSES piping and pipe support designs. Stone & Webster Engineering Corporation (SWEC) has been contracted by the applicant to perform this requalification program. In addition, a third-party overview of this effort is being conducted by TERA Corporation (TERA) to provide assurance that the objectives of the Design Adequacy Program in the piping and pipe support area are being achieved. The CPRT Program Plan describes the piping and pipe support program and overview in DSAP IX.

In this section of the SER, we will discuss the staff review and evaluation of the SWEC piping and pipe support requalification program. The staff review and evaluation of the TERA effort is provided in Appendix A, Section 4.5 of this SER.

The staff has reviewed the CPRT Program Plan DSAP IX Attachment 2 and Appendix Section II.F which describe the SWEC piping and support effort and the SWF interfaces with other organizations, respectively. In addition, the staff performed several audits at the SWEC offices and at the CPSES site to further understand the depth and breadth of the effort. Our review focused on the adequacy of the scope and the completeness of action plan details in addressing the technical concerns associated with piping and pipe support design which have been raised in external sources as well as in self-initiated reviews.

5.5.2 CPRT Approach

The scope of the SWEC program for the requalification of piping and pipe supports includes:

- 100% of all ASME Code Class 2 and 3 piping larger than 2 inches (large bore), excluding portions within the boundary of Westinghouse Class auxiliary branch line stress problems,
- 100% of all ASME Code Class 1, 2, and 3 large bore pipe supports,
- small bore piping and pipe supports on a sampling basis,
- all Class 5 piping and pipe supports within ASME Code Class 2 and 3 stress analysis problem boundary, and
- all Class 5 supports within the ASME Code Class 1 stress problems.

The CPRT Program Plan in DSAP IX Attachment 2 describes the outline of the SWEC Action Plan. The SWEC Action Plan consists of the following six elements:

1. Development of Comanche Peak Pipe Stress and Pipe Support Design Criteria.
2. Verification of As-Built Information.
3. Review and Verification of System Design Input, Seismic Acceleration and Fluid Transients.
4. Verification of Existing Pipe Support Design Documents.
5. Resolution of Special Technical Concerns.
6. Reanalysis of Piping Systems and Reevaluation of Pipe Support Designs.

1. Development of Comanche Peak Pipe Stress and Pipe Support Design Criteria

The Design criteria and procedures to be used for the pipe stress and support requalification effort by SWEC will be included in procedures listed below:

<u>Procedure</u>	<u>Title</u>	<u>Issue Date</u>
CPPP-1	Management Plan for Project Quality, Rev. 2	12/02/85
CPPP-2	Project Organization Charts, Rev. 0	12/02/85
CPPP-3	Document Control Procedure, Rev. 2	11/25/85
CPPP-4	Project Records Management Procedure, Rev. 1	11/25/85
CPPP-5	Field Walk Procedure, Rev. 1	10/18/85
CPPP-6	Pipe Stress/Support Requalification Procedure - Unit No. 1, Rev. 1	10/31/85
CPPP-7	Design Criteria for Pipe Stress and Pipe Supports, Rev. 1	11/04/85
CPPP-8	Support System Verification Walkdown Procedure, Rev. 0	10/28/85
CPPP-9	Pipe Stress/Support As-Built Procedure - Unit No. 2, Rev. 1	11/01/85
CPPP-10	Power Division Procedure for Documented Review of Plant Operating Mode Conditions, Rev. 0	10/31/85
CPPP-11	Administrative Control of Calculations, Rev. 0	11/27/85
CPPP-12	Cost and Schedule Control Procedure, Rev. 0	10/11/85
CPPP-13	Site Construction Support Activities, Rev. 0	10/11/85
CPPP-14	Procedure for the Preparation and Control of Project Procedures, Rev. 1	11/05/85
CPPP-15	Small Bore Stress/Support Requalification Procedure	
PM's	Project Memoranda	
PM-001	Pipe Support Computer Program Usage	11/01/85
PM-002	Design Criteria for Pipe Stress and Pipe Supports	11/04/85
PM-003	Design Information Request Procedure	11/18/85
PM-004	Embedment Plate Evaluation	12/02/85
PM-005	Valve Modeling	12/03/85
PM-006	Use of Code Case N-411 for CPSES Stress Requalification	12/13/85

The major details, however, are contained in procedure CPPP-5, CPPP-6, CPPP-7, and CPPP-8.

They will be issued to the NRC staff for review. At this time none have been released. These procedures will reflect all CPSES FSAR commitments and the ASME Section III Code of Record (with NRC approval changes). In the process of requalification effort, it is expected some changes to this FSAR and ASME Section III Code of Record will be requested by TUGCO. These changes (some previously approved by the NRC for use on previous SWEC-designed plants) might include permission to use the following documents:

NUREG-0484	Code Case N-411
Code Case N-397	Code Case N-413

In addition, Procedures CPPP-6 and -7 will include any specific methods required for the proper treatment of all external source issues which are not covered by the standard SWEC procedures and which are unique to the CPSES plant. At this time, Procedures CPPP-6 and -7 do not include all of the methods required for the resolutions of these issues.

When all work is completed, revisions to these procedures will be incorporated. It is not intended that all of the backup detail or supporting SWEC calculations will be included in the procedures. This detail will be available for review at the SWEC offices.

TUGCO has requested (W.G. Council letter dated 11/18/85 to V. Noonan) approval for the use of Code Case N-411 from the NRC. This request is presently under consideration at the NRC.

2. Verification of As-Built Information

Because the as-built data will be used as input for the SWEC requalification effort, it is important to develop confidence in its accuracy.

The process being used to develop this confidence involves walkdowns performed by SWEC, a reliance of previous work by TUGCO, and other work by the CPRT.

The walkdowns by SWEC include:

- (a) CPPP-5 Field Walkdown
- (b) CPPP-8 Walkdown
- (c) SWEC "Stress Reconciliation Walkdown"

Previous work by TUGCO includes their (1) "General Program for As-Built Piping Verification", and (2) "Penetration Schedule".

The activities by CPRT to be considered here include the reinspection performed under the QA/QC Construction Adequacy Program, specifically for those samples related to piping and supports. The various as-built walkdowns and reinspections are discussed in the following paragraphs.

CPPP-5 Walkdown - The purpose of this walkdown by SWEC was to establish confidence in the adequacy of dimensions and functions shown on the as-built drawing to support the initiation of the piping analysis effort. This walkdown is described in SWEC procedure CPPP-5 and the results will be published in a walkdown report. The walkdown was performed at the site during the weeks of _____. The walkdown consisted of the field verification of random samples of four attributes selected by SWEC. The attributes selected included valve location, pipe support location, pipe support function and support orientation. Although the procedure and the walkdown report have not yet been formally issued, preliminary results indicated the need for a 100% walkdown of the support and valve orientation attribute. This 100% attribute walkdown has now been completed by TUGCO.

CPPP-8 Walkdown - The as-built walkdown performed is a piping and support system engineering walkdown. The objectives of the walkdown are:

- (1) To determine whether there are technical configuration issues, other than existing technical findings from previous reviews, that should be evaluated relative to the functional behavior of the system, and
- (2) for experienced SWEC personnel to become familiar with the physical aspects of the design and determine whether additional, or refinements of, design inputs, guidelines, or procedures are necessary for the pipe stress and supports requalification effort.

The walkdown was performed on a total of 70 stress problems out of the approximately 360 which are within the scope of the SWEC requalification effort.

The walkdown was performed by teams of SWEC pipe stress analysts and pipe support designs during the weeks of November 12-22, 1985. The data is presently being evaluated and additional verification walkdowns will be performed at the site as needed. The final report for this effort is expected to be issued in late January 1986.

SWEC Stress Reconciliation Walkdown - This, as in other nuclear plants, will be performed by pipe stress analysts when the piping stress analyses are completed. Examples of the attributes to be inspected during this walkdown include gaps and interferences.

TUGCO General Program for As-Built Piping Verification - These represent the walkdowns performed by TUGCO to satisfy NRC IE Bulletin 79-14. The TUGCO procedures used included CP-QP-11.3, Rev. 6, QI-QP-11.13-1, Rev. 8, CP-EI-4.5-1, Rev. 9 and TNE-DC-24-1, Rev. 0.

Penetration Schedule - The penetration schedule is a detailed computer listing describing all of the penetrations in the plant. The schedule lists the type of sealant, type of penetration, openings and a number of other parameters. The stress analyst can obtain all required information relative to clearances at penetrations having this available.

3. Review and Verification of Systems Design Input, Seismic Acceleration and Fluid Transients

SWEC will review all drawings and specifications for systems within this scope. The specifications will be reviewed to assure compliance with licensing commitments and that all operating modes and conditions are identified appropriately. Existing fluid transient loads will be reviewed will be reviewed and new loadings generated, if required. SWEC Procedure CPPP-10 describing the operating conditions for the plant has been prepared and includes some of the above data.

A third-party review of this activity will also be performed. A procedure review will be performed to verify that the SWEC procedures are adequate to perform their intended purpose. This procedure review will focus on, among other things, the definition and verification of design input.

4. Verification of Existing Pipe Support Design Documents

The CPRT Program Plan in DSAP IX Attachment 2 states that the existing pipe support calculations will be reviewed to determine their technical adequacy.

SWEC originally intended to review existing large bore support calculations on a sampling basis to determine their acceptability by using a load comparison method. However, in the November 22, 1985 letter, the approach changed to evaluating all large bore pipe supports individually. SWEC Project Procedures CPPP-6 and CPPP-7 describe the approach to be used, the design criteria to be satisfied, and the extent of the review required for the pipe support requalification effort. Thus, this Action Plan element has been incorporated into Action Plan Element #6.

5. Resolution of Special Technical Concerns

The CPRT Program Plan describes the SWEC approach to be used in the resolution of special technical concerns. The special technical concerns are those issues outside the scope of the typical problems encountered in the conventional piping stress analysis and pipe support design and which are required to be addressed by a special technical group. Many of the external source issues are included in the special technical concerns and are required to be addressed in the procedures used for the piping and pipe support reanalysis. The approach to resolution is being developed by a SWEC special technical group. The resolutions of the special technical concerns will be incorporated in the SWEC Project Procedures CPPP-6, "Pipe Stress/Support Requalification Procedure" and CPPP-7, "Design Criteria for Pipe Stress and Pipe Supports." The approach to resolution and the background information for the resolution, however, are contained supporting SWEC calculations, special studies and/or reports.

6. Reanalysis of Piping Systems and Reevaluation of Pipe Support Designs

Attachment 2 of DSAP IX of the CPRT Program Plan describes the reanalysis of piping systems and the reevaluation of pipe support designs. The Plan states that the pipe stress reanalysis effort will follow project procedure CPPP-6, "Pipe Stress Analysis Procedure for As-Built ASME Class 2/3 Piping Systems" and CPPP-7, "Analysis and Design Criteria for Pipe Stress and Pipe Support for ASME Class 2/3 Piping Systems."* The large bore piping reanalysis will include all ASME Class 2 and 3 piping larger than 2 inches (nominal pipe size) excluding portions within the boundary

*Staff audits have noted that although the general topics covered under CPPP-6 and CPPP-7 remain essentially the same, the titles have changed. CPPP-6 is now titled, "Pipe Stress/Support Requalification Procedure" (includes pipe support requalification), and CPPP-7 is now titled, "Design Criteria for Pipe Stress and Pipe Supports."

of Westinghouse Class 1 auxiliary branch line stress problems and all Class 5 piping within the ASME Class 2 and 3 stress problem boundaries. The large bore pipe stress analysis will utilize verified as-built data (See Action Plan Element #2 above) and verified system design input (See Action Plan Element #3 above). New seismic amplified response spectra using the damping values per ASME Code Case N-411 might be used. Elimination of unnecessary pipe supports (including snubbers) to optimize system performance will be performed by pipe stress engineers where judged appropriate. The large bore piping stress reanalysis will be used as the analysis of record to qualify the structural integrity of the piping systems. Gibbs & Hill will remain the designer A/E of record for the piping systems with full responsibility for the system functional design. The SWEC piping stress results will also be evaluated for consistency with the postulated pipe break locations.

For small bore piping systems, the CPRT Program Plan states that reanalysis of small bore (2 inches and under) piping and supports will be performed on a sampling basis to verify adequacy. SWEC is preparing a project procedure (CPPP-15) for the requalification of small bore piping systems. The specific approach to be used for the requalification effort has not been developed at this time. The CPPP-15 procedure is expected to be completed in December 1985.

For large bore pipe supports, SWEC is reevaluating all ASME Class 1, 2, and 3 pipe supports and Class 5 supports within the ASME Class 1, 2, and 3 piping stress analysis problem boundaries. Each pipe support calculation will be reviewed for technical adequacy including the need to address those aspects of the calculation which are associated with external source issues.

5.5.3 Staff Evaluation

1. Development of Comanche Peak Pipe Stress and Pipe Support Design Criteria

Because the major details of the SWEC requalification effort are contained in the SWEC project procedures CPPP-5, CPPP-6, CPPP-7, and CPPP-8 and because these procedures have not yet been made available to the staff for detailed review, the staff evaluation has not yet been completed at this time. Staff audits have been performed both at the SWEC offices and at the CPSES site. During these audits, draft copies of the procedures were available for review. However, the staff cannot provide its findings on the technical adequacy of the pipe stress and pipe support design criteria without a detailed review of the documents. The staff is awaiting formal submittal of the procedures by the applicant in order to proceed with staff review.

This item is an open item. The staff will consider this further in a supplement to this SER.

2. Verification of As-Built Information

During staff audits at the SWEC offices and at the CPSES site, the topics of CPPP-5, the CPPP-5 walkdown report, CPPP-8, the TUGCO as-built procedures, the penetration schedule and the QA/QC piping and pipe supports samples were discussed and reviewed. In addition, the staff and its consultants performed verification of the -5 and -8 walkdowns.

As a result of our review, the staff has identified several areas where additional information is required to complete our review.

- a. For the CPPP-5 walkdown - the valve and support location tolerances used by SWEC range from ± 3 inches to ± 12 inches depending on the dimension used on the drawing. Typically, a tolerance for such a

dimension is a function of the diameter of the piping system. In this case, there is no relationship. Using this CPPP-5 approach, a valve or support could be mislocated more on a 3-inch line than on a 30-inch line and is within the acceptability limits established in CPPP-5. The staff requires further justification for these tolerances (e.g., the 12-inch tolerance should be justified by SWEC for small diameter piping). This is considered to be an open item and will be discussed further in a supplement to the SER.

- b. SWEC Stress Reconciliation Walkdown Procedure CPPP-6 indicates that a final field walkdown will be performed at the completion of the requalification effort. The purpose of this walkdown is to verify that sufficient clearance exists between the piping systems and nearby structures. Based on the preliminary conclusions from the CPPP-8 walkdown data, the scope of the stress reconciliation walkdown should be expanded to reconcile concerns related to improper clearances between pipe and pipe supports, improper alignment and interferences with the rear bracket which were identified in the CPPP-8 walkdown. This is considered to be an open item and will be discussed in a supplement to the SER.
- c. TUGCO Penetration Schedule - During an audit at the CPSES site, the content of this schedule was discussed with TUGCO employees. It appears that the information required by the pipe stress analysis is available in this schedule. The apparent lack of reference of this penetration schedule, however, in the SWEC Procedure CPPP-7, is of concern to the staff. In addition, the staff plans a walkdown to verify the accuracy of the data in the penetration schedule in the near future. Due to the above, the staff considers this to be an open item and will consider it in a supplement to this SER.
- d. QA/QC Construction Adequacy Program Reinspection - During audits at the site, it was determined that there is a difference of tolerances used within this reinspection versus those used by SWEC in the CPPP-5

walkdown. In addition, it is not clear to the staff that the tolerances used here for gaps (e.g., on box frame supports) would be acceptable for the SWEC pipe stress requalification effort. It is recommended that all tolerances here be reviewed by SWEC and their acceptance documented. Until this is available for review by the staff, this remains an open item and the staff will consider it in a supplement to this SER.

As described above, the total verification of the as-built drawings is a function of a compilation of a number of walkdowns and work by at least three organizations. The need for an evaluation to integrate all of this information and document the results is apparent. Without such a document, it is not clear to the staff if all of this information is compatible and it is not clear that it will lead to the proper conclusions. In addition, because the need for the 100% walkdown of valve and strut orientation came about in CPPP-5 as a result of the failure of one of the four attributes chosen by SWEC, and because this failure affects any conclusion relative to the accuracy of the as-built data, the staff requires that the applicant address this failure and its effect on the accuracy of the as-built data. The comparison of the 100% TUGCO re-walkdown with the existing as-built data would be helpful in reaching a conclusion.

Until all of the documents noted above are available for thorough review by the staff, all of the concerns noted above are satisfactorily resolved, the verification of as-built data remains as an open item.

4. Verification of Existing Pipe Support Design Documents

The staff has reviewed and evaluated the CPRT Program Plan DSAP IX, Attachment 2 action plan details related to the verification of existing pipe support design documents. Based on the November 22, 1985 letter from W. Council to V. Noonan, the effort associated with this Action Plan

Element has been changed. Thus, the SWEC approach to requalify pipe support designs has been addressed as part of Action Plan Element #6 and the staff evaluation is provided therein.

5. Resolution of Special Technical Concerns

The staff has reviewed and evaluated the CPRT Program Plan details related to the resolution of special technical concerns. The resolutions of the special technical concerns are being developed by a special SWEC technical group who is not directly involved in the piping stress analysis effort. This division of responsibility allows the resolutions to be conducted independent from the daily pressures involved with the production level of effort and, thus, assures a thoughtful and uniform resolution. The SWEC special group has reviewed past studies, analyses, and reports on certain technical issues in addition to the transcripts and filings associated with the CPSES hearings in order to understand the concerns of all parties. SWEC has developed approaches for the resolution of several piping and pipe support concerns and has incorporated their resolution in SWEC Project Procedures CPPP-6 and CPPP-7. The staff has not yet received copies of the SWEC Project Procedures CPPP-6 and CPPP-7 for detailed review but has performed preliminary reviews of the procedures which were available at the SWEC offices during audits. Based on our preliminary review, the staff finds that the procedures allow an adequate process to exist for the resolution of the special technical concerns, however, the staff has not yet reviewed the details of the resolutions. The staff plans to engage in a series of audits specifically to review the technical adequacy of the resolution. Thus, the staff has not yet completed its evaluation of the adequacy of the technical resolutions. The staff considers this to be an open item and will address this item in a future supplement to this SER.

6. Reanalysis of Piping Systems and Reevaluation of Pipe Support Designs

The staff has reviewed and evaluated the CPRT Program Plan details associated with the reanalysis of piping systems and reevaluation of pipe support designs.

5.5.3-5

The staff review of the scope of the large bore piping stress reanalysis finds it to be adequate contingent upon an acceptable resolution of the following concerns.

The scope of the large bore piping stress reanalysis includes certain Class 5 piping. Specifically, the scope will include only those Class 5 piping within the boundaries of ASME Class 2 and 3 piping stress problems. The staff requires further justification for excluding the remaining Class 5 piping from reanalysis. The staff considers this to be an open item.

In the November 22, 1985 letter to the staff, the CPRT states that SWEC is responsible for the structural qualification of piping and supports. However, it is stated that Gibbs & Hill will remain the designer A/E of record for the piping systems with full responsibility for the system functional design. The staff review of the CPRT Program Plan Appendix F (Revision 1) Section II.F finds that interfacing information from SWEC related to design, construction, and QA/QC concerns found during walkdowns will not be provided to Gibbs & Hill. Because Gibbs & Hill has the full responsibility for ensuring the piping system functional design, it is not clear why Gibbs & Hill would not need this information. In addition, if Gibbs & Hill will remain the designer A/E of record for the piping systems, then the staff needs justification for a lack of review of the SWEC reanalysis by Gibbs & Hill. The staff considers this to be an open item and will address its resolution in a supplement to the SER.

The staff has reviewed the CPRT Program Plan response related to small bore piping requalification. Because the SWEC approach to be used for the requalification effort has not been completed at this time and will be addressed by SWEC Project Procedure CPPP-15, the staff has not yet completed its review and evaluation of this item. The staff considers this to be an open item and will report our findings in a supplement to the SER.

The staff has reviewed and evaluated the CPRT Program Plan details related to the reevaluation of large bore pipe supports. The staff finds the scope of the large bore pipe support reevaluation to be acceptable except for the following concern. Similar to concern raised by the staff for Class 5 piping, the staff requires further justification for excluding Class 5 pipe supports other than those Class 5 supports within ASME Class 1, 2, and 3 piping stress problem boundaries from the pipe support equalification effort. The staff considers this to be an open item and will address its resolution in a supplement to the SER.

5.5.4 Conclusions

Based upon the staff review of the CPRT Program Plan, the CPRT response to staff questions provided in its November 22, 1985 letter, and staff audits performed to date, and contingent upon acceptable resolutions of the above open items, the staff concludes the following.

The scope of the piping and pipe support requalification effort being performed by SWEC provides a comprehensive program for addressing many of the technical concerns raised in the external source issues related to the design adequacy of piping and pipe supports at CPSES. However, proper implementation of the program must be conducted in order to assure that the program design criteria have been met and licensing commitments have been satisfied. The staff review and evaluation of the implementation of the program will be addressed in a supplement to the SER.

12/24/85

Appendix A

6. Exclusion of Vendors and Other Organization Activities

6.2 CPRT Justification

The Stone & Webster Engineering Corporation (SWEC) requalification effort includes all ASME Class 2 and 3 piping and all ASME Class 1, 2, and 3 pipe supports. The third-party (TERA) effort includes an overview of the TUGCO/SWEC actions related to the requalification effort. However, the staff finds that the ASME Class 1 piping are not being reassessed nor evaluated. SWEC is responsible for the requalification of the supports on the Westinghouse-analyzed ASME Class 2 auxiliary branch lines connected to the reactor coolant loop.

The third-party will review the SWEC procedures and implementation to ensure that the interface with the NSSS vendor (Westinghouse) is functioning properly. However, it is the CPRT's view that a review of other aspects of the Westinghouse analysis is not necessary because the most significant issues concerning mass participation and support stiffness are not in question. The CPRT states that for the Westinghouse analysis performed, mass participation factor was appropriately considered and actual pipe support stiffness was included. Furthermore, CPRT believes there is a high level of confidence in Westinghouse's ability to analyze these piping systems based on their knowledge and experience in having qualified similar piping systems for a number of other plants.

6.3 Staff Evaluation

The staff evaluation of interface between SWEC and Westinghouse finds the following. The Class 1 piping is not within the SWEC scope but is the responsibility of Westinghouse. The loads from the SWEC analysis of the Class 2 and 3 piping imposed on the Class 1 piping as well as the requalification results of Class 1 supports (including pipe support stiffness) will be transmitted to Westinghouse. These interfaces are described in procedure CPPP-6 have been reviewed by the staff and are considered to be acceptable.

The staff evaluation of the third-party review of the piping and supports discipline finds the following. The staff concurs with the CPRT that the NSSS ASME Class 1 piping (i.e., the reactor coolant loop) should not be included in the DAP scope of review. The previous staff reviews of the Westinghouse topical reports have adequately addressed the acceptability of those NSSS components. However, the ASME Class 1 auxiliary branch lines are not covered by the Westinghouse topical reports and are considered to be plant-unique depending on the piping configuration and routing. Because of the similarity of the work performed for ASME Class 1 branch lines by Westinghouse and the work performed by the architect-engineer (Gibbs & Hill) for the ASME Class 2 and 3 piping systems, the susceptibility for error as found in the ASME Class 2 and 3 piping analyses also potentially exists for the ASME Class 1 auxiliary branch line analyses. The staff finds no basis for CPRT's statements that mass participation was appropriately considered by Westinghouse and that the implementation of actual pipe support stiffnesses was properly conducted. Furthermore, there exists an external source issue which specifically questions the use of erroneous damping values by Westinghouse in their ASME Class 1 auxiliary branch line analysis which has not been completely resolved. Thus, the staff requires that the ASME Class 1 auxiliary branch line analyses (not the reactor coolant loop) be included in the DAP self-initiated scope of review. The staff considers this to be an open item.

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Appendix B

Staff Evaluation of the CPRT Construction Adequacy Program Plan

4. External Source Issues

4.4 Mechanical and Piping Issues

4.4.1 Introduction

Plug Welds

It was alleged that incorrectly located bolt holes in baseplates, pipe supports, and cable tray supports were "plug welded" without authorization, with undocumented weld filler metal and without Quality Control inspection. NRC Region IV had substantiated the allegation, in part, with the identification of undocumented "plug welds" in cable tray supports. Further details on the allegation were obtained by the TRT from a review of ASLB testimony. The TRT determined that the ASME B&PV Code, Section III, Subsection NF was applicable to Class 1, 2, and 3 pipe hangers and supports, that ANSI B31.1 Power Piping Code was applicable to Class 5 and 6 pipe hangers and supports, and that AISC Specification for Design, Fabrication and Erection of Structural Steel for Buildings, were applicable to cable tray supports. The first two codes both reference Section IX of the ASME B&PV Code for welding procedure and welder performance qualifications. The last one references AWS D1.1 Structural Welding Code.

The TRT reviewed the appropriate editions of the applicable codes in detail and established that none of them set forth explicit requirements authorizing, prohibiting, or governing the repair by welding of fabrication errors such as misdrilled holes. (The TRT noted that a later edition of AWS D1.1 specifically addresses the repair of misdrilled holes by welding.) Consequently, the TRT concluded that the repair of misdrilled holes by welding was not prohibited.

The TRT review of Brown and Root Specifications established that misdrilled holes were regarded as base material defects. For Class 1, 2, 3, 5, and 6 supports, such defects were supposed to be dispositioned by NCR action. For cable tray supports, engineering direction was required.

The TRT concluded that the identification of undocumented "plug welds" and the difficulty in detecting them raised a generic concern as to the potential existence of an unknown number of unauthorized "plug welds" of questionable quality. Potentially defective welds in highly stressed areas could have safety significance. The TRT directed that the Applicant modify a plan of action already proposed to NRC Region IV with respect to specific items or perform a bounding analysis to assess the generic effects of undocumented "plug welds" on the ability of pipe supports, cable, tray supports, and baseplates to perform their intended function.

Repositioning of the Main Steam Line

The TRT investigated an allegation relating to construction deficiencies during installation of a Unit 1 Main Steam (MS) line. It was alleged that the 32-inch MS line was forced into position by the polar crane and 3-ton come-alongs and that "tension" induced in the line as a result of movement during the alleged incident was still present in the line.

The TRT investigation substantiated the allegation in part. The TRT found that repositioning of the Unit 1 loop 1 MS line had been performed due to settlement of temporary supports. The TRT determined that the partially installed MS line had been used in flushing operations and that the partially installed line had sagged due to settlement of temporary support during flushing and/or construction. The TRT also determined that the TUEC analysis performed 1 year after the alleged incident did not adequately address the full sequence of events involved in the incident.

Details of the TRT investigation of the allegation are documented in CPSES SSER No. 10, pp N-99 through N-112. Details of related TRT investigations regarding improper welding of temporary supports are also documented in SSER No. 10, pp N-37 through N-42.

4.4.2 CPRT Approach

Plug Welds

The CPRT action plan has an initial objectives:

- (1) the verification of the presence or absence of undocumented "plug welds" in ASME pipe supports and baseplates.
- (2) verification of the quality of cable tray supports containing undocumented plug welds.

To accomplish the first objective, a sample of pipe supports and baseplates representative of reactor Unit 1 and common components and a second sample of pipe supports and baseplates representative of reactor Unit 2 will be selected for examination. Each sample plan is to be based on identifying with 95% confidence a rate of detectable plug welds of 5% or greater. For this confidence level and rate, the minimum random sample size of undocumented or unauthorized plug welds is 60 with an acceptance number of zero.

When a suspected "plug weld" is found, the paint will be removed from the support, the presence of a "plug weld" verified, visual inspection made, and comparison made to prior documentation to determine if the "plug weld" was or was not authorized. NCRs will be issued for unauthorized "plug welds" and engineering evaluation performed to evaluate structural integrity of the baseplate of support. If structural integrity is not affected, the need for additional inspection will be based on observed trends in the inspection results.

If any support or baseplate lacks structural integrity because of an unauthorized or undocumented "plug weld," the sample plan will be either expanded or increased to 100% inspection. If no unauthorized or undocumented "plug welds" are found, it will be concluded that the structural integrity of ASME pipe supports and baseplates has not been degraded by the presence of such welds.

Corollary to this investigation will be a review of existing QC inspection and documentation procedures for necessary changes.

To accomplish the second objective, random samples of cable tray supports in both units 1 and 2 will be inspected and, if necessary, subjected to engineering evaluation. The investigative steps, in general, parallel those for ASME pipe supports and baseplates. Results will be used to assess the root cause and to determine generic implications.

Preceding either of the above objectives is the development of a viable inspection procedure to identify "plug welds," including criteria for paint by personnel meeting the CPSES Quality Assurance Program or personnel qualification requirements of the CPRT Program Plan.

Repositioning of the Main Steam Line

The CPRT approach to resolve the TRT concerns resulting from the TRT investigation of the allegations regarding forced movement of the MS line and improper welding of temporary supports is described in Section 4.0, "CPRT Action Plan" of ISAP V.e., Rev. 1. A review of this CPRT plan indicates that specific engineering evaluations of the MS line incident and a generic study of possible damage to other piping are proposed.

The specific engineering evaluation includes: reviews of procedures for pipe erection and placement of temporary and permanent pipe supports; interviews of personnel involved in the MS line incident; evaluations of procedures and practices; analytical evaluations of full parametric variations of analysis inputs for the MS line incident; significance of stresses and support loads resulting from the analytical evaluations; reviews of existing UT examinations and hydrostatic test data for the affected MS line; and a possible reinspection program.

The generic study for possible damage in other piping, including the Unit 1, Loop 4, MS line includes: reviews and procedures for pipe erection and placement of temporary and permanent pipe supports; reviews of Nonconformance Reports (NCR's) and Piping Deviation Request Forms (PDRF's) for circumstances similar to the MS line incident; interviews of pipe installation personnel to determine piping subjected to adjustments during fitup; review of all other sources of residual stresses in piping systems; evaluations of the significance of residual stresses due to fitup; possible additional pipe fitup evaluations; and possible modifications to Gibbs & Hill (G&H) specifications and/or related procedures to ensure that piping and associated equipment are not adversely affected during flushing activities and/or by the use of temporary supports.

Section 4.3, "Responsibilities," of ISAP V.e., Rev. 1, indicates that all activities were to be performed by third party (including a verification of previous work done by RLCA) except for the modification (if required) of procedures and specifications for the control of pipe erection, temporary supports and hydrostatic testing and flushing which was to be a Comanche Peak Project Engineering responsibility.

4.4.3 Staff Evaluation

Plug Welds

Preliminary critique by the staff of the CPRT Program Plan raised several concerns, some of which have been adequately resolved. The staff's concern about the following items remains unresolved:

- (1) In 4.1.1.1, the second paragraph is confusing. The statement is made "The Sample Plan will be based on identifying with a 95 percent confidence a rate of detectable plug welds of 5% or greater. The smallest random sample which will achieve this confidence level and rate of unauthorized or undocumented plug welds is 60, with an acceptance number of zero." These statements seem contradictory. Are we establishing, with a confidence level of 95%, the rate of detectable plug welds or the rate of unauthorized or undocumented plug welds? Also, is the rate 5% or greater, or is it really 5% or less?
- (2) The Staff expressed concern that there is uncertainty as to the ability to detect a plug weld covered by paint and that this uncertainty should be factored into the sample size. The CPRT has reported the results of inspection of simulated cable tray support members containing "plug welds" made, surface prepared using methods available to CPSES personnel, and painted. The inspectors tested detected, on average, 82% of the "plug welds." The maximum detected was 94%. The TRT notes that this reported capability negates the CPRT Program Plan stated intent of 95% confidence of a rate of 5% or more. How does the CPRT propose to reattain 95% of a 5% rate?
- (3) In March of 1985 at the CPRT action plan presentation at CPSES, the TRT stated its position that volumetric examination of any unauthorized "plug welds" found should be made since the welder, who was trying to avoid QC cognizance, would be included to rush the job and may, therefore, have used poor welding techniques. The CPRT has not responded directly to this position.
- (4) The sample plan (Section 4.1) and the definition of a reject were stated by the TRT as incompatible as currently written. CPRT's response, which references 3.4 ISAP V.a, Item 1, is confusing and needs explanation.

Repositioning of the Main Steam Line

The staff review found that the details of the specific engineering evaluation and the generic study of possible damage to other than the Unit 1, Loop 1, MS

pipng was responsive to the actions required of TUEC by the TRT as a result of its investigation of the MS line allegation. These actions are given in SSER No. 10, P. N-110, Items 1 through 8. A comparison of items in the CPRT Action Plan and the actions required of TUEC by the TRT found that the CPRT Action Plan was sufficient to umbrella the actions required of TUEC by the TRT.

However, there are concerns that:

- 1) The observation noted in Section 3.2, "Preliminary Determination of Root Cause and Generic Implications" of ISAP V.e., Rev. 1, that
"in construction practice, it is not at all uncommon to perform adjustments in pipe position prior to final welding, particularly when permanent supports are installed subsequent to final fitup" could predisposition the implementation of the CPRT evaluations and studies.
- 2) The third party review of the RLCA work should not be limited to a verification only. Provisions for additional third party investigations should be provided, if required.
- 3) Although the CPRT has indicated that its investigations performed as part of ISAP V.e., Rev. 1, have concluded that the sequence of events described in SSER No. 10 relating to MS line incident is not correct, the generic implications of settlements of supports and stresses due to hydrostatic testing and flushing activities will still be required to be evaluated by TUEC.

4.4.4 Conclusions

For the issue concerning plug welds, the Staff concludes that there are important questions related to the CPRT Program Plan which must be satisfactorily answered prior to approval of the Plan.

For the issue concerning the repositioning of the main steam line, the specific engineering evaluation and generic study described in ISAP V.e., Rev. 1, of the CPRT Program Plan provides an acceptable basis for resolution of the issues and concerns resulting from the TRT investigations of allegations regarding forced movement of the main steam line and improper welding of temporary supports. Final acceptability is contingent upon verification of proper implementation of the details of the specific engineering evaluations of the main steam line incident and the generic study of possible damage to other piping.