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September 29, 1987

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Re: Texas Utilities Electric Company, et al
(Comanche Peak Steam Electric Station,
Units 1 & 2); Docket Nos. 50-445 and 50-446 -OL

Dear Administrative Judges:

TU Electric has this date delivered to the Nuclear Regulatory Commission the following SRT approved Results Reports:

II.e	Rebar in the Fuel Handling Building
V.a (Errata)	Inspection for Certain Types of Skewed Welds in NF Supports
DSAP IX	Piping and Supports Discipline Specific Action Plan

These reports should be placed in sequence behind the tab "Civil/Structural" for II.e; "Mechanical" for V.a (Errata); and "DSAP" for DSAP IX in the results reports binders previously transmitted. Also enclosed is a revised Table of Contents reflecting the issuance of these reports. As with all previous Results Reports issued to date, this material is not being offered into evidence at this time but provided for information only.

Respectfully submitted,

Robt A Wooldridge

Robert A. Wooldridge

RAW/klw
Enclosures
cc: Service List

DS03

TU ELECTRIC

Log # TXX-6809
CPRT-1001
File # 10068

William G. Counsil
Executive Vice President

September 29, 1987

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
DOCKET NOS. 50-445 AND 50-446
CPRT RESULTS REPORTS

Gentlemen:

We transmit herewith the following SRT approved Results Reports:

II.e	Rebar in the Fuel Handling Building
V.a (Errata)	Inspection for Certain Types of Skewed Welds in NF Supports
DSAP IX	Piping and Supports Discipline Specific Action Plan

These reports should be placed in sequence behind the tabs "Civil/Structural" for II.e; "Mechanical" for V.a (Errata); and "DSAP" for DSAP IX in the results reports binders previously transmitted.

The files that contain supporting documentation for these Results Reports have been reproduced in their entirety and are available for public inspection in our Dallas office. Anyone wishing to inspect these files should contact Ms. Debra Anderson (214-812-4379).

We shall issue further Results Reports on a periodic basis as they are approved by the CPRT Senior Review Team.

Very truly yours,

W. G. Counsil

W. G. Counsil

By: G S Keeley

G. S. Keeley
Manager, Nuclear Licensing

TLS/gj

c - Mr. R. D. Martin, Region IV
Resident Inspectors, CPSES (3)

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COMANCHE PEAK RESPONSE TEAM

RESULTS REPORT

ISAP: II.e

Title: Rebar in the Fuel Handling Building

REVISION 1

Issue Coordinator — 9/2/87 Date

Review Team Leader — 9/2/87 Date

John W. Beck, Chairman CPRT-SRT — 9/3/87 Date

RESULTS REPORT

ISAP II.e

Rebar in the Fuel Handling Building

1.0 DESCRIPTION OF ISSUE IDENTIFIED BY NRC

Issue II.e was identified in Supplement 8 to the Safety Evaluation Report (SSER-8) for the CPSES (Reference 9.1, page K-89) as follows:

> Allegation AC-15 identifies a specific instance of the possible unauthorized cutting of rebar. In this case, a former Brown & Root employee stated he possibly drilled holes through rebar in a concrete floor without a component modification card (CMC) or a design change authorization (DCA). He explained that in January 1983 he drilled approximately 10 holes about 9 inches deep while installing 22 metal plates with a core drill. He said the metal plates were used to secure the trolley process aisle rails located on the 810-foot, 6-inch floor level in Room 252 of the Fuel Handling Building.
>
> The TRT inspected the trolley process aisle rails and its anchoring system and observed no violations of project drawings or specifications. The TRT reviewed the reinforcement drawings (2323-S-0800 and 2323-S-0820) for the Fuel Handling Building to determine the location of rebar. The drawing showed three layers of reinforcement in the upper part of the mat, which consisted of a No. 18 bar running in the east-west direction, in the first and third layers, and a No. 11 bar running in the north-south direction, in the second layer [See Figure 1].
>
> The review of the reinforcement drawings (2323-S-0800 and 2323-S-0820) revealed that the layout of the east-west reinforcement and the trolley process aisle rails was such that only one bar of the east-west reinforcement could be cut by drilling holes for rail anchors. However, if 9-inch holes were drilled, both layers of the No. 18 reinforcing bar would be cut. Design Change Authorization (DCA) No. 7041 was written for authorization to cut the uppermost No. 18 bar at only one rail, but it did not reference the authorization to cut the lowermost No. 18 bar. The DCA (No. 7041) also stated that the expansion bolts and baseplates could be moved in the east-west direction to avoid interference with the No. 11 reinforcement running in the north-south direction. The information described in DCA No. 7041 was substantiated by Gibbs & Hill calculations. The DCA approval was based on the understanding that only the uppermost No. 18 reinforcement would be cut. If the 10 holes were actually drilled 9 inches deep, then the allegation that reinforcement was cut without proper authorization may be valid.

RESULTS REPORT

ISAP II.e
(Cont'd)

2.0 ACTION IDENTIFIED BY NRC

The NRC (Reference 9.1, page K-91) indicated that the following action should be taken on this issue:

TUEC shall Provide:

1. Information to demonstrate that only the No. 18 reinforcing steel in the first layer was cut, or

2. Design calculations to demonstrate that structural integrity is maintained if the No. 18 reinforcing steel on both the first and third layers was cut.

3.0 BACKGROUND

The base mat (slab) at elevation 810'-6" of the Fuel Handling Building is approximately 5 feet thick with reinforcing steel (rebar) layers near both the top and bottom surfaces of the slab. Reinforcing steel at the top of the slab consisted of three layers, No. 18 bar in the first and third layers, spanning east-west, and No. 11 bar in the second layer, spanning north-south (see Figure 1). To install a pair of rails, holes were drilled into the slab in order to insert Hilti bolts that would hold rail clips. This rail installation (which according to the operational traveler for this activity (Reference 9.2) actually occurred in September 1982, not in January 1983 as stated by the alleger) will be referred to in the following as "the subject case". It was alleged that in the subject case ten holes were drilled approximately 9 inches deep, 3 inches deeper than required for the Hilti installation. Drilling to 9 inch depth may have resulted in cutting through both the 1st and 3rd layers of the east-west No. 18 reinforcing steel along a line next to the northern-most rail at the top of the mat.

Design Change Authorization (DCA) No. 7041, Rev. 7 (Reference 9.3) concerning drilling for the subject installation authorized cutting of only the first layer of rebar. The DCA required that the rail clips be so located in the east-west direction that cutting of the 2nd layer of (No. 11) rebar running north-south would be avoided. A field inspection verified that the location and length of the Hilti bolts installed is such that rebar in both the 1st and 3rd layers could have been cut in several locations along the east-west line next to the northern-most rail (Reference 9.4).

RESULTS REPORT

ISAP II.e
(Cont'd)

4.0 CPRT ACTION PLAN

4.1 Scope and Methodology

The objectives of this action plan were to:

- Assess the structural adequacy of the slab in the subject case.

- Evaluate whether in other cases where cutting of reinforcement bar was authorized for the installation of Hilti bolts structural adequacy was compromised due to potential unauthorized cutting of additional bars.

The CPRT tasks implemented to achieve these objectives are described in the following paragraphs.

Design calculations (Reference 9.5) were generated to evaluate structural adequacy of the concrete mat at elevation 810'-6", assuming one No. 18 bar in the 1st layer and one in the 3rd layer are each cut along the east-west line Both bars were modeled as being completely ineffective (i.e., omitted) in the analysis.

Procedural controls governing rebar cutting for Hilti installation drilling as well as for core drilling were reviewed. The review focused on requirements for engineering authorizations and inspections of drilling as well as on craft procedures and control of rebar cutting equipment.

All cases from units 1 and 2 where rebar cutting was requested for installation of Hilti bolts were identified (Reference 9.6). The possibility of additional (i.e., unauthorized) rebar cutting was determined for these cases, based on the design reinforcement pattern in the slab or wall. An evaluation of structural adequacy (Reference 9.7) was performed by postulating that the additional rebar was cut in all cases for which the possibility for unauthorized rebar cutting existed. Ultrasonic inspection was conducted in some of these cases to verify actual installed embedded length of Hilti bolts (Reference 9.8).

In addition, following a review to identify other work processes in which rebar could have been cut, installations of pipe supports in units 1 and 2 that utilize shear lugs were investigated for the possibility of rebar cutting while drilling holes for the lugs (Reference 9.9).

RESULTS REPORT

ISAP II.e
(Cont'd)

4.0 CPRT ACTION PLAN (Cont'd)

A review of the NRC conclusions regarding the number of diamond drill bits that could have been used for unauthorized rebar cutting was performed. This also involved comparison of the alleged unauthorized rebar cuts and the Project documentation on cut authorizations.

4.2 Participants Roles and Responsibilities

The organizations and personnel that participated in this effort are described below with their respective scopes of work.

4.2.1 TUGCO Nuclear Engineering (TNE) - Civil/Structural Discipline

4.2.1.1 Scope

- Prepared design calculations documenting the adequacy of the slab at elevation 810'-6".

- Identified rebar cuts by review of all DCAs and CMCs, and evaluated cases where potential for unauthorized cuts existed.

4.2.1.2 Personnel

Mr. C. R. Hooton	TNE Civil/Structural Discipline Supervisor
Mr. D. G. Patankar	Civil/Structural Lead Engineer
Mr. S. A. Raz	Structural Engineer

4.2.2 Gibbs & Hill (G&H) - Site Design Review Team

4.2.2.1 Scope

- Performed design review of calculations performed by TNE.

RESULTS REPORT

ISAP II.e
(Cont'd)

4.0 TUEC ACTION PLAN (Cont'd)

4.2.2.2 Personnel

Mr. B. Wilcoxson	Design Review Group Supervisor
Mr. B. K. Bhujang	Structural Group Lead
Mr. R. P. Shah	Principal Engineer

4.2.3 Stone & Webster Engineering Corporation (SWEC)

Lead Contractor responsibility for this task was transferred by TU Electric from G&H to SWEC on October 13, 1986. After that date, SWEC participated in the execution of this action plan as described below.

4.2.3.1 Scope

Assessed the extent of potential unauthorized rebar cutting by reviewing:

a. the diary of the foreman of the crew that performed drilling for most of the Hilti installations; this individual made allegations that unauthorized rebar cuts were made and documented in his diary;

b. Project design change documents to determine whether the rebar cuts listed in the alleger's diary were or were not authorized; and

c. Project documents to determine the number of diamond drill bits that are capable of cutting rebar and to determine the total number of rebar at the plant.

4.2.3.2 Personnel

Mr. T. W. Houston	Principal Structural Engineer
Mr. M. P. Holland	Group Leader, Structural Division

RESULTS REPORT

ISAP II.e
(Cont'd)

4.0 TUEC ACTION PLAN (Cont'd)

4.2.4 Third-Party Activities

4.2.4.1 Scope

- Reviewed design calculations performed by TNE to verify adequacy of the slab at elevation 810'-6".

- Reviewed procedural controls for rebar cutting.

- Reviewed Project identification and evaluation of Hilti installations where potential for unauthorized rebar cutting existed.

- Determined actual lengths of Hilti bolts by Ultrasonic testing for cases where rebar cutting was required for Hilti bolt installation and the possibility of additional rebar cutting exists.

- Reviewed Project evaluations of the total extent of potential rebar cutting.

- Prepared Results Report.

4.2.4.2 Personnel

Mr. H. A. Levin	TERA - Civil/ Structural Review Team Leader
Dr. J. Honekamp	TERA - TRT Technical Manager
Mr. J. Miller	TERA - TRT Issues Manager
Dr. J. Arros	TERA - Issue Coordinator

RESULTS REPORT

ISAP II.e
(Cont'd)

4.0 CPRT ACTION PLAN (Cont'd)

Mr. G. Lagleder	Southwest Research Institute - UT measurement of Hilti bolt lengths

4.3 Personnel Qualification Requirements

Where inspections required the use of certified inspectors, qualifications at the appropriate level were to the requirements of ANSI N45.2.6, "Qualification of Inspection, Examination, and Testing Personnel at Nuclear Power Plants". Third-party inspectors were certified to the requirements of the third-party employer's quality assurance program and trained to the applicable inspection procedures.

Third-party participants in the implementation of this Action Plan meet the personnel qualification and objectivity requirements of the CPRT Program Plan and its implementing procedures.

Other participants were qualified to the requirements of the CPSES Quality Assurance Program or to the specific requirements of the CPRT Program Plan. Activities performed by other than third-party personnel were governed by the applicable principles of Section III.K, "Assurance of CPRT Program Quality", of the CPRT Program Plan.

4.4 Procedures

Calculations and evaluations performed by TNE, Gibbs & Hill, and SWEC were performed in accordance with the procedures normally applicable to those activities for CPSES. Third-party activities were conducted in accordance with applicable CPRT guidelines.

Procedure SWRI-NDT-800-103, Revision 1, "Ultrasonic Length Measurements of Bolting" (Reference 9.8) was specifically developed by Southwest Research Institute to provide guidance for ultrasonic length measurements of bolting in place. This procedure describes the responsibilities of SWRI personnel and the techniques and equipment to be utilized during the performance of ultrasonic length measurements of bolting and establishes the method of recording the results of field inspections. This procedure was approved by TNE and TERA.

RESULTS REPORT

ISAP II.e
(Cont'd)

4.0 CPRT ACTION PLAN (Cont'd)

4.5 Standards/Acceptance Criteria

1. ACI-318-71, "Building Code Requirements for Reinforced Concrete", and stipulations of FSAR Section 3.8 formed the basic standards and design criteria for the original design of the concrete mat at El. 810'-6" in the Fuel Handling Building. The acceptance criteria for calculations generated within this action plan were consistent with the original design criteria.

2. Adequate controls of activities related to rebar cutting, such as engineering authorization, equipment use, and QC inspections must be defined in the Project procedures.

3. DCAs and CMCs associated with identified rebar cuts must be supported with appropriate analyses to evaluate and qualify the changed condition.

5.0 IMPLEMENTATION AND DISCUSSION OF RESULTS

The implementation of this action plan involved: preparation of design calculations for the Fuel Handling Building concrete mat postulating that the unauthorized rebar cutting had occurred; review of procedures for drilling for Hilti installations and core drilling to determine the controls for rebar cutting; identification and evaluation of Hilti installations where a rebar cut was authorized and the possibility of cutting underlying rebar existed; and ultrasonic measurement of the length of some Hilti bolts. These tasks are discussed in the following sections. Additional sections discuss a review of the NRC conclusions, an evaluation of the potential safety significance, and root cause and generic implications of this issue. Figure 1 provides a sketch of the subject Hilti bolt installation and rebar placement in the concrete mat. The activities that were performed by the Project were reviewed by the Third Party.

5.1 Fuel Building Concrete Mat at Elevation 810'-6"

In order to respond to the NRC request regarding the possible rebar cutting in the subject case, as stated in Section 2.2 above, a field walkdown of the area was performed by Projects. The walkdown consisted of a determination of the location of

RESULTS REPORT

ISAP II.e
(Cont'd)

5.0 IMPLEMENTATION AND DISCUSSION OF RESULTS (Cont'd)

the bolts and a UT measurement of the length of the installed Hilti bolts (Reference 9.4). It was determined that some of the bolts were long enough (greater than 7 inches) to have required holes to be drilled deep enough to potentially cut a rebar in the third layer. In addition, TNE performed calculations, assuming that a section of rebar in the first and third layers was cut (Reference 9.5). The calculations established that even if rebar in both the first and third layers had been cut along the east-west line next to one of the rails, the mat satisfies the requirements of the design criteria (i.e., ACI-318-71). DCA-7041 was revised to incorporate authorization for cutting both the first and third layers of rebar. The new calculations and DCA-7041, Rev. 10 were reviewed by the G&H Site Design Review Team and also by the third party.

In the subject case, and in the 62 other Hilti installations where potential for additional unauthorized rebar cutting was determined to exist (see Section 5.3), it has not been confirmed that additional rebar was actually cut because removal of the Hilti to allow inspection would lead to the destruction of the bolt or the concrete around the hole. Instead, it was conservatively assumed for evaluation purposes that the rebar was cut in all instances where it may have been cut as a consequence of drilling deeper than the design documents authorized.

Even if any rebar was actually cut by drilling in any of these cases, it is unlikely that the rebar was completely cut. It is probable that the drill bit and the rebar were not aligned perfectly and, further, in several cases the diameter of the drill bit was less than the diameter of the rebar. For example, the diameter of a No. 18 bar, potentially cut in the subject case, is 2.25 inches, while the diameter of the Hilti bolt was 1/2 inch, for which a 1/2 inch drill bit is used. As a result, the potential drilling into the 3rd layer No. 18 bar could not totally sever the bar, but could only reduce the cross-sectional area by 28 percent. However, in all evaluations, it was conservatively assumed that every rebar that could have been partially cut, was totally ineffective. These two assumptions provide a significant margin of conservatism in the results of the evaluations.

5.2 Review of Procedural Controls for Rebar Cutting

Procedural controls for cutting rebar either while drilling for Hilti installations or by core drilling were reviewed by the third party.

RESULTS REPORT

ISAP II.e
(Cont'd)

5.0 IMPLEMENTATION AND DISCUSSION OF RESULTS (Cont'd)

Hilti bolts range in size from 1/4 inch in diameter to 1 1/4 inch in diameter. Hilti bolts are installed by drilling into concrete using drill bits of the same nominal diameter as the bolt and by inserting the bolt into the hole. When the nut is tightened, the wedges around the bolt expand and the bolt is anchored.

Core drilling (also sometimes called core boring) is performed using special drives and core bits to drill an annular void and to remove the core of material from within the void.

The procedures relevant to rebar cutting activities in the context of Hilti installations were identified as the following:

- Construction procedure CEI-20, "Installation of 'Hilti' Drilled-in Bolts",
- Craft procedure CCP-47, "Requests for Rebar Cutting",
- Quality Control Procedure CP-QP-11.2 "Inspection of Concrete Anchor Bolt Installation",
- Quality Instruction QI-QP-11.2-1, "Installation of 'Hilti' Drilled-in Bolts".

The procedures relevant to core drilling were identified as the following:

- Craft procedure MCP-13, "Requests for Core Drilling",
- Quality Instruction QI-QA-11.0-6, "Inspection of Grouting".

The procedures were reviewed for the following aspects relevant to rebar cutting:

- The requirements for engineering approvals for rebar cutting;
- the method of drilling, including any details that relate to the possibility of cutting rebar; e.g., specification of equipment to be used;

RESULTS REPORT

ISAP II.e
(Cont'd)

5.0 IMPLEMENTATION AND DISCUSSION OF RESULTS (Cont'd)

- the requirements for QC inspection of the drilled holes to verify that either no rebar was cut or that rebar was cut in accordance with a DCA authorizing rebar cutting; and

- the control of drilling equipment capable of cutting rebar.

5.2.1 Procedures for Hilti Installations

Construction Procedure CEI-20 "Installation of 'Hilti' Drilled-In Bolts"

This procedure established the guidelines and requirements for the field installation of 'Hilti' drilled-in expansion anchors. The provisions of the procedure apply to Hilti bolts used for installation of safety-related equipment, and for the installation of non-safety-related equipment located in safety-related structures. Revision 0 of this procedure was issued on May 31, 1978.

Section 3.2.1 of the procedure states, in part,

> "Expansion bolt holes shall not be drilled into concrete reinforcing steel unless approved by the Gibbs & Hill resident engineer or his representative. Holes for the expansion bolts shall be drilled into concrete by the use of suitable power drills using 'Hilti' carbide masonry bits of the same nominal size as the bolt and which are designed and recommended by the Hilti Corporation specifically for this purpose."

These requirements have been repeated in all subsequent revisions of the procedure. It is noted that the carbide masonry bits are not capable of cutting through rebar (Reference 9.10).

Revision 7 of the procedure, issued on February 11, 1981, added in its Section 3.1.2.3.

> "Where cutting of structural reinforcing steel is permitted by the engineer, Drillco

RESULTS REPORT

ISAP II.e
(Cont'd)

5.0 IMPLEMENTATION AND DISCUSSION OF RESULTS (Cont'd)

> water cooled carbide/diamond bits or equal shall be used. Once the structural reinforcing steel is cut, the remainder of the hole shall be drilled with a 'Hilti' carbide masonry bit per 3.1.2.1." [Paragraph 3.1.2.1 of Revision 7 corresponds to Paragraph 3.2.1 of Revision 0.]

Section 3.1.2.4 of Revision 7 further added,

> "In limited access areas it may be difficult to drill holes for expansion bolts using equipment as required by 3.1.2.1. For this situation, a flexible drive drill with drill press/vacuum base and Drillco water cooled carbide/diamond bit or approved equal may be used. Caution shall be used when drilling to avoid the cutting of structural reinforcing steel. In no case shall structural reinforcing steel be cut without prior approval of the Engineer."

The requirements of Sections 3.1.2.3 and 3.1.2.4, have been repeated in the subsequent revisions of the procedure.

When drilling is performed, whether using carbide masonry bits or diamond drill bits, it is obvious to an operator when a rebar is encountered. Thus, the caution in Section 3.1.2.4 affords a practical means of controlling rebar cutting.

Revisions 1 and 2 of CEI-20 specified QC inspection requirements for Hilti bolts. In-process surveillance inspections performed at a frequency (once per shift) specified in the procedure were intended to verify that Hilti installations were performed in accordance with the guidelines of the procedure. All unsatisfactory conditions were to be reported on an Inspection Report. However, the Inspection Report for these inspections did not include specific requirements for a check of

RESULTS REPORT

ISAP II.e
(Cont'd)

5.0 IMPLEMENTATION AND DISCUSSION OF RESULTS (Cont'd)

the hole drilled for the Hilti to determine whether any rebar was cut, or to verify that rebar cutting was in accordance with design change documents. This observation was transmitted to the QA/QC Review Team for their consideration in collective evaluation. Since Revision 3 of the procedure (dated January 11, 1979), QC inspections have been addressed by reference to applicable QC procedures and instructions.

Craft Procedure CCP-47 "Requests for Rebar Cutting"

Revision 0 of this procedure was issued on June 17, 1981, and is still the current revision.

This procedure provides a method for controlling the requests for cutting of structural reinforcing steel embedded within structural concrete by requiring that a document, Rebar Cut Request (RCR), be used to communicate a rebar cut request to the Project Civil Engineering. It is noted that prior to June 1981, rebar cut requests were communicated to engineering by phone calls or memoranda (Reference 9.11); however, the requests were still to be dispositioned with engineering approvals documented in DCAs or CMCs.

Section 2.3 states,

> "The project civil engineer or his designee shall review the RCR to ascertain its correctness, determine the specific reinforcing steel being encountered, review the cutting criteria and rebar maps to determine the acceptability for cutting. If acceptable for cutting, a Design Change Authorization (DCA) will be issued indicating rebars to be cut."

Also, engineering approval was required before issuance of the DCA.

Quality Control Procedure CP-QP-11.2, "Inspection of Concrete Anchor Bolt Installation" and Quality Instruction QI-QP-11.2-1, "Installation of Hilti Drilled-In Bolts"

RESULTS REPORT

ISAP II.e
(Cont'd)

5.0 IMPLEMENTATION AND DISCUSSION OF RESULTS (Cont'd)

Revision 0 of CP-QP-11.2 and QI-QP-11.2-1 were issued on December 14, 1979 and December 13, 1979, respectively. Before this time, the requirements for Hilti installation inspections were specified in CEI-20. The generic inspection requirements are identified in CP-QP-11.2 while more detailed requirements are addressed in QI-QP-11.2-1. CP-QP-11.2 and QI-QP-11.2-1, Revision 0 and later revisions required inspections to be performed at a specified frequency to verify that Hilti installations were performed in accordance with the requirements of the CEI-20. Section 3.1 of QI-QP-11.2-1 specifically stated that concrete anchors were not to be drilled into reinforcing steel without written engineering approval. However, the Inspection Report for these inspections did not include specific requirements for a check of the hole drilled for the Hilti to determine whether any rebar was cut or to verify that rebar cutting was in accordance with design change documents. This observation is the same as was observed with respect to CEI-20 and was also transmitted to the QA/QC Review Team for their consideration in collective evaluation.

5.2.2 Procedures for Core Drilling

Construction Procedure MCP-13, "Requests for Core Drilling"

Revision 0 of this procedure was issued on September 27, 1977, and provides a method for controlling the request for core drills and obtaining required approvals. It applies to all core drilling in the plant. Core drilling is typically performed for installing wall/slab penetrations and installations of through or grouted-in anchor bolts.

Section 2.4.2.1 contains instructions for correct placement of core drill holes to prevent damage to embedded plant items. Sections 4.1.1 and 4.1.2 require the engineer responsible for the craft requesting the cutting of rebar to initiate a Core Drill Request (CDR)

RESULTS REPORT

ISAP II.e
(Cont'd)

5.0 IMPLEMENTATION AND DISCUSSION OF RESULTS (Cont'd)

detailing the size and location of the hole to be drilled. "The request form is then routed for review and approval through the B&R Engineering Department and the owner." The approval signature block on the CDR form includes a sign-off by civil engineering personnel as well as representatives of other disciplines, if appropriate. According to Section 4.2.1, "QA/QC notification of core drilling is required. The witness of work is a QA option, work may proceed if the QC inspectors are not available unless otherwise notified by QA/QC Department."

Later revisions of the procedure have maintained all of the requirements of Revision 0 and have added guidelines on chipping of concrete where needed for locating rebar. The requirement for QA notification was deleted in the second (May 28, 1980) and later revisions of the procedure. However, core drilled holes were inspected prior to grouting as discussed in Section 5.2.3 below.

5.2.3 Quality Instructions

Quality Instruction QI-QP-11.0-6, "Inspection of Grouting"

Revision 0 of this procedure was issued on July 28, 1976, and outlines the methods and criteria used to inspect grout pre-placement, placement and post-placement. The instruction is relevant to the subject issue through the fact that core bores except for special cases, e.g., in block-outs, are grouted. Revision 1, June 13, 1977, of procedure CCP-16, "Grouting of Base Plates, Bearing Plates, and Equipment Bases", which also applied to grouting of core bores, established the grout card as the place where the QC inspector documents his pre-pour checkout and acceptance by a signoff in accordance with the requirements of the QI-QP-11.0-6. The grout card required verification of "structural steel" but not of "rebar cutting" as a line item. Observed notations addressing rebar on the grout cards pertaining to pours involving rebar cuts indicated awareness of rebar cutting considerations. However, the formal inspection requirements did not address inspection of core bores for possible rebar cutting.

RESULTS REPORT

ISAP II.e
(Cont'd)

5.0 IMPLEMENTATION AND DISCUSSION OF RESULTS (Cont'd)

5.2.4 Results of Review

It was concluded that the procedure for Hilti installation, CEI-20, and the procedure for core drilling requests, MCP-13, established strict requirements for obtaining engineering approval prior to any rebar cutting.

For Hilti installations, since its original issue in May 1978, CEI-20 cautioned against drilling into reinforcing steel and specifically required the use of a carbide masonry bit which is not capable of cutting through rebar (Reference 9.10). If rebar needed to be cut, an engineering evaluation and a DCA were required. Hilti installations were inspected by QC under a Hilti surveillance program for conformance with CEI-20 requirements; however, inspections for rebar cutting were not documented.

In the subject case, the requirements of CEI-20 were followed to the extent that when the first layer of no. 18 East-West rebar was encountered, an engineering evaluation was performed and a DCA was issued that authorized cutting of the first layer. However, if the rebar in the third layer was cut as alleged, authorization to cut a rebar in both the first and third layers would have been required.

For core drilling, since its original issue in September 1977, MCP-13 cautioned about not damaging items embedded in concrete and required engineering evaluation and approval for every core bore. Pre-grouting inspections in accordance with QI-QP-11.0-6 required the involvement of Civil Engineering QC inspectors for every core bore that was grouted, i.e., essentially every core bore. However, inspection to verify that either no rebar was cut or that rebar was cut in accordance with engineering authorization was not specifically required.

No procedures were identified that would establish controls on equipment used for rebar cutting, i.e.,

RESULTS REPORT

ISAP II.e
(Cont'd)

5.0 IMPLEMENTATION AND DISCUSSION OF RESULTS (Cont'd)

core bore drill machines, diamond drill bits or core bore drill bits. Such procedures were not essential to preclude unauthorized rebar cutting, since the procedure on Hilti drilling (CEI-20) and core drilling (MCP-13) provided adequate controls. However, procedures controlling equipment would have added to the control of rebar cutting activities and reduced the possibility of unauthorized rebar cutting.

It is concluded that while the procedural controls governing drilling operations were adequate, additional requirements for QC inspections for all rebar cutting and controls of rebar cutting tools would have strengthened them. Current procedures have been strengthened in these respects as discussed in Section 8.0.

5.3 Review of Documentation of Rebar Cuts for Hilti Installations and Evaluation of Postulated Rebar Cuts

All Civil/Structural concrete outline and reinforcement drawings were reviewed by TNE to identify all DCAs and CMCs regarding rebar cuts for Hilti installations in units 1 and 2 (Ref. 9.6). A total of 189 such rebar cut cases were identified (113 DCAs and 76 CMCs). For each of these cases, design drawings were reviewed to determine whether there was rebar beneath the bar authorized for cutting that could potentially have been cut if a hole had been drilled deeper than implied by the authorization using a diamond drill bit. It was determined that in 62 cases such underlying rebar was specified in the design. TNE evaluated these 62 cases to determine structural adequacy, postulating that the additional rebar, not authorized to be cut, was cut, regardless of the length of the Hilti bolt installed. In all 62 cases the structures were found adequate. Therefore, it was not necessary from a structural point of view to determine if the additional rebar that could have been cut while drilling in the authorized locations, were in fact cut.

Identification of DCAs and CMCs regarding rebar cuts and the structural evaluations performed by TNE were reviewed and found acceptable by the third party (References 9.12 and 9.13).

RESULTS REPORT

ISAP II.e
(Cont'd)

5.0 IMPLEMENTATION AND DISCUSSION OF RESULTS (Cont'd)

5.4 Results of Ultrasonic Measurements

Within this Action Plan two methods were originally identified to evaluate and disposition Hilti installation cases where it was determined that the potential existed for cutting more rebar than authorized: 1) to determine whether the drilled hole was deep enough to possibly cut rebar and evaluate accordingly, or 2) to evaluate the structure, postulating that if a rebar was authorized for cutting, any underlying rebar was also cut. As discussed in Section 5.3, all cases with potential for unauthorized cutting were evaluated using the latter alternative. However, during the early execution of the Action Plan, the length of the Hilti bolts was determined by ultrasonic measurement (as discussed in Section 5.1) in nine additional cases (Reference 9.8). In six out of the nine cases the Hilti bolt was found to be long enough that rebar underlying the rebar that was authorized to be cut could also have been cut. In the other three cases the length of the Hilti was such that only the authorized cut should have been made (assuming the hole is, in accordance with the procedures, only one half inch deeper than the length of the Hilti bolt.) Based on these findings, the Hilti bolt length was not relied upon in dispositioning cases with potential unauthorized cutting. Instead, all of the 62 cases where there was rebar underlying the rebar authorized for cutting were evaluated postulating that the unauthorized cutting had occurred as discussed in Section 5.3.

5.5 Shear Lugs

An investigation to determine whether there were other work processes that might have caused rebar cuts revealed that rebar cutting also could have occurred when holes were drilled for shear lugs used in some pipe supports. A shear lug is a piece of round steel bar, up to nine inches long, with a diameter from one to two inches, welded at the back of a support base plate to increase the shear capacity of the pipe support anchorage. All pipe support drawings were reviewed to identify the supports utilizing a shear lug (Reference 9.9). Twenty-four (24) such supports were identified, one of which had QA documentation. Therefore an evaluation was performed for the concrete slab or wall where each of the remaining twenty-three (23) supports was installed assuming rebar was cut (Reference 9.14). In all cases, the structure was found to meet the design criteria.

RESULTS REPORT

ISAP II.e
(Cont'd)

5.0 IMPLEMENTATION AND DISCUSSION OF RESULTS (Cont'd)

5.6 Review of NRC Conclusion

An issue that was addressed in the SSER (Reference 9.1), concerned the fact that the number of diamond drill bits of the diameter sizes used for Hilti installations purchased for the plant appeared to be significantly larger than should have been needed based on the extent of rebar cutting documented in the DCAs authorizing rebar cutting. This raised questions concerning potential unauthorized use of diamond drill bits. The possibility that such use could have resulted in unauthorized rebar cuts was concluded by the NRC to be of "...inconsequential effect..." (Reference 9.1).

This issue was reopened in a meeting between NRC staff and the third party in October 1985, and the NRC staff indicated that an investigation of unauthorized use of diamond drill bits should be conducted.

The NRC staff based their original conclusion of inconsequential effect on an analysis that assumed a maximum of 5000 diamond drill bits had been used on the project by the time of the TRT investigations. The upper limit estimate of 5000 bits was arrived at by researching the purchase documents for drill bits. NRC further assumed, in accordance with the statements made by an individual who made allegations about unauthorized rebar cutting, that as many as 20 percent of the diamond drill bits may have been used in an unauthorized manner, and that up to five rebars could be cut with one drill bit. These assumptions combined with the estimate of approximately 800,000 to 1,200,000 rebars installed in the concrete structures of the plant, led to the NRC's conclusion that approximately 0.6 percent of the total rebar in the plant could have been cut in an unauthorized manner. It was further noted (Reference 9.1) that if every one of the 5,000 drill bits were used to cut rebar (5 bars per bit), only 3 percent of the total rebar at the plant could have been cut.

In response to the NRC staff's request to reconsider the diamond drill bit issue, the Project investigated all diamond drill bit purchase documents. After screening for those sizes of bits used for Hilti installations, and deducting the number of bits used for cuts through non-structural embedded steel, e.g., steel templates, and the bits in stock as of late 1986, it was estimated that the number of diamond drill bits that were available for rebar cutting was less than 2000 (Reference 9.15) rather than the 5,000 conservatively estimated by the NRC, as discussed above.

RESULTS REPORT

ISAP II.e
(Cont'd)

5.0 IMPLEMENTATION AND DISCUSSION OF RESULTS (Cont'd)

A further added margin of conservatism to the numbers presented by the NRC in the SSER is provided by the fact that the Project estimated the total amount of rebar in all concrete structures to be in the order of 2,000,000 (Reference 9.15) rather than the 800,000 to 1,200,000 assumed by the NRC.

Two crews, the steel fabrication department drilling crew and a millwright crew were assigned to perform drilling using diamond drill bits. The steel fabrication drilling crew typically drilled the small holes (2 inches or less in diameter) and the millwright crew did the larger core bores (Reference 9.16). (Drilling of concrete for Hilti installations using carbide masonry bits which could not cut rebar was not limited to the two special drilling crews.)

After the termination of his employment, allegations about unauthorized rebar cuts at unspecified locations were made by the foreman of the steel fabrication department drilling crew that performed most of the drilling involving rebar cutting for Hilti installations. (Reference 9.1). The foreman had maintained a diary about the drilling activities of his crew. He had stated that the diary included documentation of rebar cuts that had not been authorized and documented in appropriate design change documents. To assess the accuracy and implications of the allegations, the Project obtained a copy of the diary and thoroughly reviewed it. By comparing every rebar cut identified in the diary for seismic Category I buildings with the authorizations in the project documents, the Project determined that there were no more than ten rebar cuts that had not been authorized by the Project (Reference 9.17). All ten cases were for installations for which other rebar cuts had been authorized.

An estimate of the number of potentially unauthorized cuts performed by the drilling crew during the total construction period was extrapolated by multiplying the number of unauthorized cuts during the foreman's employment by the ratio of the number of design change documents authorizing cuts issued during the total construction period to the number of authorizations issued during the period of the foreman's employment (September 1978 - October 1979). This resulted in an estimate of a total of 22 potentially unauthorized rebar cuts in the concrete structures. This led to an estimate that at most 0.0013 percent of the approximately 1,650,000

RESULTS REPORT

ISAP II.e
(Cont'd)

5.0 IMPLEMENTATION AND DISCUSSION OF RESULTS (Cont'd)

rebar in the seismic Category I buildings of the plant (as compared to 2,000,000 in the total plant) have been subjected to some amount of cutting (Reference 9.18). This is significantly less than the NRC estimate of 0.6 percent that was stated in the SSER-8 for all concrete structures (Reference 9.1). This estimate of .0013 percent is judged to be reasonable, in part, because the controls on rebar cutting became more rigorous during the time frame following the foreman's employment.

Considering the fact that the steel fabrication department drilling crew performed practically all drilling for Hilti installations that required rebar cutting (Reference 9.10) (a millwright crew performed core drilling for holes with larger diameters) using special heavy drilling equipment providing water cooling to the drill bit, and the fact that the diary appears to be an accurately maintained log of the crew's activities, it can be judged that the diary provides strong evidence that the total number of unauthorized rebar cuts is well below the upper bound estimate presented by NRC in SSER-8.

Further, nine individuals, who allegedly had knowledge of potential use of diamond drill bits by personnel other than the crew assigned to perform drilling requiring rebar cutting, gave sworn statements denying any knowledge of unauthorized rebar cutting (Reference 9.1).

Collectively, the evidence supports the NRC's conclusion about the "inconsequential effect on the safety of the structures" of the issue of unauthorized cutting of rebar.

5.7 Summary of DIRs

Two DIRs concerning potential unauthorized rebar cutting in the Fuel Handling Building were written during implementation of the ISAP II.e. Both of these DIRs (E-0986 and E-1050) were written to document the concern expressed on the subject case in two separate NRC Reports. Based on the evaluation of the subject case, the two DIRs were classified as deviations, i.e., the possible (not confirmed) unauthorized rebar cutting represents a violation of a design criterion. The subject case was resolved by implementation of this Action Plan, ISAP II.e, and the two DIRs were closed.

RESULTS REPORT

ISAP II.e
(Cont'd)

5.0 IMPLEMENTATION AND DISCUSSION OF RESULTS (Cont'd)

5.8 Safety Significance Evaluation

The evaluation of the Fuel Building mat concluded that the structural design criteria are met even if a rebar in the third layer was cut as alleged. The evaluation of the 62 cases where rebar cutting was authorized but underlying rebar could also have been cut, concluded that even if the underlying rebar had been cut, the structural design criteria were met. The same conclusion was reached in the evaluations of the ten potentially unauthorized cuts identified in the alleger's diary. Based on these evaluations, and the fact that the potentially unauthorized cuts identified in the diary are at scattered locations, there is a reasonable assurance that other unauthorized rebar cuts would not present a safety significant deviation. This conclusion is in agreement with the conclusion of "inconsequential effect on the safety of structures" presented in the SSER (Reference 9.1). In conclusion, no deficiencies were identified in the investigations for this ISAP.

5.9 Root Cause and Generic Implications Assessment

The investigations performed under this action plan did not identify any deficiencies or adverse trends, thus an evaluation of root cause and generic implications is not required by the CPRT Program Plan.

6.0 CONCLUSIONS

The concrete mat at the 810'-6" elevation of the Fuel handling Building was found to be structurally adequate even if the second layer of No. 18 rebar was cut as alleged. The other identified locations where the possibility of unauthorized rebar cutting existed were also found to be structurally adequate assuming rebar was cut. The procedures specify requirements to perform drilling for Hilti installations and drilling core bores in such a way that, if they are followed, unauthorized rebar cutting cannot occur. This investigation did not identify any deficiencies.

7.0 ONGOING ACTIVITIES

There are no ongoing activities.

RESULTS REPORT

ISAP II.e
(Cont'd)

8.0 ACTION TO PRECLUDE OCCURRENCE IN THE FUTURE

Procedures CEI-20 and QI-QP-11.2-1 were revised to strengthen the controls of rebar cutting in order to minimize the possibility of future occurrences of unauthorized rebar cutting when drilling for Hilti installations. The revised procedures require that if rebar cutting is performed, a construction traveler be used and that a QC inspector inspect the bolt holes to ascertain that the rebar is cut in accordance with the issued design change authorization. The QC inspection for rebar cutting will be documented.

Procedures MCP-13 and QI-QP-11.0-6 were revised to require that if rebar cutting is performed, a construction traveler be used with a "hold point" for QC inspection to verify that any rebar cutting is completed in accordance with the issued design change authorization. This strengthens procedural controls of rebar cutting due to core boring.

MCP-13 was further revised to establish controls on the diamond drill bits and core bore bits; new requirement will restrict issuance of those bits only to the cognizant craft foreman responsible for core drilling against the rebar cutting traveler. The General Mechanical Superintendent or his Assistant signs on the traveler for his approval of issuance of the drill bit.

9.0 REFERENCES

9.1 NUREG-0797, Supplement No. 8, "Safety Evaluation Report Related to the Operation of Comanche Peak Steam Electric Station, Units 1 and 2", pages K-89-91, February 1985.

9.2 Operation Traveler ME-82-1454-6000.

9.3 Design Change Authorization, DCA-7041 Revision 7.

9.4 Memorandum, J. Arros to ISAP II.e File, August 25, 1987.

9.5 Comanche Peak Project Civil Engineering Calculation SFB-102C, Set 1, Revision 10 with supplementary information.

9.6 TNE-CPSES Calculation Sheet, "TRT-Issue II.e, Investigation into Possibility of Additional Rebar Cuts - Other Than Those Previously Authorized - for Hilti Bolt Installation" M. M. Kamble, June 12, 1986, with supplementary information.

RESULTS REPORT

ISAP II.e
(Cont'd)

9.0 REFERENCES (Cont'd)

9.7 TUGCO Memorandum, C. R. Hooton to B. K. Bhujang, "Comanche Peak Steam Electric Station, TRT Issue II.e, Evaluation of Rebar Cuts", March 6, 1986, with supplementary information.

9.8 Final Report "Ultrasonic Length Measurement of Selected Bolting at the CPSES Units 1 and 2":, Rev. 1 Southwest Research Institute, September, 1985.

9.9 Memorandum to ISAP II.e File "Project Identification of Pipe Supports Utilizing Shear Lugs", G. Braun, August 20, 1987.

9.10 TERA Contact Log, Ben Hauser, Bob Prather, J. Arros, August 12, 1987.

9.11 TERA Contact Log, J. Arros with S. McBee, August 3, 1987.

9.12 TENERA Notes, "TRT Issue II.e, Review of Project's Identification of CMCs and DCAs Related to Hilti Rebar Cutting", F. Ramezanbeigi, July 14, 1986.

9.13 TENERA Notes, "TRT Issue II.e, Review of Project's Evaluation of Postulated Additional Rebar Cuts due to Hilti Installations", F. Ramezanbeigi, July 14, 1986.

9.14 TENERA Notes, "Review of Shear Lug Calculations TRT-Issue II.e", F. Ramezanbeigi, June 12, 1986.

9.15 STIR CPRT-S-004, Rev. 0, "Rebars Improperly Drilled/Cut During Hilti Expansion Anchor Installation" June 12, 1987.

9.16 Letter, USNRC to TUGCO, G. L. Madsen to R. J. Gary, September 29, 1983.

9.17 Memorandum, F. Ramezanbeigi to J. Arros, "Third Party Check of SWEC's Review of Messerly's Diary", September 1, 1987.

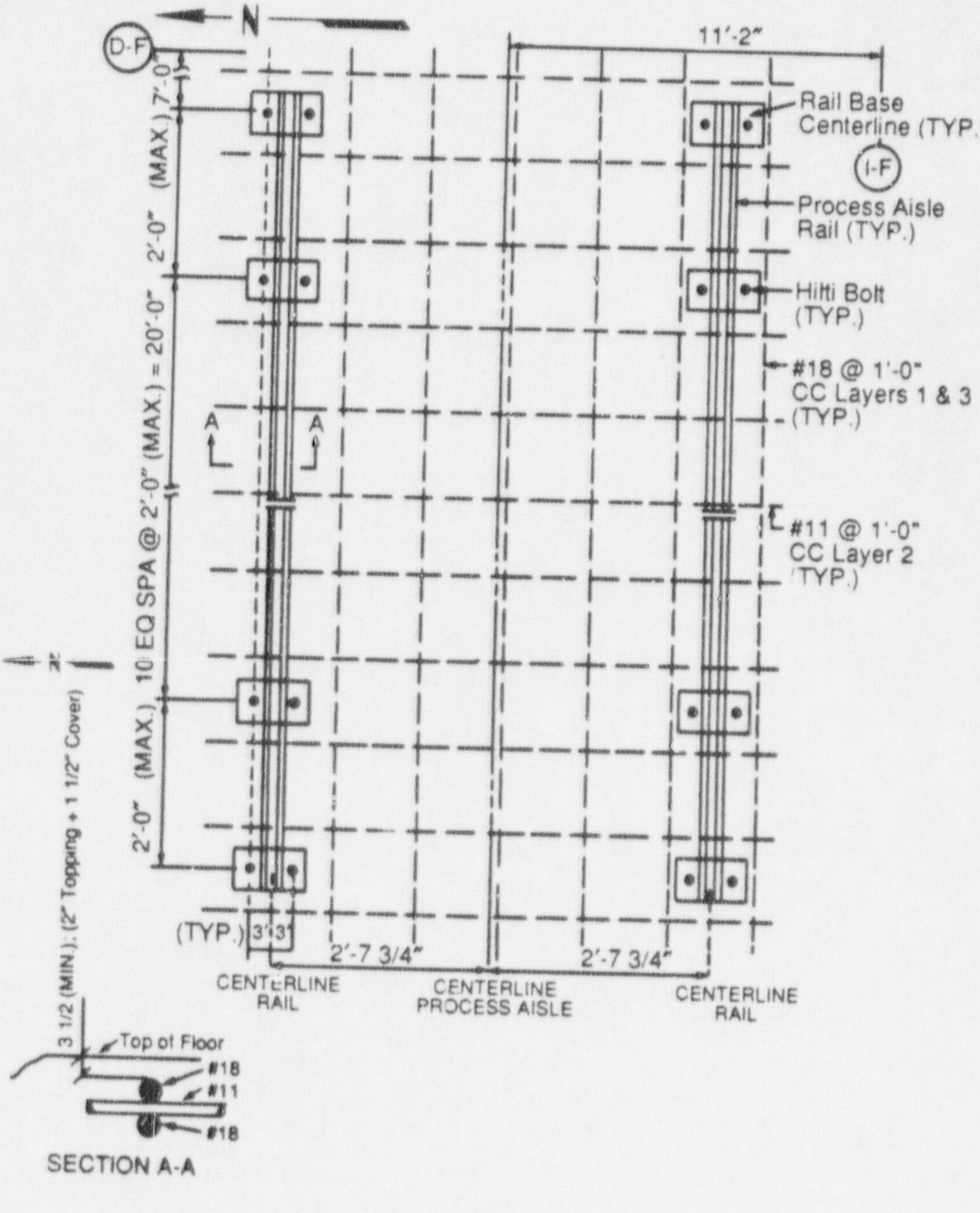
9.18 Memorandum, F. Ramezanbeigi to J. Arros, "Third Party Check of SWEC's Estimate of Total Number of Rebars Received at CPSES", September 1, 1987.

RESULTS REPORT

ISAP II.e
(Cont'd)

Figure 1

Fuel Building Slab at Elevation 810'-6"
Partial Plan Showing Process Aisle Rail, Hilti Bolt Location
and Positions of Upper Three Layers of Rebar



COMANCHE PEAK RESPONSE TEAM

RESULTS REPORT ERRATA

JULY 21, 1987

ISAP:V.a

TITLE: Inspection For Certain Types Of Skewed Welds In NF Supports

Rawinder K Sanan
Issue Coordinator

8·6·87
Date

Review Team Leader

8-13-87
Date

John W. Beck
John W. Beck, Chairman CPRT-SRT

9/2/87
Date

RESULTS REPORT ISAP Va REV. 1
SKEWED WELDS

ERRATA

Pg 5, Subsection 4.1.2

Change: Add at the end of the subsection:
The revision has no physical significance.
It did not change the measurement techniques or the inspection requirements.

Reason: Statement of physical significance of changes.

Pg 8, Subsection 4.6

Change: Add at the end of the subsection:

It was established that no supports exceeded the ASME Code allowables.

Reason: Statement on need for modifications

Pg 13, Three places

Change: Change QI-QAP-12.1 to CP-QAP-12.1

Reason: Typographical error

Pg 18, Second paragraph

Change: Change the paragraph to read:

Fourteen (14) welded supports had a record documenting a QC inspection at fit-up of the type-2 skewed welds. Eight (8) of these welds were fit-up inspected prior to October 18, 1984. (From this date on, partial penetration welds were required by construction procedure CP-CPM-6.9G, Rev. 6 DCN #003 to have the fit-up inspection). Since the fit-up inspection would not have been required prior to that date unless the scribe line technique was intended to be used, it is considered probable that at least those eight (8) welds were inspected using the scribe line technique. Of the remaining six (6), it is also considered probable that the scribe line technique was used, because the inspector had to inscribe the lines to inspect the fit-up, and he or another inspector would most likely have taken advantage of the existing scribe lines to proceed with the weld inspection.

Reason: Clarify a statement in the original paragraph about fit-up inspections of these welds prior to January 25, 1985 not being required, and the associated logic about skewed welds being inspected using the scribe line technique.

Pg 18, Third paragraph, third sentence

Change: "Eleven of these inspectors..." to read "Twelve of these inspectors..."

Pg 18, Third paragraph, fourth sentence

Change: "The remaining two inspectors each..." to read "The remaining inspector..."

Reason: Original statements were based on the inspection signoff, these statements reflect the identification of the actual inspector.

Pg 38, Third column

Change: "Rev. 8 (05/02/82)" to "Rev. 8 (05/20/82)"

Reason: Typographical error

Pg 38, Second column

Change: "Rev. 16 (12/15/83)" to "Rev. 16 (12/15/82)"

Reason: Typographical error

Pg 39, Third column

Change: "thru 06/28/86)" to "thru 06/28/83)"
"thru 08/02/82)" to "thru 08/02/83)"

Reason: Typographical errors

Pg 40, Second column

Change: "thru 04/14/85)" to "thru 04/24/85)"
"thru 04/15/85)" to "thru 04/25/85)"

Reason: Typographical errors

Table 4

Change: Replace the table with the attached Table 4 Errata. Table 4 of Revision 1 identified the individual who signed off the inspection records. He may not always be the same as the individual who performed and initialed for the actual inspection. The new table identifies the actual inspector and the inspection checklist and also corrects typographical errors.

RESULTS REPORT

ISAP V.a
(Cont'd)

Table 4

QC Document Package Review for Skewed Welds

Hanger/Support No.	Unit No.	Skewed Weld Description	B&R Inspection	Inspect Date	B&R Procedure No.	Rev. No.	Inspector	Checklist Type	Comments
SI-2-071-405-632K	2	1/4" Fillet TS 6"x6"x3/8" to 3/4" Saddle	Skewed Welds	12-14-84	QI-QAP-11.1-28	28	E. Rey	MWDC	
CC-1-202-001-653A	1	6"x6" x 1/2" TS to 3/8" saddle 5/16" Fillet	Skewed Welds	11-16-83	CP-QAP-12.1	9	T. Coleman	QC-CSC	
CT-2-005-403-622K	2	6"x6" x 3/8" TS to 1/2" saddle 5/16" Fillet	Skewed Welds	09-14-84	QI-QAP-11.1-28	25	Clem Mathews	WICL	Note 1
				07-08-82	QI-QAP-11.1-28	10	R. Ondrecek	MWDC	
CC-X-022-001-F43A	Common	10" Sch 80 Pipe to 3/4" T saddle 1/2" fillet	Skewed Welds	04-13-83	CP-QAP-12.1	9	R. Allstrom	QC-CSC	Note 1

Note 1: NCR condition in reinspection under ISAP V.a
Note 2: Fitup holdpoint for skewed weld checked on MWDC

RESULTS REPORT

ISAP V.a
(Cont'd)

Table 4
(Cont'd)

Hanger/Support No.	Unit No.	Skewed Weld Description	B&R Inspection	Inspect Date	B&R Procedure No.	Rev. No.	Inspector	Checklist Type	Comments
AF-2-101-431-S33A	2	3"Sch. 80 to 1/2" saddle 5/16" groove + 1/8" x 1/4" fillet	Skewed Welds	03-09-84	QI-QAP-11.1-28	24	D. Hayes	WICL	Note 2
CC-2-158-408-A43K	2	6"x6"x1/2" TS to 3/4" saddle 1/4" fillet	Skewed Welds	11-17-83	CP-QAP-12.1	9	S. Sanders	QC-CSC	
CC-1-009-016-A43A	1	8" Sch. 40 to 1/2" saddle 1/4" groove + 1/2" fillet	Skewed Welds	01-24-84	CP-QAP-12.1	10	S. Sanders	QC-CSC	
RH-1-001-010-C41K	1	6"x6"x1/2" TS to 1/2" saddle 1/4" fillet	Skewed Welds	08-26-83	CP-QAP-12.1	7	M. Ivey	QC-CSC	

RESULTS REPORT

ISAP V.a
(Cont'd)

Table 4
(Cont'd)

Hanger/Support No.	Unit No.	Skewed Weld Description	B&R Inspection	Inspect Date	B&R Procedure No.	Rev. No.	Inspector	Checklist Type	Comments
RC-1-146-003-C81K	1	2" Sch. 160 to 1/2" saddle 1/4" fillet	Skewed Welds	03-15-84	CP-QAP-12.1	10	W. Campbell	QC-CSC	
CT-1-049-415-C92A	1	6" x 4" x 1/2"TS to 1/2" Saddle 7/16" fillet	Skewed Welds	06-14-83	CP-QAP-12.1	6	J. Stanford	QC-CSC	Note 1
CC-2-116-006-F43A	2	12" Sch 40 to 14" Sch 80 pipe stanchion 5/6 fillet 12" SCH 40 to 6" SCH 40 1/4" fillet	Skewed Welds	04-20-83	CP-QAP-12.1	6	F. Evans	QC-CSC	
AF-2-006-412-S33A	2	6" Sch 80 to 1/2" plate 3/8" grove + 3/8" fillet	Skewed Weld #6	12-12-83	QI-QAP-11.1-28	23	V. Frost	WICL	Note 2
			Skewed Weld #5	12-9-83	QI-QAP-11.1.28	23	L. Fields	WICL	Note 2

RESULTS REPORT

ISAP V.a
(Cont'd)

Table 4
(Cont'd)

Hanger/Support No.	Unit No.	Skewed Weld Description	B&R Inspection	Inspect Date	B&R Procedure No.	Rev. No.	Inspector	Checklist Type	Comments
RH-2-064-406-S22R	2	3"x3" x 1/4" TS to 1/2" saddle 3/16" Fillet	Skewed Welds	08-31-84	QI-QAP-11.1-28	25	S. Duncan	MWDC	
RC-1-135-004-C51K	1	8"x8" x 1/2" TS to 1/2" saddle 5/16" fillet	Skewed Welds	08-16-83	CP-QAP-12.1	4	W. Chadwick	QC-CSC	
				02-14-83	QI-QAP-11.1-28	17	M. Kaplan	MWDC	
CS-2-597-403-C42A	2	1/4" groove + 3/16x1/4" fillet saddle to trunnion	Skewed Welds	03-27-85	QI-QAP-11.1-28	29	A. Linzy	MWDC	Note 2
CT-1-013-421-C82R	1	6" Sch 40 to 3/4" saddle 1/4" fillet	Skewed Welds	06-23-83	CP-QAP-12.1	6	D. McDonald	QC-CSC	

RESULTS REPORT

ISAP V.a
(Cont'd)

Table 4
(Cont'd)

Hanger/Support No.	Unit No.	Skewed Weld Description	B&R Inspection	Inspect Date	B&R Procedure No.	Rev. No.	Inspector	Checklist Type	Comments
MS-1-004-009-C62K	1	16" Sch 60 pipe to 1-1/2" T saddle 5/8" fillet	Skewed Welds	08-23-83	CP-QAP-12.1	9	R. Daigle	QC-CSC	Note 1
				07-11-83	QI-QAP-11.1-28	21	J.R.Parker	MWDC	
BR-X-106-059-S43A	Common	4" Sch 80 to 3/8" ss pl. 3/16" fillet 4" Sch 80 to 6" Ø Sch 120 Stanchion 1/4" fillet	Skewed Welds	08-18-83	CP-QAP-12.1	8	T. Coleman	QC-CSC	
AF-2-004-405-S33A	2	4"x6"x3/8" TS to 1/2" T saddle 3/8" groove + 3/16" x 3/8" fillet	Skewed Welds	02-16-84	QI-QAP-11.1-28	23	V. Frost	WICL	Note 2

RESULTS REPORT

ISAP V.a
(Cont'd)

Table 4
(Cont'd)

Hanger/Support No.	Unit No.	Skewed Weld Description	B&R Inspection	Inspect Date	B&R Procedure No.	Rev. No.	Inspector	Checklist Type	Comments
CT-2-039-404-C42A	2	3" Sch 80 to 3/8" Saddle 1/4" fillet	Skewed Welds	02-11-84	QI-QAP-11.1-28	23	D. Hayes	WICL	
CC-1-035-018-A33A	1	5" Sch 40 to 3/8" saddle 5/16" fillet	Skewed Welds	10-21-83	CP-QAP-12.1	9	E. Ray	QC-CSC	
DO-1-038-003-S63K	1	24" Sch 100 to 1/2" Saddle 1/4" fillet	Skewed Welds	07-13-83	CP-QAP-12.1	7	M.C. Welch	QC-CSC	
CT-2-038-404-C52A	2	4" x 2"x 1/4" TS to 1/2" saddle 1/4" fillet	Skewed Welds	03-22-84	QI-QAP-11.1-28	23	J. Barrett	WICL	

RESULTS REPORT

ISAP V.a
(Cont'd)

Table 4
(Cont'd)

Hanger/Support No.	Unit No.	Skewed Weld Description	B&R Inspection	Inspect Date	B&R Procedure No.	Rev. No.	Inspector	Checklist Type	Comments
MS-1-03-005-C72K	1	18" Sch 80 to 1" saddle 3/8" fillet	Skewed Welds	07-10-83	CP-QAP-12.1	7	A.R. Bagley	QC-CSC	
SI-2-038-409-S22A	2	1/4" groove + 1/4" fillet. TS 4"x4"x1/2" to saddle	Skewed Welds	07-03-84	QI-QAP-11.1-28	25	A. Linzy	MWDC	Note 2
RH-2-016-401-S22K	2	5/16 groove + 3/16 x 5/16 fillet 4"Ø Trunnion to 3/4" saddle.	Skewed Welds	12-20-84	QI-QAP-11.1-28	28	M. Osterday	WICL	Note 2
AF-1-002-033-Y33K	1	4"x4"x1/2" TS to 3/4" saddle 5/16" fillet	Skewed Welds	09-07-83	CP-QAP-12.1	9	F. L. Harper	QC-CSC	

RESULTS REPORT

ISAP V.a
(Cont'd)

Table 4
(Cont'd)

Hanger/Support No.	Unit No.	Skewed Weld Description	B&R Inspection	Inspect Date	B&R Procedure No.	Rev. No.	Inspector	Checklist Type	Comments
SW-2-035-703-J03R	2	8"x8"x3/8" TS to 24" Sch 20 saddle 3/16" fillet	Skewed Welds	06-29-83	CP-QAP-12.1	7	J. Staus	QC-CSC	
CC-X-079-006-A43A	Common	18" Sch 40 to 3/4" saddle 3/8" fillet	Skewed Welds	09-26-83	CP-QAP-12.1	9	S. Duncan	QC-CSC	
MS-1-002-008-C72K	1	16" Sch 60 pipe to 1-1/4" T saddle 1/2" fillet	Skewed Welds	03-01-84	CP-QAP-12.1	10	W. Campbell	QC-CSC	Note 1
CT-1-053-404-C62A	1	3" Sch 80 to 4" Sch 60 saddle 1/4" fillet	Skewed Welds	07-05-83	CP-QAP-12.1	7	M. Holder	QC-CSC	

RESULTS REPORT

ISAP V.a
(Cont'd)

Table 4
(Cont'd)

Hanger/Support No.	Unit No.	Skewed Weld Description	B&R Inspection	Inspect Date	B&R Procedure No.	Rev. No.	Inspector	Checklist Type	Comments
SI-1-037-005-S32A	1	6" Sch 80 to 3/4" T saddle 1/2" fillet	Skewed Welds	10-03-83	CP-QAP-12.1	9	F. Coleman	QC-CSC	
DD-1-012-033-Y33A	1	4" Sch 80 to 3/8" saddle 1/4" fillet	Skewed Welds	10-04-83	CP-QAP-12.1	9	J. Wasylyszyn	QC-CSC	Note 2
CS-1-597-006-C42A	1	3" Sch 160 to 4" Sch 160 saddle 1/4" fillet	Skewed Welds	12-05-83	CP-QAP-12.1	9	D. Lankford	QC-CSC	
VA-X-05-716-A73K	Common	8" Sch 40 to 5/8" saddle 1/4" fillet	Skewed Welds	06-07-83	CP-QAP-12.1	6	P. Atkins	QC-CSC	

RESULTS REPORT

ISAP V.a
(Cont'd)

Table 4
(Cont'd)

Hanger/Support No.	Unit No.	Skewed Weld Description	B&R Inspection	Inspect Date	B&R Procedure No.	Rev. No.	Inspector	Checklist Type	Comments
AF-2-084-401-S33A	2	6" Sch xxS to 1/2" Saddle 7/8" groove and 7/16" x 7/8" fillet	Skewed Welds	06-08-85	QI-QAP-11.1-28	30	G. Groesnickle	MWDC	Note 2
BR-X-001-720-A53A	Common	3" Sch 160 to 1/2" T saddle 3/8" fillet	Skewed Welds	07-25-83	CP-QAP-12.1	7	D. Nisich	QC-CSC	Note 1
CC-1-087-004-A33A	1	8"x8"x5/8" TS to saddle 3/8" groove + 3/8" fillet	Skewed Welds	06-14-84	QI-QAP-11.1-28	24	G. Daugherty	WICL	Note 1
RC-1-135-008-C41K	1	6"x6"x5/8" TS to 3/4" saddle 1/4" fillet	Skewed Welds	10-05-83	CP-QAP-12.1	9	D. Lankford	MWDC	

RESULTS REPORT

ISAP V.a
(Cont'd)

Table 4
(Cont'd)

Hanger/Support No.	Unit No.	Skewed Weld Description	B&R Inspection	Inspect Date	B&R Procedure No.	Rev. No.	Inspector	Checklist Type	Comments
CC-1-235-006-C53R	1	2" Sch 80 to 3/8" saddle 1/4" fillet	Skewed Welds	06-08-83	CP-QAP-12.1	6	H. Higgins	QC-CSC	
AF-2-009-413-S33A	2	4"Sch 160 to 3/4" saddle 5/16" groove + 3/16x5/16" fillet	Skewed Welds	07-11-84	QI-QAP-11.1-28	25	T. Coleman	WICL	Note 2
CT-1-039-423-C42A	1	3" Sch 80 to 1/2" plate 1/4" fillet	Skewed Welds	09-28-83	CP-QAP-12.1	9	J. Massey	QC-CSC	
CT-1-054-431-C42A	1	3" Sch 80 to 5" Sch 120 saddle 1/4" fillet	Skewed Welds	09-09-83	CP-QAP-12.1	9	J.M. Rodgers	QC-CSC	

RESULTS REPORT

ISAP V.a
(Cont'd)

Table 4
(Cont'd)

Hanger/Support No.	Unit No.	Skewed Weld Description	B&R Inspection	Inspect Date	B&R Procedure No.	Rev. No.	Inspector	Checklist Type	Comments
CT-1-042-401-C82A	1	6"x6"x1/2" TS to 1/2" saddle 7/16" fillet	Skewed Welds	12-8-83	CP-QAP-12.1	9	J. Lloyd	QC-CSC	Note 1
CT-2-127-403-C72A	2	6" Sch 40 to 1/2" saddle 1/4" groove + 1/8"x1/4" fillet	Skewed Welds	06-07-85	QI-QAP-11.1-28	30	R. Boykin	CSF & SWIR	Note 2
CT-1-127-403-C72A	1	6" Sch 80 to 1/2" saddle 5/16" fillet	Skewed Welds	07-10-83	CP-QAP-12.1	7	A.R. Bagley	QC-CSC	
MS-1-002-012-C72S	1	10"x6"x1/2" TS To 1/2" saddle 1/4" Fillet	Skewed Welds	10-24-83	CP-QAP-12.1	9	P. Brown	QC-CSC	

RESULTS REPORT

ISAP V.a
(Cont'd)

Table 4
(Cont'd)

Hanger/Support No.	Unit No.	Skewed Weld Description	B&R Inspection	Inspect Date	B&R Procedure No.	Rev. No.	Inspector	Checklist Type	Comments
CC-1-065-003-S33R	1	6" Sch 80 (Stanchion) to 3/4" plate 3/8" fillet	Skewed Welds	12-06-83	CP-QAP-12.1	9	F. Coleman	QC-CSC	
DD-1-012-724-A33A	1	3" pipe to 5"Ø Sch 120 saddle 3/16" fillet	Skewed Welds	09-09-83	CP-QAP-12.1	9	S. Duncan	QC-CSC	
MS-1-003-009-C72K	1	3/4" fillet for 10" Sch 140 to 20" Sch 80	Skewed Welds	12-29-83	CP-QAP-12.1	9	M. Cannon	QC-CSC	
CT-1-033-414-C92A	1	4"x4"x1/2" TS to 1/2" saddle 5/16" fillet	Skewed Welds	07-02-83	CP-QAP-12.1	7	J. Lloyd	QC-CSC	Note 1
CC-1-019-003-A33R	1	16" Sch 40 to 3/4" saddle 3/8" fillet	Skewed Welds	08-30-83	CP-QAP-12.1	9	B. Coffin	QC-CSC	Note 1

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ISAP V.a
(Cont'd)

Table 4
(Cont'd)

Hanger/Support No.	Unit No.	Skewed Weld Description	B&R Inspection	Inspect Date	B&R Procedure No.	Rev. No.	Inspector	Checklist Type	Comments
CC-2-028-414-S33R	2	8" Sch 40 to 3/4" saddle 5/16" groove and 5/16"x 3/16" fillet 14" Sch 40 to 3/4" saddle 7/16" groove + 7/16x1/4" fillet	Skewed Welds	10-24-84	QI-QAP-11.1-28	26	C. Swindell	WICL	Note 2
CC-1-109-005-A43A	1	8" Sch 40 to 1/2" saddle 3/8" fillet	Skewed Welds	12-01-83	CP-QAP-12.1	9	S. Duncan	QC-CSC	
CC-1-173-012-S53A	1	4" Sch 80 to 1/2" saddle 1/2" fillet	Skewed Welds	07-29-83	CP-QAP-12.1	7	M. Kaplan	QC-CSC	Note 1
MS-2-416-405-S43R	2	6"x6"x3/8" TS to 3/4" saddle 3/8" groove + 3/8" fillet	Skewed Welds	06-26-85	QI-QAP-11.1-28	30	R. Boykin	CSF & SWIR	Note 2

RESULTS REPORT

ISAP V.a
(Cont'd)

Table 4
(Cont'd)

Hanger/Support No.	Unit No.	Skewed Weld Description	B&R Inspection	Inspect Date	B&R Procedure No.	Rev. No.	Inspector	Checklist Type	Comments
CC-1-065-002-S33R	1	3/4" plate to 3/4" plate 5/16" fillet	Skewed Welds	12-15-83	CP-QAP-12.1	9	F. Coleman	QC-CSC	Note 1
CC-2-068-405-S33R	2	8" Sch 40 to 1/2" saddle Groove and 5/32"x5/16" fillet	Skewed Welds	03-28-85	QI-QAP-11.1-28	29	C. Mathews	WICL	Note 2
AF-1-006-013-S33A	1	6" Sch 80 to 1/2"saddle 3/4" fillet	Skewed Welds	11-11-83	CP-QAP-12.1	9	K. Crider	QC-CSC	
CC-2-028-411-S33K	2	3/4" saddle to TS 1/2"x8"x8" 5/16" fillet	Skewed Welds	02-07-85	QI-QAP-11.1-28	29	K. Moss	WICL	Note 2

COMANCHE PEAK RESPONSE TEAM

RESULTS REPORT

DSAP IX

TITLE: PIPING AND SUPPORTS DISCIPLINE SPECIFIC ACTION PLAN

REVISION 1

E A Wais
Discipline Coordinator

8/27/87
Date

Howard A. [illegible]
Review Team Leader

8/27/87
Date

John W. Beck
John W. Beck, Chairman CPRT-SRT

9/3/87
Date

COMANCHE PEAK RESPONSE TEAM

DESIGN ADEQUACY PROGRAM

DISCIPLINE SPECIFIC RESULTS REPORT: PIPING AND SUPPORTS

DAP-RR-P-001
Revision 1
August 27, 1987

TENERA, L.P.
1995 University Avenue Berkeley, California 94704 415-845-5200

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1.0 EXECUTIVE SUMMARY AND CONCLUSIONS

This Results Report summarizes the results of a Third Party review of the adequacy of certain large bore piping and supports at the *Comanche Peak Steam Electric Station* (CPSES) as described in Section 2.0. This review was performed as part of the *Design Adequacy Program* (DAP) under the charter of the *Comanche Peak Response Team* (CPRT) Program Plan *(Reference 7.1)* by a Third Party Organization (TENERA, L.P.) The approach, methodology, and scope developed to accomplish this review are described in *Discipline Specific Action Plan* (DSAP) IX (Appendix C of the CPRT Program Plan) as modified in Appendix A of Reference 7.1.

The purpose of DSAP IX is to determine with reasonable assurance the adequacy of the design of certain piping and piping supports at CPSES. "Adequacy" is defined as conformance to the CPSES *Final Safety Analysis Report* (FSAR) and licensing commitments, including appropriate codes and standards.

The scope of this review, which involves external source concerns, has been categorized into thirty-two "*external source issues*," each of which has been the subject of an engineering evaluation. These issues were identified in publicly available NRC docketed information. The purpose of this report is to summarize the results of these evaluations and to provide conclusions regarding the adequacy of the design aspects reviewed by the Third Party.

The Third Party overview of the *Stone and Webster Engineering Corporation* (SWEC) pipe stress reanalysis and pipe support requalification program has been completed. This effort involved evaluation of SWEC's methodologies that address resolution of the concerns related to the thirty-two external source issues. This scope involved large bore pipe stress reanalysis and large bore pipe support requalification, including the basis for the methods discussed in the procedures to be used in these activities. Other activities, including the review of technical procedures for reanalysis and requalification of small bore piping and supports and the overview of the implementation of procedures for both types of piping including verification of design input, such as construction/as-built verification, will be addressed as part of the TU Electric Quality Assurance Technical Audit Program (See Reference 7.2).

This report summarizes the results and presents the conclusions from this Third Party review.

The activities addressed in this report are as follows:

- Issue Review (DSAP IX, Section 4.2.1.1)
- Commitment Verification (DSAP IX, Section 4.2.1.2)
- Large bore piping reanalysis and support requalification procedures review (DSAP IX, Section 4.2.1.3)

Briefly stated, the review identified external source issues, established applicable criteria based on the CPSES FSAR and licensing commitments, reviewed SWEC's procedures against those criteria, and evaluated the resolution methodologies for the issues. The resolution methodologies were presented in SWEC's *Generic Issues Report* (GIR) *(Reference 7.3)* and incorporated into SWEC's procedures. Considerations regarding root causes and generic implications and the programmatic aspects of the external source issues will be addressed as part of the TU Electric programs for processing and evaluation of nonconformance and discrepancy reports (See Reference 7.2).

As required in DSAP IX, the Third Party identified external source issues by conducting a document review. The Third Party review of over 40,000 pages of documents resulted in the issuance of approximately 800 piping-related *Discrepancy/Issue Resolution Reports* (DIRs) which documented concerns raised by external sources. These DIRs were consolidated into *External Source Issue Summaries* (ESISs, which are also referred to as "issues"), to facilitate efficient resolution of the concerns. These DIRs and ESISs were forwarded to SWEC and form the basis for the scope of this report.

SWEC procedures were reviewed for compliance with applicable CPSES FSAR and licensing criteria. Licensing commitments applicable to CPSES were used to establish a listing of criteria which were then used to check SWEC procedures. The procedures were determined to be in compliance either with the existing criteria or criteria changes that were accepted by the NRC for submittal as FSAR amendments. (see NRC letter to TUGCO dated November 4, 1986, *Reference 7.4*).

As documented in the GIR and its procedures, SWEC addressed each of the thirty-two issues using one or more of the following options:

- Elimination of selected designs
- Use of analysis and design practices that are typical of industry practice
- Development of new methods specifically applicable to the concerns raised
- Use of more advanced analysis techniques or testing to confirm the adequacy of analysis and design methods
- Use of SWEC Corporate Quality Assurance Program
- Implementation of project specific procedures for control of all phases of design and design interfaces

For each of the thirty-two issues, the resolution methodology has been reviewed by the Third Party and found to be responsive to the concern and in compliance with applicable FSAR and licensing criteria. The Third Party has concluded that the overall objectives of the review have been met, and considers all piping-related external source issues applicable to the large bore piping scope to be closed with respect to the methodology being applied to the requalification effort assuming the NRC approves the FSAR amendments.

The Third Party has concluded that SWEC's large bore pipe stress reanalysis and pipe support requalification program is comprehensive and capable, if properly implemented, of resolving known issues. Proper implementation will ensure that the CPSES large bore piping and supports will meet the FSAR and licensing commitments.

2.0 SCOPE

This report addresses three areas of review identified in DSAP IX as follows:

- **Issues** - The Third Party identified, reviewed, and tracked external source identified issues which were raised regarding pipe analysis and pipe support design. This effort also included consideration of TRT Issue V.c (*Reference 7.5*) which addresses design considerations for piping between seismic Category I and non-seismic Category I buildings. The criteria and methodology used by the Project (SWEC) for analysis of these systems were reviewed by the Third Party. This review provides reasonable assurance that the external source issues have been identified and that criteria and methodology used by the Project address all identified issues.
- **Commitment Verification** - The Third Party verified that commitments which establish piping and support-related design criteria and standards are adequately addressed in procedures and other Project documents. The commitment sources included the FSAR, design specifications, and the ASME Codes of Record for piping *(Reference 7.6)* and for piping supports (*Reference 7.7*). For each criterion source and standard identified, the appropriate criteria and commitments were summarized. These criteria were used in the development of checklists for the review of specific program areas. This review ensures that Project procedures are consistent with applicable criteria and commitments.

  Where criteria changes have been submitted by the project to resolve differences between the approved FSAR and Project procedures (documented on C-DIRs) closure is based on the assumption that the NRC will approve the amendments.
- **Procedure Review** - The Third Party reviewed procedures (including appropriate SWEC Project Management memoranda) developed by the Project (SWEC) for the performance of the SWEC scope involving large bore piping analysis and support design to verify, by evaluation of the supporting analyses, that they are adequate to achieve their intended purpose. This review verifies that the project procedures resolve the external source issues.

The focus of these review efforts is to ensure that the SWEC procedures adequately address:

- compliance with Project licensing commitments, codes, and standards,
- resolution of externally identified issues, and
- ability to accommodate and resolve additional issues as needed.

The portions of the SWEC scope involving piping reanalysis and pipe support requalification addressed in this report are:

- all piping and pipe supports within ASME III Code Classes 2 and 3 large bore (larger than 2 inch pipe size) stress problem boundaries (including ASME Code Classes 2 and 3 small bore and Class 5 piping and supports within these boundaries), and
- all pipe supports within ASME III Code Class 1 stress problem boundaries (including all ASME III Code Classes 1, 2, and 3 and Class 5 supports within these boundaries). (See Reference 7.1).

SWEC analytical methods are governed by procedure CPPP-7 *(Reference 7.8)* which applies to both Unit 1 and Unit 2. Procedure CPPP-6 *(Reference 7.9)* is largely administrative and is applicable to Unit 1. CPPP-9 *(Reference 7.10)* is the corresponding Unit 2 procedure. The Third

Party reviews of both CPPP-6 and CPPP-9 determined that the differences in these procedures reflect differences in the stage of completion between the two units and provide equivalent adequacy of analytical methods. The results expressed in this report are applicable to both units because the procedural differences do not have a significant effect on the adequacy of the methods. Where it has been necessary to review implementation activities as part of this review, the Third Party generally examined Unit 1 results because Unit 1 implementation was at a further stage of completion. Unit 1 and 2 implementation is based on the same methodology.

Where the scope of the review covered by this report required an interface with another DAP discipline, that interface was established as discussed in Section 3.2.3 under the appropriate issue.

This report does not address the following DSAP IX reviews:

- Review of technical procedures for small bore piping and supports
- Overview of the implementation of procedures
- Overview of Project verification/reconciliation of as-built information.

The status of these areas of DSAP IX reviews will be addressed in separate reports to be transmitted to TU Electric for further consideration under their Quality Assurance Technical Audit Program.

3.0 EXTERNAL SOURCE ISSUES

3.1 Review Methodology

All external source issues identified as being related to the piping and supports discipline are addressed in this report. DSAP IX addresses both the identification of these issues and the program for resolving them. The conduct of the Third Party review was controlled in accordance with Third Party procedures and Discipline Instructions, written in accordance with *Design Adequacy Procedure 10* (DAP-10) (*Reference 7.11*).

The diagram in FIGURE 3.1-1 depicts the relationship among review activities leading to the conclusions documented in this report. There were two independent, parallel paths that led to the evaluation of the SWEC methodology. One path focused on the information directly related to the external concerns. The other path focused on the criteria to which the CPSES is committed. The process incorporated consideration of the external source issue DIRs and the licensing commitments to verify that the methodology used will produce an acceptable resolution of the external source issues. All issue resolutions were reviewed and the results documented in Engineering Evaluations which are the basis for the conclusions presented in this report.

A discussion of each of the thirty-two issues is provided in Section 3.2.3. The remainder of this section describes the Third Party approach to identification of external source issues, criteria and commitment compliance review of SWEC procedures, and evaluation of SWEC resolution methodology.

3.1.1 Identification of External Source Issues

External source issues were identified and documented in accordance with DAP-2 (*Reference 7.12*). The process required the following three steps:

1) identification of external source documents,
2) source document review and preparation of issue records/DIRs, and
3) consolidation of individual issues into issue summaries.

The identification of source documents focused on documents judged to include summaries of relevant issues, particularly information either presented to the *Atomic Safety and Licensing Board* (ASLB) or originated by the Board. ASLB hearing transcripts were used as a basic source of information. In addition to the ASLB hearing transcripts, pertinent filings with the board by the NRC staff, *Texas Utilities Electric Company* (TU Electric) (previously Texas Utilities Generating Company or TUGCO), *Citizens Association for Sound Energy* (CASE), and Cygna Energy Services were included and, as appropriate, the *Safety Evaluation Report* (SER) and supplements thereto (SSERs). The documents also encompassed transcripts of meetings between any of the above-mentioned parties, and between those parties and the Third Party, that addressed piping or support issues. Cygna reports and letters addressing these issues were also included. The listing of all source documents used by the Third Party for external issue identification is provided as Attachment A.

Each source document was reviewed in accordance with DAP-2. The result is a record of external issues discussed in the source documents. Issues are documented on Issue Records to capture a minimum of one citation of each distinct issue.

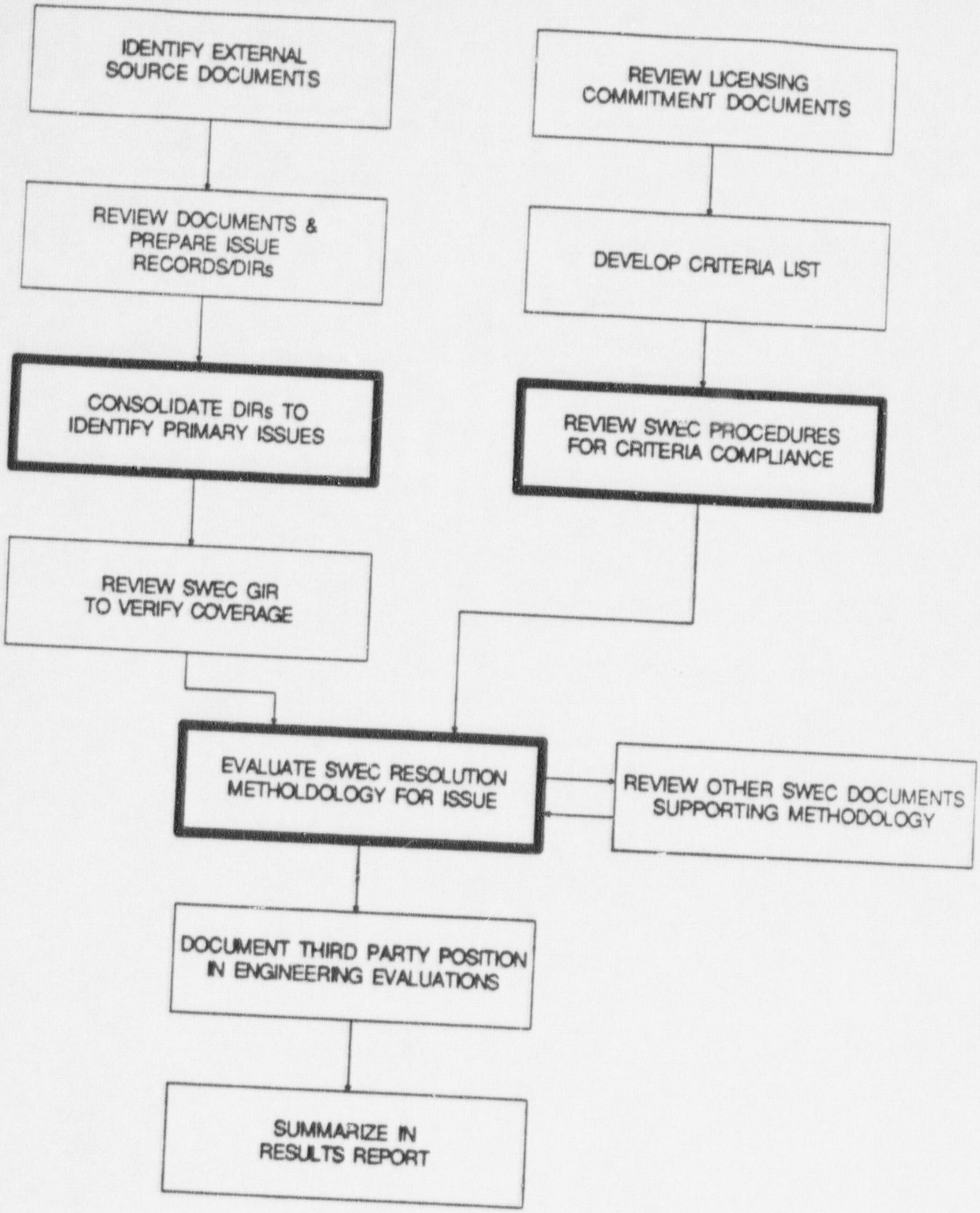

FIGURE 3.1-1

EXTERNAL SOURCE ISSUE
LOGIC DIAGRAM

For every Issue Record, a DIR was issued to assist the Third Party in tracking closure of the issue. The document title and specific page(s) on which the issue is discussed are recorded on each DIR. The reviewer was not permitted to exclude any issue based on an assessment of validity or consideration by the source that the issue was closed.

The public records used as source documents contain considerable discussion of all of the piping and support issues. In most cases, external issues are discussed in many documents, resulting in repetitive documentation of the same issue in more than one DIR. To comprehend the full extent and to support effective resolution of each issue, it was necessary to consolidate information relating to a given issue. The aim of this consolidation was to ensure that key aspects of the issue identified in the various DIRs were included within the definition of the issue. The consolidated issues are defined in thirty-two ESISs. The issue descriptions in each ESIS were developed by technical assessment of the key aspects discussed in the source documents. The DIRs serve as references to the external source documents pertaining to the issue. Lists of the pertinent DIRs are provided in each ESIS, and a primary DIR is used for each issue to track the resolution. Because TU Electric elected to proceed directly to corrective actions for the external source issues in piping and supports, the Primary DIRs are categorized as "unclassified trends" as described in Appendix E of the Program Plan.

3.1.2 Criteria and Commitment Compliance Review of SWEC Procedures

The second review activity conducted by the Third Party to evaluate the adequacy of the requalification program was to identify the criteria and commitments which the SWEC procedures must address. The criteria and commitments used for the overview of piping reanalysis and support and pipe requalification were taken from the FSAR (*Reference 7.29*); applicable Regulatory Guides; industry standards; the ASME Code; and design specifications. These documents were used by the Third Party to develop the Design Criteria List, DAP-CR-P-001 (*Reference 7.13*) in which applicable requirements are consolidated in accordance with DAP-1.

The criteria were then evaluated collectively. Design Criteria Review Checklist DAP-CLA-P-001 was used to review the criteria for completeness, accuracy, and consistency.

The acceptance criteria identified in the Design Criteria List were further tailored to each review by development of Design Review Evaluation Checklists. Applicable criteria were broadened into checklist attributes, as appropriate, by stating the specific requirements of the code, standard, or regulatory guide. This approach permitted a detailed, documented assessment of the review items.

Application of a Design Review Evaluation Checklist to specific design procedures involved assessment of compliance of the document with the checklist attributes. For each attribute, the reviewer determined if the procedure was in compliance with design commitments. If compliance was satisfactory, the reviewer indicated "SAT." If the procedure was not in compliance, or was indeterminate, the disposition was "UNSAT." Each UNSAT determination was followed by issuance of a Discrepancy/Issue Resolution (DIR) Report which documented the finding for future evaluation. An attribute which was not applicable to the specific document or design was marked "N/A." If an attribute was outside the defined scope of review documented on a particular checklist, it was marked "N/C" (Not Checked) since it was not evaluated.

The final status of the Design Review Evaluation Checklist will be delineated and forwarded to the TU Electric QA Technical Audit Program.

SWEC has issued two procedures that define input and methods, and technical process for Unit 1, including information interfaces, for the reanalysis and requalification effort:

1) **CPPP-6:** Pipe Stress/Support Requalification Procedure — Unit 1 (*Reference 7.9*)
2) **CPPP-7:** Design Criteria for Pipe Stress and Pipe Supports (*Reference 7.8*)

CPPP-7 procedure applies to both units and serves to define the technical methodology which includes the approaches used to resolve the external source issues. Additionally, SWEC has issued CPPP-9 which applies to Unit 2 and corresponds to CPPP-6.

The procedures were reviewed using a set of checklists. The checklist, DAP-CLC-P-002, was used to document the review for Revision 2 of CPPP-6 and CPPP-7. Some aspects of the methodology were not included within Revision 2 and were either so indicated within the procedures or documented in a series of project memoranda. A list of project memoranda reviewed as part of CPPP-7 is included as Attachment C of this report. Comments were issued with the checklist and DIRs were used to track open items. Differences between revisions reviewed and later revisions will be addressed as part of the TU Electric Quality Assurance Technical Audit Program (See Reference 7.2).

3.1.3 Evaluation of Resolution Methodology

The third review activity conducted by the Third Party was to evaluate the SWEC resolution methodology. This evaluation incorporated the results of the Third Party review of SWEC procedures that were described in the preceding section. Assessments by the Third Party of the SWEC approach to each of the external source issues are provided in a series of engineering evaluations.

The SWEC *Generic Issues Report* (GIR) outlined the approach to resolving external source issues. This report and the procedures that implement the approach are the major sources of information used by the Third Party to evaluate the resolution methodology. The Third Party evaluation required additional information concerning CPPP-7 which involved review of the SWEC documents supporting the methodology (primarily generic analyses/calculations). These generic analyses/calculations were reviewed to facilitate selective numerical checks of tabulated values and checks of the mathematical development of equations specified in CPPP-7, because the procedure does not include this level of detail. The calculations also provided justification for certain assumptions on which specific methods were based. The approach used for these justifications was also reviewed.

Using the issues as defined in the ESISs, acceptance criteria for resolution were developed. Documentation of those criteria and the evaluation of SWEC's methodology against them are provided in a separate engineering evaluation for each issue. This report summarizes the results of those evaluations.

3.2 Results

3.2.1 External Source Issue Identification

As discussed in Section 3.1.1, repeated references to a common set of issues were found within the documents reviewed. The references were documented by the Third Party in approximately 800 Issue Records that have corresponding DIRs that are used to track each issue to closure. TABLE 3.2-1 lists the consolidated issues, the primary DIRs used to track them, and the

TABLE 3.2-1

ISSUE DOCUMENTATION

ISSUE TITLE	ENG. EVAL.	ESIS	PRIMARY DIR
Richmond Inserts	DAP-E-P-001	ESIS-P-001	E-1234
Local Stresses	DAP-E-P-002	ESIS-P-002	E-1235
Large Framed Wall-to-Wall and Floor-to-Ceiling Supports	DAP-E-P-003	ESIS-P-003	E-1236
Support System Stability	DAP-E-P-004	ESIS-P-004	E-1237
Generic Stiffness	DAP-E-P-005	ESIS-P-005	E-1238
U-Bolts Acting as Two-Way Restraints	DAP-E-P-006	ESIS-P-006	E-1239
Friction Forces	DAP-E-P-007	ESIS-P-007	E-1240
AWS vs. ASME	DAP-E-P-008	ESIS-P-008	E-1241
A500, Grade B Tube Steel	DAP-E-P-009	ESIS-P-009	E-1242
Section Properties	DAP-E-P-010	ESIS-P-010	E-1243
U-Bolt Cinching	DAP-E-P-011	ESIS-P-011	E-1244
Axial/Rotational Restraints	DAP-E-P-012	ESIS-P-012	E-1245
Gaps	DAP-E-P-013	ESIS-P-013	E-1246
Seismic Design Load Specification	DAP-E-P-014	ESIS-P-014	E-1247
Support Mass Effects on Piping Analysis	DAP-E-P-015	ESIS-P-015	E-1248
Mass Point Spacing	DAP-E-P-017	ESIS-P-017	E-1249
High Frequency Mass Participation	DAP-E-P-018	ESIS-P-018	E-1250
Fluid Transients	DAP-E-P-019	ESIS-P-019	E-1251
Self-Weight Excitation	DAP-E-P-020	ESIS-P-020	E-1252
Local Stress in Pipe Support Members	DAP-E-P-021	ESIS-P-021	E-1253
Safety Factors	DAP-E-P-022	ESIS-P-022	E-1254
SA-36 and SA-307 Steel	DAP-E-P-023	ESIS-P-023	E-1255
Valve and Flange Qualification and Valve Modeling	DAP-E-P-025	ESIS-P-025	E-1256
Piping Model	DAP-E-P-026	ESIS-P-026	E-1257
Welding	DAP-E-P-027	ESIS-P-027	E-1258
Anchor Bolts	DAP-E-P-028	ESIS-P-028	E-1259
Strut Angularity	DAP-E-P-029	ESIS-P-029	E-1260
Structural Modeling for Frame Analysis	DAP-E-P-031	ESIS-P-031	E-1263
Computer Program Verification and Use	DAP-E-P-032	ESIS-P-032	E-1264
Hydrotest	DAP-E-P-034	ESIS-P-034	E-1266
Seismic/Non-Seismic Interface	DAP-E-P-038	ESIS-P-038	E-1275
Programmatic Aspects and QA	DAP-E-P-016	ESIS-P 016	E-1276

associated ESISs. Each ESIS lists the individual DIRs used to track the closure of the concerns identified. DIRs for Issue Records that were not included within one of the summaries are addressed in Section 3.2.3.33. These DIRs generally covered less complex questions. These DIRs were addressed using the DIR form for documentation in accordance with Third Party procedures.

In the opinion of the Third Party, there is sufficient information in the public record (documents listed in Attachment A) for each concern, to enable the Third Party to define and focus each issue. The list of documents reviewed is extensive and the level of repetition high, providing a high degree of assurance that all concerns are addressed.

The external source issues can be classified into the following four groups of concerns:

1) concerns that well-defined and explicit working level requirements were not correctly implemented,
2) concerns that a technically specific FSAR commitment, industry code or standard, or regulatory position was not implemented in design methods,
3) concerns that the use of standard design and analysis practices were not changed as necessary when applied to atypical designs, and
4) concerns that specific aspects of methodology, although in compliance with industry codes, standards, or standard practice, failed to satisfy the requirements imposed by Appendix A of 10CFR50.

3.2.2 SWEC Compliance with CPSES Criteria

The collective evaluation of the Design Criteria List concluded that it represents a complete, consistent, and adequate set of criteria.

SWEC procedures CPPP-6 and CPPP-7 were reviewed, and comments provided to SWEC. For every item in the procedures that was determined to be a discrepancy when compared with the checklist attribute, a DIR was written. These DIRs are C-type DIRs, which are used to document technical resolution and to track the closure of open items. Each DIR issued against SWEC procedures provides both a description of the question posed by the third party and the technical resolution. The DIRs have all been closed by the Third Party through either technical resolution or transfer to the TU Electric Quality Assurance Technical Audit Program (*Reference 7.2*). DIRs which were closed based on proposed FSAR amendments assume acceptance of the changes by the NRC. Unresolved DIRs will be delineated in the final Third Party surveillance audit report. Additionally, CPPP-9 was compared to CPPP-6 to determine if there were significant differences. The conclusion was that no differences existed that affected the adequacy of SWEC compliance with CPSES criteria.

Based on the above reviews, the conclusion was reached that the SWEC procedures comply with that set of criteria.

3.2.3 External Source Issue Resolution

Evaluations of the resolution methodologies have been completed for the thirty-two external source issues. Each of the thirty-two issues is described in an individual subsection below along with discussions of resolution methodology and the Third Party evaluation and conclusions.

3.2.3.1 Richmond Inserts

ISSUE DESCRIPTION

The use of Richmond Inserts in structural tube connections (see FIGURE 3.2-1) has raised concerns generally relating to design allowables, methods used to compute bolt loads in tube connections, and frame modeling and analysis of the insert/tube connection. A more detailed discussion of this issue can be found in Engineering Evaluation DAP-E-P-001. Specific concerns within these areas are the following:

- **Factor of Safety** - The design allowables for tension and shear were determined based on Richmond Screw Company test data from tests using 3000 psi concrete and a safety factor of 2.0. The Richmond Screw Company recommends a safety factor of 3.0 for their products. A second, related concern is adequacy, without confirmatory testing, of the interaction equation for combined tension and shear, which was taken from the *Prestressed Concrete Institute* (PCI) Handbook.
- **Concrete Strength** - The concern is that the Richmond Inserts have been installed in concrete weaker than the 4000 psi design strength used for design.
- **Shear Stress Allowables for 1-1/2" Richmond Inserts** - Shear allowables for 1-1/2" Richmond Inserts have been extrapolated from test data for 1" and 1-1/4" inserts and may not be conservative.
- **Computation of Bolt and Insert Loads** - Richmond Insert/tube steel connections were analyzed using a simplified method which does not account for bolt angularity or bolt bending due to shear in the tubing, and may not accurately predict the prying tension in the insert and the tube.
- **Frame Modeling of Tube-to-Insert Connections** - Inconsistencies in modeling tube-to-insert connections (such as the selection of pinned versus fixed joints) may result in inaccurate calculation of support stiffness and tube/frame stresses. These inconsistencies may also result in unconservative calculations of loads on bolts and inserts.
- **Testing of Richmond Inserts** - TUGCO performed tests on Richmond Inserts to determine the load-carrying capacity of the insert and to examine the behavior of connection for combined loading. Questions were raised by external sources regarding: (a) the representativeness of the tests to actual plant conditions, and (b) the interpretation of the test results.
- **TUGCO Finite Element Study** - Verification of the screening method used to justify the simplified method for design of Richmond Inserts was based on improperly interpreted results of finite element analyses.
- **Local Stress at Bolt Holes in Tubing** - The local stress at bolt holes in structural tubing was not evaluated. Such stress could cause punching-type failure in the tubing.
- **Fatigue** - Fatigue caused by cyclic loading of the connection was not considered in the design.
- **Improper Use of Richmond Allowables** - Threaded rods/bolts at Richmond Inserts occasionally were unconservatively evaluated because the tension and shear allowables for the insert were used.

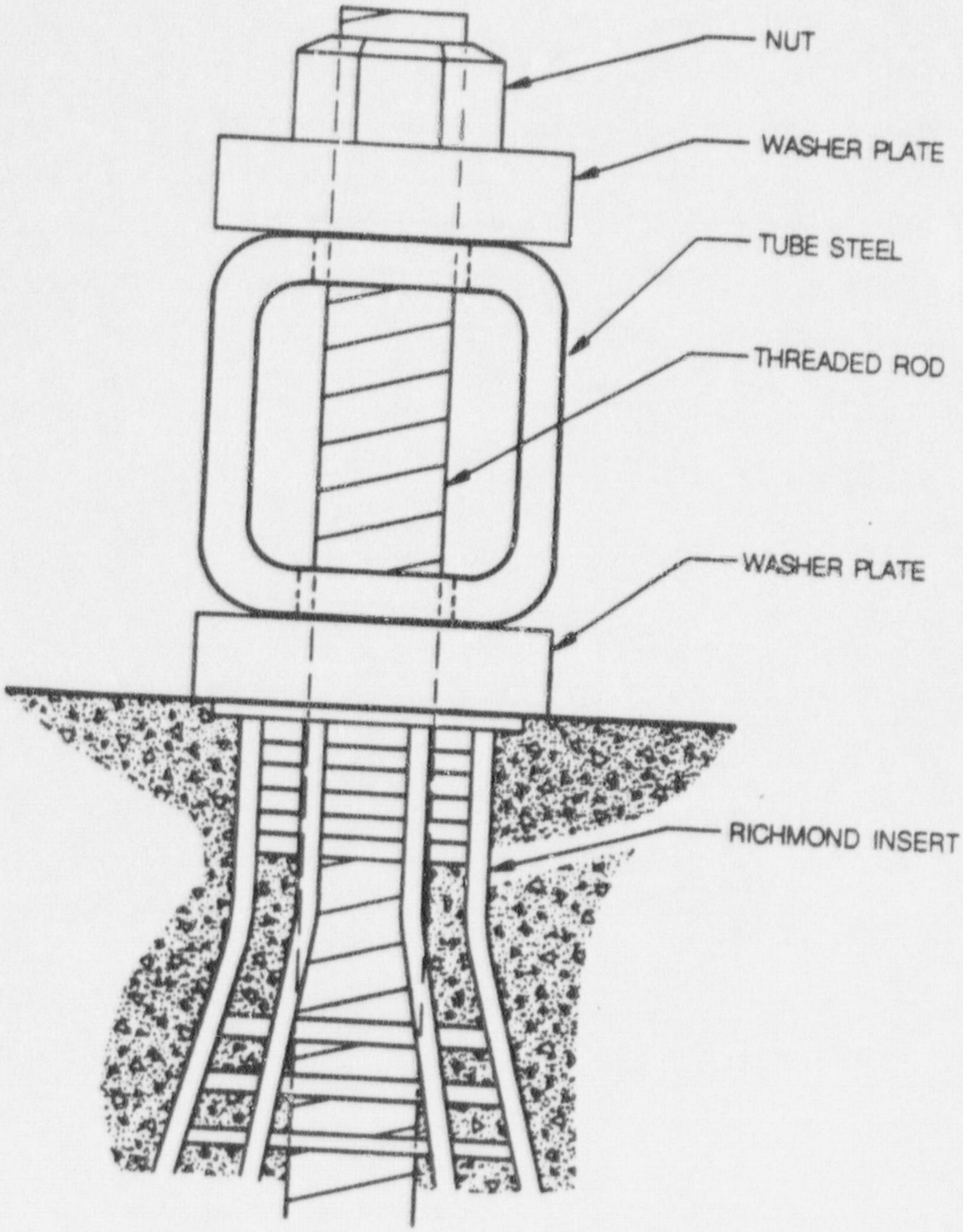

FIGURE 3.2-1

TYPICAL RICHMOND INSERT/
TUBE STEEL CONNECTION

- **Spacing at Richmond Inserts** - Lack of TUGCO structural attachment interface program could result in failure to consider spacing effects of nearby anchors/sleeves in the structural evaluation of inserts.
- **Shear Distribution at Richmond Inserts** - The threaded rod and hole fit-up tolerances could cause unequal sharing of shear loading from tubing which is anchored by two or more Richmond Inserts.
- **LOCA Thermal Expansion of Tube Steel** - Under LOCA conditions, thermal expansion of long tubing anchored by two or more Richmond Inserts could produce unacceptably high loads and large deformations in the insert/rod connection.

SWEC RESOLUTION METHODOLOGY

The methods used by SWEC to resolve or address the concerns identified above are as follows:

- **Factor of Safety** - SWEC has adopted a safety factor of 3 for Richmond Inserts under normal, upset, and emergency loading conditions, as recommended by The Richmond Screw Company, but SWEC used a safety factor of 2 for faulted condition loading. The allowables are based on averaging TUGCO insert capacity test failure loads. Additionally, specific requirements have been imposed for concrete strength, anchorage spacing, and concrete edge distance.

  For combined tension and shear, SWEC has adopted the *Prestressed Concrete Institute* (PCI) Handbook interaction equation which is used to evaluate all loading conditions.
- **Concrete Strength** - SWEC methods assume a concrete strength of 4000 psi.
- **Shear Stress Allowables for 1-1/2" Richmond Inserts** - TUGCO performed additional tests to establish allowables for all sizes of Richmond Inserts. Shear allowables for all Richmond Inserts are based on the average test failure loads presented in the TUGCO test reports.
- **Computation of Bolt and Insert Loads** - The SWEC approach for computation of bolt and insert loads depends on certain modeling requirements for structural analysis: a non-linear interaction equation to evaluate the adequacy of the rod in the insert for combined bending, tension, and shear; and a force-couple transformation of bolt bending moment to compute insert tension.
- **Frame Modeling of Tube-to-Insert Connections** - The SWEC approach for evaluating tube-to-insert connections establishes specific modeling requirements at specific structural interfaces, including: tube steel and rod at the insert, the rod end attaching to the insert, rod end attaching to the tube steel, and rod and tube steel.
- **Testing of Richmond Inserts** - The SWEC approach uses the load capacity insert test results of two TUGCO test reports. For Richmond Inserts, these test results are used to establish the design allowables for plant service conditions, to validate the interaction equation for combined shear and tension, to establish the design stiffness for insert connections, and to establish the design limits used to evaluate the effects of LOCA thermal expansion. The TUGCO tests used previously to examine the behavior of the connection are not used.
- **TUGCO Finite Element Study** - The SWEC approach to insert connection qualification does not rely on the previously performed TUGCO finite element study.

- **Local Stress at Bolt Holes in Tubing** - SWEC procedures provide a methodology and implementing tables for evaluating the local load capacity at bolt holes in structural tube steel. This methodology limits the local stress in the bolt hole vicinity.
- **Fatigue** - SWEC does not consider fatigue to be a relevant factor in these connections, and therefore does not include it in the design.
- **Improper Use of Richmond Allowables** - The SWEC methodology requires that the threaded rod and insert be evaluated separately, using specified allowables and interaction equations.
- **Shear Distribution at Richmond Inserts** - SWEC procedures assume equal distribution of shear loads resulting from rod and hole fit-up tolerances, where tubing is anchored by two or more Richmond Inserts. However, during final reconciliation, these designs will be reviewed by SWEC to verify that unequal shear load sharing assumption is adequate.
- **LOCA Thermal Expansion of Tube Steel** - SWEC procedures provide methods for evaluating the effects of LOCA thermal expansion of tubing on Richmond Insert connections. The method is based on RLCA Report RLCA/P142/01-86/009 *(Reference 7.18)* which uses shear test results in combination with an elastic analysis of failure to estimate deformations. By applying a safety factor of 2 to these deformations, design limits on insert/rod deformations are established for LOCA thermal expansion and system mechanical loads.
- **Spacing at Richmond Inserts** - SWEC Corrective Action Program (SWEC-CAP) is responsible for collecting all structural attachment load information and performing final evaluation for all pipe support structural attachments, including Richmond Inserts.

THIRD PARTY EVALUATION

The following paragraphs describe the Third Party evaluations of the SWEC methods for the identified concerns:

- **Factor of Safety** - The safety factor of 3 for normal, upset, and emergency loading conditions complies with the recommendation of the Richmond Screw Company. The safety factor of 2 for faulted conditions is based on *American Concrete Institute* (ACI) Standard 349-85 (*Reference 7.15*) using the results of tests performed by TUGCO. ACI 349-85 provides an industry experience/consensus basis for design of nuclear safety related concrete structures. TUGCO does not have a licensing commitment to comply with this standard for this application; however, this is an acceptable standard for establishing adequate margin. The TUGCO test data indicates that the scatter in the test failure loads is quite small, particularly when compared to data for other types of concrete anchorages, indicating that the reliability of Richmond Inserts is much greater than that of expansion bolts. A lower safety factor is acceptable, based on the test data and ACI 349-85.

  Use of the interaction equation for combined tension and shear is supported by PCI Technical Report, "Connections for Precast Concrete Building", which states that an interaction equation (identical to that used by SWEC) represents a lower bound curve on insert test results. The statement is not limited to prestressed concrete. The application of this equation was evaluated and determined by the Third Party to be acceptable for the Richmond Inserts without reliance on confirmatory tests.

- **Concrete Strength** - Plant concrete strength was addressed in *Issue Specific Action Plan* (ISAP) II.b Results Report, titled Concrete Compressive Strength, (*Reference 7.16*) of the CPRT program. This report concluded that reasonable assurance exists that the minimum required design strength of 4000 psi was met.
- **Shear Stress Allowables for 1-1/2" Richmond Inserts** - The SWEC allowables are based on average results obtained from TUGCO tests performed specifically for 1-1/2" Richmond Inserts. The test results are adjusted in accordance with ACI 349-85. The safety factors discussed above are maintained. This is an acceptable basis to account for variations in shear stress allowables.
- **Computation of Bolt and Insert Loads** - The SWEC methodology for computation of bolt and insert loads provides a conservative evaluation of the rod and insert, which adequately considers bolt angularity, bolt bending due to shear in the tubing, and prying action in the insert and the tube. The SWEC structural modeling procedure results in a set of rod loads that yields conservative rod interaction values when compared to results of detailed finite element studies performed by RLCA. The SWEC procedure for transforming rod loads into insert loads results in conservative insert interaction values (using the PCI interaction equation) when compared to the detailed RLCA studies. The rod interaction equation and allowables for SA-36 and A-193 Grade B7 materials, along with the additional check for direct stress in A-193 material, provide a code acceptable evaluation of the threaded rod in tension, shear, and bending.
- **Frame Modeling of Tube-to-Insert Connections** - The influence of structural modeling on Richmond Insert qualification is discussed above. The influence on support stiffness and member stresses is covered in Section 3.2.3.28, where it is concluded that the modeling is adequate and in compliance with ASME Section III, Paragraph XVII - 2420. Briefly stated, the classical approach to modeling a connection based on an assumption of either a pinned or fixed connection is replaced with a more detailed model.
- **Testing of Richmond Inserts** - The representativeness of test to in-plant conditions is being evaluated under DSAP VIII in Third Party *Issue Resolution Report* (IRR) DAP-E-C/S-515. (*Reference 7.17*)

  The concern regarding interpretation of TUGCO test results is acceptably resolved because: a) the SWEC procedure for evaluating the tube steel to Richmond Insert connection relies upon the RLCA analysis previously discussed, not on the TUGCO connection tests previously used to justify the TUGCO methods, b) the SWEC procedure appropriately adjusts insert capacities to account for the difference between plant concrete design strength and the concrete strength for the insert capacity tests, and c) industry codes and standards (e.g. ACI 349) permit the averaging of test failure results to establish the design strength of inserts.
- **Finite Element Study** - Because the SWEC approach does not use the simplified screening method and does not rely on the previously performed analysis, this concern is irrelevant to the current technical resolution.
- **Local Stress at Bolt Holes in Tubing** - Richmond Insert/tube steel connections utilize large rectangular 1-inch thick washer plates which distribute the stress at the bolt hole. Under the maximum allowable tension loads which can develop at 1-inch and 1-1/2 inch connections for the sizes of tube steel used, the simplified SWEC local load capacity methodology provides an adequate means for evaluating local effects at the loaded connection hole. The model on which the SWEC methodology is based employs a

simplifying construct to calculate the stresses in the bolt hole region. To verify the adequacy of this analysis, additional analyses were performed by the Third Party using an alternate methodology. These separate analyses confirmed the acceptability of the SWEC methodology.

- **Fatigue** - Since specific loads identified in the SWEC procedures are dynamic, a separate SWEC evaluation was performed to consider high cycle fatigue as required by ASME Section III. This evaluation confirmed that the lower threshold limit of 20,000 cycles, established in subsection NF, below which fatigue is not a concern, will not be reached.
- **Spacing at Richmond Inserts** - The SWEC approach provides a centralized comprehensive program for evaluating Richmond Inserts, considering effects of all nearby anchorages/sleeves.
- **Improper Use of Richmond Allowables** - The SWEC procedures ensure that Richmond Insert connections will be properly evaluated.
- **Shear Distribution at Richmond Inserts/Tube Steel Connections** - The SWEC procedures provide specific written criteria for the evaluation of Richmond Inserts used in conjunction with tube steel. The Third Party considers these methods adequate for evaluating shear distribution.
- **LOCA Thermal Expansion of Tube Steel** - The SWEC procedure for evaluating LOCA thermal expansion of Richmond Insert connected tube steel is based on the results of a detailed analysis, RLCA/P142/01-86/009 *(Reference 7.18)*, performed by RLCA. To verify the adequacy of this analysis, additional analyses were performed by the Third Party using an alternate methodology. These separate analyses confirmed the acceptability of the SWEC methodology.

CONCLUSION

SWEC methodology adequately addresses the concerns identified in this issue. This issue is closed.

3.2.3.2 Local Pipe Stresses

ISSUE DESCRIPTION

A concern was raised that local pipe stresses at welded attachments, such as lugs and trunnions, were not being evaluated for comparison to piping stress limits. Although the Code of Record *(Reference 7.6)* does not contain specific requirements for the analysis of attachments, it is standard practice to calculate stresses in the pipe that result from support loads on the attachments. Analysis of reinforcing pads and dimensional limitations on analytical methods are two concerns that are related to evaluation of local pipe stresses.

There are some frame supports at CPSES with zero radial clearance. Normally, box frames are designed with a gap to allow for pipe radial thermal growth. A concern was raised that the differential radial growth between the pipe and the support could result in unacceptably high stresses in the pipe and the support. For Class 2/3 piping, radial thermal expansion effects are not normally considered and the Code does not specify criteria for this type of loading. Similar concerns were raised about cinched U-bolts and anchors. In these cases, the effect can be classified as a circumferential line load. Another concern was raised regarding the consequences of longitudinal line loads on piping. At a frame support, the pipe rests with line contact on a cross-member. Local stresses are induced in the pipe as a result of a support load at this line contact. The local pipe stress issue is evaluated in Engineering Evaluation DAP-E-P-002 which contains a detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

SWEC is evaluating local pipe stresses at welded attachments. Procedures were developed for common lugs and trunnions, including reinforcement pads. Local stresses are added to the piping stresses for comparison to Code allowables. *Welding Research Council Bulletin (Reference 7.19)* (WRC) 107 methodology is followed for some of the configurations. Certain attachment dimensions are not within the WRC 107 recommended limits. SWEC has completed special studies which justify the use of procedures in these cases where the designs incorporate dimensions outside the WRC recommended limits and for unique designs such as plate anchors.

Design changes have eliminated zero gap frames and cinched U-bolts, thus allowing for radial thermal expansion. Radial thermal expansion local stresses are being evaluated for U-bolts (uncinched--cinched U-bolts have been deleted), stiff pipe clamps, and opposing trunnions. In addition, SWEC has developed procedures to investigate radial thermal expansion stresses at anchors.

Procedures were also defined for evaluating local pipe stresses at circumferential and longitudinal line loads at supports.

THIRD PARTY EVALUATION

SWEC has issued procedures for evaluating local pipe stresses at welded attachments and at supports with circumferential or longitudinal line loads. The computed stress values that are compared to Code allowables are determined by addition of local stresses to pipe stresses. This is consistent with Code Cases N-318-2 and N-329 which represent established methodology. Code Cases N-318-2 and N-329 use allowables from a later Code which are higher than the Code of Record. These higher allowables are also used for circumferential and longitudinal line load evaluations. These higher allowables are considered acceptable by the Third Party for application to local stresses in the cases analyzed by SWEC.

SWEC has detailed (finite element) analyses to justify the procedures and range of applicability for certain parameters, and to qualify unique designs (trunnions with gussets, anchors, attachments on fittings, etc). Such finite element analyses are an acceptable means for addressing the issue. A sample of thirteen finite element analyses has been reviewed. Eight of these are generic calculations which justify procedures which including attachments on fittings, expanded beta limits, expanded Pitrife limits, non-integral pads, opposing trunnions, bearing pads, clamp anchor local stress, and a finite element model sensitivity study. Five of the calculations reviewed are qualifications of specific support attachment designs.

As a result of the finite element analysis studies, several procedures for local stress evaluation have been changed. Pipe local stresses caused by radial thermal expansion are being evaluated for support designs where they could be significant. The stresses are being added to piping stresses for comparison to Code allowables--this is a conservative approach for Class 2/3 piping.

CONCLUSIONS

SWEC's approach (calculating local stresses and adding local stresses to the pipe stresses for comparison to piping allowables) adequately addresses the concerns. This issue is closed.

3.2.3.3 Large Frame Wall-To-Wall And Floor-To-Ceiling Supports

ISSUE DESCRIPTION

This issue is evaluated in Engineering Evaluation DAP-E-P-003 which provides a detailed discussion of the issue. In summary, the concern is that in the design evaluation of large frame wall-to-wall and floor-to-ceiling supports the following considerations for frame or anchor bolts were not explicitly included:

- frame thermal expansion due to LOCA and containment ambient conditions,
- relative differential displacements between the frame and the building attachment points for seismic building movements and time-dependent displacement effects, e.g., concrete creep, and
- cumulative effects resulting from thermal expansion, seismic, and time-dependent relative movements.

SWEC RESOLUTION METHODOLOGY

SWEC addresses the issue through analysis or support modifications as follows:

- With the exception of service water tunnel supports, large frame wall-to-wall or floor-to-ceiling supports are modified to include slip joints to accommodate differential displacements and thermal expansion.
- Service water tunnel supports extending from wall-to-wall or floor-to-ceiling are qualified for loading combinations that include frame thermal expansion, relative differential building displacements due to seismic movement, long term concrete creep, and live loads. Effects are evaluated cumulatively.
- Corner supports other than those attached to secondary walls are qualified using piping loads only. Relative building displacements have been demonstrated to be insignificant by SWEC. For supports spanning between building primary and secondary walls, project procedure CPPP-35 (*Reference 7.25*) has been issued to address such designs.

THIRD PARTY EVALUATION

The approach adopted by SWEC addresses issue resolution by three methods. The modification of all large frame supports (except those in the service water tunnel) to include slip joints eliminates the concern of differential displacements for these supports. The combination of loads used to evaluate large frame wall-to-wall and floor-to-ceiling supports in the service water tunnel addresses the issue and the requirements of subsection NF-3231.1(a) of the ASME Code (*Reference 7.7*) and the intent of Regulatory Guide 1.124, Position 5.

CONCLUSIONS

The SWEC approach adequately addresses this issue for wall-to-wall and floor-to-ceiling supports either by physical modification or by design qualification. SWEC method to address corner supports for significant OBE building displacements spanning primary and secondary walls as defined in CPPP-35 is adequate to close this issue.

3.2.3.4 Support System Stability

ISSUE DESCRIPTION

Certain pipe supports were identified which appeared to be capable of large displacements. A possible result of such displacements is a loss of intended function, that is, the support might not restrain the pipe as modeled in the piping analysis. Such supports are considered unstable. The supports in question have been grouped, for convenience, into the following categories:

- Box frames connected to struts or snubbers
- U-bolts connected to a single strut or snubber
- Trapeze supports
- Column/strut assemblies
- Trunnion/strut assemblies

For each of these categories, a displacement mechanism can be postulated that leads to a failure to carry the intended load. The technical issue is whether one can analytically demonstrate that the postulated mechanisms do not occur under the set of loading conditions imposed for the qualification of piping. FIGURE 3.2-2 depicts a postulated displacement wherein a box frame moves along the axis of a pipe. A support which may undergo such displacement is considered unstable because it may not perform as required or as modeled in the analysis.

The stability issue is evaluated in Engineering Evaluation DAP-E-P-004 which provides a more detailed discussion of the issue. A related issue is U-bolt cinching, which is evaluated in Engineering Evaluation DAP-E-P-011.

SWEC RESOLUTION METHODOLOGY

SWEC addressed support system stability with the following solutions:

- delete the potentially unstable supports from the analysis and physically remove them from the piping system,
- redesign these supports, using a rigid configuration or standard hardware (e.g. pipe clamps),
- modify trapeze designs to eliminate potential for large displacements, and
- develop analytical methods to confirm stability.

SWEC established a procedure for evaluating support function and stability which includes the specific types of design that were previously questioned and extends the evaluation to other designs. Both support designers and piping analysts participate in these evaluations. The evaluation is performed for all piping analyses. This evaluation is intended to provide assurance that variations of the questionable configurations are also considered.

THIRD PARTY EVALUATION

The approach adopted by SWEC addresses the concern specifically for the types of supports that were previously challenged, and also for every piping analysis, by performing evaluations for stability. The implementation of this process is a significant factor in the determination by the Third Party that the stability issue is comprehensively addressed. The SWEC solutions for

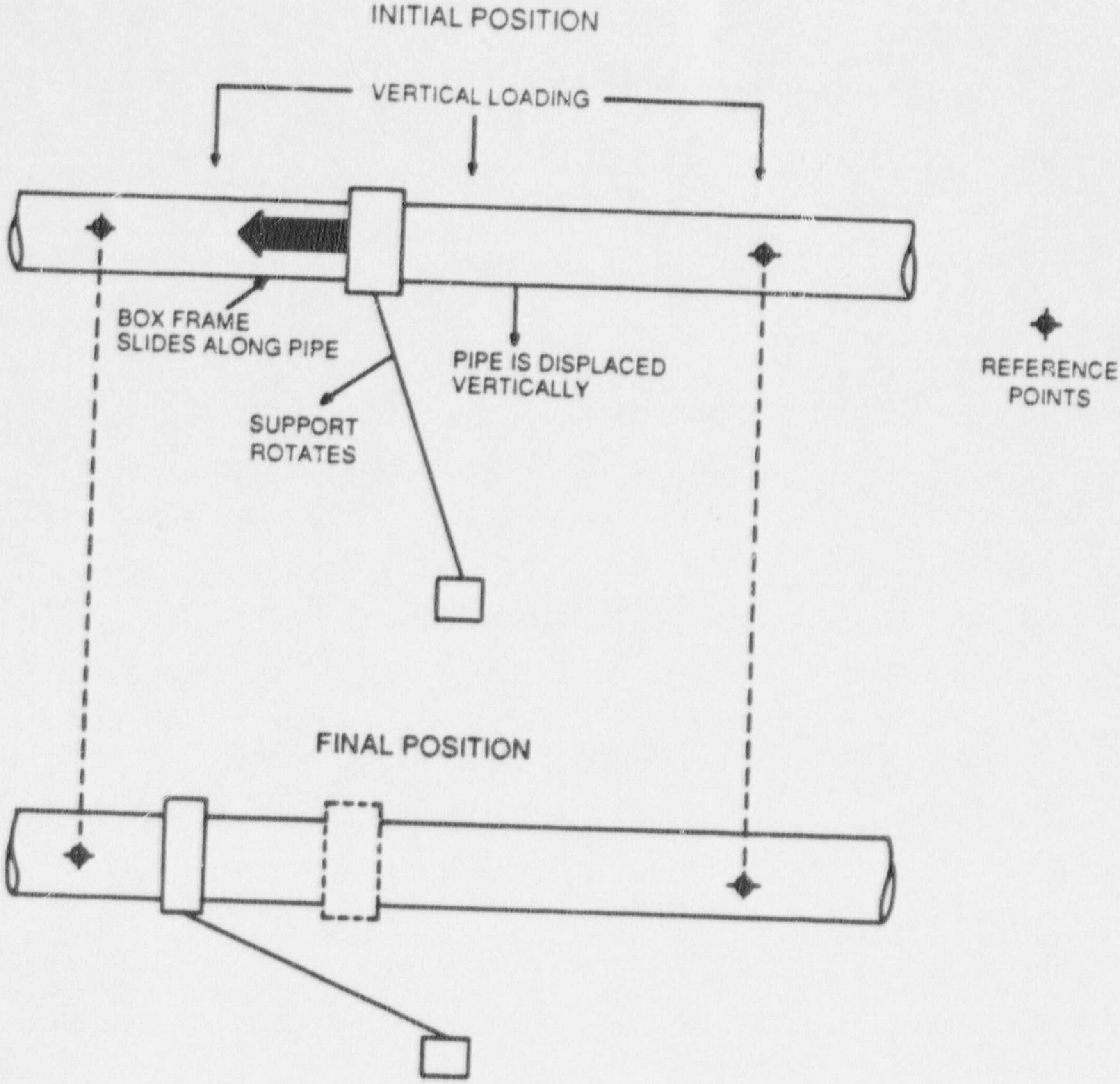

FIGURE 3.2-2

SUPPORT STABILITY

specific support designs provide the basis for determining the adequacy of the approach. SWEC has placed the major emphasis on support removal or redesign. Implementation of the SWEC approach has resulted in elimination of two of the five categories of unstable design. The support categories were treated in the following ways:

- **Box frames** - Box frames connected to struts or snubbers were eliminated.
- **U-bolts** - U-bolts connected to a single strut or snubber were eliminated.
- **Trapeze supports** -Trapeze supports were not entirely eliminated. The alternative preferred by SWEC was to remove the support, or redesign to eliminate the trapeze, but this was not mandatory. The cinched U-bolt, however, was in all cases eliminated. Three types of trapeze modification were permitted. The displacement mechanisms for these designs have been examined, and the designs have been determined to be stable.
- **Column/strut assemblies** - Analytical confirmation of stability was employed only for column/strut assemblies, where classical buckling analysis techniques could be used to establish a criterion for adequacy. This criterion was confirmed by independent analysis in Third Party calculation DAP-C-P-002.
- **Trunnion/strut assemblies** - The only potentially unstable support category not specifically addressed by SWEC under the issue of support stability is the trunnion/strut assembly. SWEC procedures, however, require a SWEC review of all supports, and SWEC has adequately defined the general requirement for achieving stability. A Third Party review of the specific configuration questioned by CASE indicated that the specific concern was addressed by SWEC as part of their modeling procedures for supports and by the methods used for local stress evaluation of trunnions.

CONCLUSION

SWEC has established an approach addressing stability of support design that is acceptable to the Third Party. The stability issue is closed.

3.2.3.5 Generic Stiffness

ISSUE DESCRIPTION

Generic stiffness values were used to represent the pipe supports in the pipe stress analysis for Class 2 and 3 systems. During the original support qualification, a 1/16" deflection criterion was imposed as a check to ensure that the stiffness was representative of the generic value used. A support stiffness criterion was not established. External sources determined that for specific lightly loaded supports, the calculated stiffness was orders of magnitude lower than the generic values. Since the response of the piping/support system is influenced by the stiffness of the supports, the results of the pipe stress analysis may not be valid if generic values are used.

Additional concerns were raised regarding the method used to calculate deflections or support stiffness values. It was contended that the calculation should include the associated flexibilities of all support components, i.e. U-bolts, base plates, and the potential effects of oversized bolt holes.

Specific questions resulting from the generic stiffness issue are as follows:

- Is the piping response accurately predicted if generic stiffness values are used?

- Is the stiffness used in the piping analysis verified as being representative of the actual stiffness of the installed support?
- Does the calculation of the support stiffness account for the flexibility effects of all support components?

This issue is evaluated in Engineering Evaluation DAP-E-P-005 which provides a more detailed description of the issue.

SWEC RESOLUTION METHODOLOGY

SWEC addressed the piping response aspect of the generic stiffness issue in SWEC report "Generic Pipe Support Stiffness Values for Piping Analysis." This report documents the SWEC determination of generic stiffness values to be used in the piping analysis and the minimum stiffness values below which calculated stiffnesses are used. The report concluded that for stiffnesses exceeding the minimum values, use of generic stiffnesses instead of calculated values will not result in significant variations in qualification parameters.

SWEC addressed the support validation issue by implementing the following sequence of steps during the pipe/support system qualification process:

1) Generic stiffness values were established based on support type (e.g., rigid support, anchor, snubber, etc.). The generic values were derived from a sample survey of installed supports and are representative of the majority of sample supports considered.
2) Minimum stiffness values were also established for each generic value defined. These minimum values were determined to define a stiffness range below each generic value that would produce comparable pipe stress results.
3) Prior to performing the piping analysis, each support stiffness was calculated based on as-built drawings and screened against the minimum values. If the calculated value was above the minimum value, generic stiffness values were used in the piping analysis; if the calculated value was below the minimum value, calculated stiffnesses were used. An exception is made regarding supports that are to be modified or replaced. For these supports, the generic value is assumed, with "confirmation required." Confirmation required supports are to be designed to meet or exceed the minimum stiffness values defined by Tables 3-10-8-1 through 3-10-8-3 of CPPP-7. Additionally, specific criteria were defined so that the analytical value would be used when certain local conditions existed (i.e., supports which restrain large masses or large axial runs) that may alter the generic values.

SWEC concluded that using the generic stiffness value produces no significant variation in pipe results. The stiffness values used in the analysis are verified on this basis.

Additional SWEC confirmation of the generic stiffness method was provided in GENX-117, a comparative analysis study of five piping problems selected by the Third Party. A comparison of results was made between analyses using the generic stiffness and the analyses using "actual" (calculated) stiffnesses for all supports. (*Reference 7.20*). The problems were selected from completed production analyses having higher than average numbers of supports where generic values were used. The problems were not considered worst case but were considered representative.

SWEC addressed the issue of including the local flexibilities of support components in the stiffness calculation by the procedures defined in CPPP-7.

Class 2 and 3 pipe support stiffness was evaluated by methods prescribed in Attachment 4-18 of CPPP-7. These methods include engineering judgment (inspection or comparison to similar designs with known stiffnesses), simple hand calculation, and detailed analysis. Attachment 4-18 also defines methods used to determine the stiffness of "special support types."

In addition to the guidance given in Attachment 4-18, the following additional guidance is provided for specific details elsewhere in CPPP-7:

- Attachment 4-4: Anchor stiffness values for Drilled-in Expansion-type Concrete Anchors.
- Attachment 4-5: Stiffness values for a single tube with insert connections along one line as the only means of structural attachment.
- Attachment 4-8: Allowable stiffness ratios between support structures (for dual snubber/strut supports using riser clamps).
- Attachment 4-12: U-bolt Stiffness, Trapeze Crosspiece stiffness, clamping stiffness of U-bolt and crosspiece.
- Attachment 4-15: Stiffnesses of trunnion type anchors.

The procedures for calculating support stiffness do not explicitly address oversized bolt holes. See Section 3.2.3.26 for a discussion of bolt hole clearances.

THIRD PARTY EVALUATION

The Third Party evaluation of the SWEC generic stiffness approach centered on the evaluation of the two sources of SWEC documentation; the SWEC report "Generic Pipe Support Stiffness Values for Piping Analysis" and the SWEC calculation GENX-117 summarizing the sample verification results of the five problem comparison analyses.

This approach, developed by SWEC, as well as those used throughout the nuclear industry have as their objective to provide a methodology to ensure that the stiffness values used in analysis are representative of the actual structures used in the plant. It is not industry practice to use actual calculated stiffness for all supports and all analyses but rather to use generic values which provide acceptable results.

Industry approaches generally involve establishing minimum stiffness (or sets of minimum stiffness values) prior to the design of the supports. Usually a deflection criterion or frequency criterion is also used. In this case, however, it is different in that these minimum values were not established prior to design and installation. The effect of this is that the supports tend to be more flexible than if a minimum stiffness or frequency criterion had been used. The object of SWEC's methodology is to use generic values where appropriate and to use actual values for the softer supports. This objective is considered by the Third Party to be reasonable and practical.

Based on the number and degree of piping analysis parameters and the factors which influence the piping system qualification, the basis for acceptance of the generic approach focused on the sample verification effort provided in GENX-117 (*Reference 7.20*). The review of the SWEC report noted the analysis approach used "simplified piping models and fundamental engineering principles." Third Party concerns were raised that the simplified piping models were not representative of actual configurations. The Third Party acceptance of the SWEC approach to generic stiffness was therefore based on evaluation of the sample analysis verification documented in GENX-117.

The results of the comparative analyses of the problems selected by the Third Party were reviewed in detail. The conclusions are discussed below:

- **Pipe Stresses** - The analysis using calculated stiffness indicated increases in stress over those calculated using generic stiffness at certain locations. These increases were generally less than 15%.
- **Support Loads** - Support loads from the analysis using calculated stiffness indicated increases in loads over those calculated using generic stiffness by more than 15% in a significant number of instances.
- **Valve Accelerations** - Valve accelerations from the analysis using calculated stiffness indicated increases in accelerations over those calculated using generic stiffness significantly more than 15%.

While the differences in the two analytical results were in some instances greater than 15%, the Third Party agrees with SWEC that in general, with some additional considerations, there are sufficient inherent safety factors associated with standard industry design practices so that variations of this order of magnitude can be neglected. The various parameters investigated in the comparative analysis are discussed below:

- **Piping Analysis** - The Third Party agrees that there is significant conservatism in the simplified SIF approach used in production piping design such that variations of this nature can be neglected recognizing the overall inherent factors of safety.
- **Support Loads** - No documentation has been provided to demonstrate overall conservatism such that the variations in loads can be neglected. SWEC issued a Project Memorandum requiring that during final reconciliation, all highly loaded supports (i.e., those with loads greater than 85% of design capacity) will be reviewed by the Options Review Committee to ensure that the use of the generic stiffness approach on a system basis does not violate the overall factor of safety consideration. The SWEC procedural requirements to review all highly loaded supports are sufficient to ensure that potential variations in support loads will not unacceptably compromise safety margins.
- **Valve Accelerations** - Accurate modeling of supports near large masses is important to ensure accurate calculation of valve accelerations. To ensure adequate representation, SWEC has issued a Project Memorandum to review, during final reconciliation, stiffness representation near valves. In addition, SWEC has provided data which indicate inherent design margins for the acceleration values used as design limits. Based upon this, the Third Party believes that SWEC's position regarding overall design margins is maintained.

Based upon the above discussion, the Third Party considers the reasonableness of the approach to be confirmed.

The detailed guidance for calculation of support stiffness including support component local flexibility was also considered of sufficient accuracy to be consistent with the generic stiffness methodology.

CONCLUSION

The method established by SWEC of accounting for support flexibility in the piping model is considered adequate. The generic stiffness issue is closed.

3.2.3.6 U-Bolts Acting As Two-Way Restraints

ISSUE DESCRIPTION

U-bolts have been used at CPSES to attach piping to rigid support members. In the applications in question, the U-bolts are not cinched. Supports of this type were used when the piping analysis called for restraint in a single translational degree of freedom. Such supports are typically referred to as *one-directional stops*. The intent was that the U-bolt would provide restraint in a direction parallel to the axis of the threaded portion. No restraint was modeled in the lateral direction, and no lateral loads were considered in the design of the support. The concern is that insufficient space exists between the pipe and the U-bolt in the lateral direction to permit the pipe to move thermally and seismically without contacting and loading the support. In effect, it was alleged that the support acted in two directions and should have been modeled and designed accordingly.

This issue is evaluated in Engineering Evaluation DAP-E-P- 006 which provides a more detailed description of the issue.

SWEC RESOLUTION METHODOLOGY

Resolution of the issue under the SWEC requalification program consists of:

- replacing all uncinched U-bolts on pipes greater than 6-inch with a support that complies with the analyzed function, and
- modeling all uncinched U-bolt supports on pipes 6-inch and less as two-way restraints in the piping analysis, and qualifying the support for the resulting loads.

THIRD PARTY EVALUATION

U-bolts that continue to be used at CPSES, i.e., 6 inch and smaller, will be modeled and qualified as both axial and lateral restraints. The allowable loads for the U-bolts are based on compliance with ASME Section III, Subsection NF, paragraph NF-3330 (*Reference 7.7*). This is an adequate basis for addressing the concern and qualifying the support in accordance with CPSES licensing commitments.

CONCLUSIONS

SWEC has established an approach to address the issue that is acceptable. The issue is closed.

3.2.3.7 Friction Forces

ISSUE DESCRIPTION

The influence of friction was considered to be inadequately and inconsistently addressed in the support design calculations. For designs produced by certain design organizations, CASE contended that:

- the coefficient of friction was incorrect,

- friction had been neglected for pipe movement less than 1/16" without justification,
- the reduction in friction load based on support stiffness was incorrect, and
- friction should have been included for dynamic load cases but was not.

The friction forces issue is evaluated in Engineering Evaluation DAP-E-P-007 which provides a more detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

SWEC addressed the technical concerns as follows:

- The effect of friction at all sliding surfaces is considered in pipe support design regardless of the size of the pipe displacement.
- A coefficient of friction value of 0.3 is used for all steel to steel friction load assessments.
- The calculated friction force is not reduced based on support stiffness.
- Friction loads are included in all static and/or steady state load cases. Dynamic load conditions are not included in the friction load evaluation.

THIRD PARTY EVALUATION

The SWEC approach to friction forces eliminates the inconsistency concern. It also eliminates the concerns related to pipe movement and support stiffness affecting friction.

The use of a coefficient of friction of 0.3 is consistent with industry practice and is considered to be sufficiently representative of the condition that would exist at a contact point between the pipe and support. The coefficient of friction will vary between a dynamic value for sliding contact, which is significantly less than 0.3, and a static value corresponding to zero movement of the pipe relative to the support. It is not engineering practice to attempt to quantify the time varying friction force or to use upper bound values. The nuclear industry has adopted a practice of using a value of approximately 0.3.

The industry practices for addressing friction loads for dynamic conditions such as seismic response varies to some extent; however, the predominant practice is to neglect friction that might develop due to dynamic conditions. Under vibratory conditions, friction forces are lower than those encountered in simple sliding without vibration. The friction force that would occur would also typically be intermittent, because the surface contact is interrupted. These conditions are not analyzed. Instead an industry practice is to establish a design practice that recognizes that the forces are not likely to be significant in support design. This practice is considered adequate.

CONCLUSION

The SWEC approach to friction forces in support design calculations is acceptable. The friction forces issue is closed.

3.2.3.8 AWS Versus ASME

ISSUE DESCRIPTION

The issue arises from a CASE concern that the *ASME Boiler and Pressure Vessel Code* (ASME Code) does not adequately address aspects of weld design and welding procedures that are essential to ensuring the adequacy of welds. Further 10CFR50 Appendix A, General Design Criteria I, requires the establishment of appropriate standards, and, since the ASME Code is inadequate, *The American Welding Society Structural Welding Code*, AWS D1.1 (AWS Code), should be imposed. There are ten areas where the ASME Code was considered by CASE to be inadequate. These are listed as numbered by CASE (*Reference 7.21*):

1) Pre-heat requirements for welds on plates over 3/4 inch thick
2) Drag angle and work angles (which limit the space allowed for the welder to function)
3) Beta Factor for tube-to-tube welds
4) Multiplication factor and reduction factors for skewed "T" weld joints
5) Limitations on angularity for skewed "T" joints
6) Calculations for punching (actually a reduction factor for the weld) shear on step tube joints
7) Lap joint requirements
8) Design procedure for joint of tube to tube with Beta equal to 1.0
9) Calculation for effective throat of flare bevel welds
10) Limitations on weld sizes relative to plate thicknesses

Additionally, the appropriateness of the CPSES welding procedures for weave welding, downhill welding, preheat requirements, and cap welding were questioned.

The AWS versus ASME issue is evaluated in Engineering Evaluation DAP-E-P-008 which provides a more detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

Items (3), (4), (5), (6), (8), (9), and (10) as listed above, are welding design aspects. Items (4), (5), and (10) are discussed in Section 3.2.3.25 as part of the Skewed "T" Joint Weld issue and the "Undersized Fillet Welds" issue. Items (3), (6), and (8) are discussed in Section 3.2.3.20, as part of the Tube Steel and Wide Flange Web Stresses at Connections issue. The remaining areas of the AWS versus ASME (areas 1, 2, 7, and 9) are discussed further in this section.

THIRD PARTY EVALUATION

Of the ten numbered items discussed in this section, three relate to welding procedures, i.e. items (1), (2), and (7). Weave welding, downhill welding, preheat requirements, and cap welding are also related to welding procedures. The principal issue, as stated by the NRC staff and accepted by the ASLB, was "whether welding procedures qualified by test in accordance with the ASME Code are adequate in light of AWS requirements for prequalified welds". Using the NRC staff comparison of ASME and AWS and their review of TUGCO welding procedures, the ASLB was able to reach a conclusion. On June 29, 1984, ASLB ruled that, "Applicant's compliance with ASME Code has been adequate to assure the safety of its welding procedures with respect to welding parameters in this issue." The Third Party evaluation of the welding procedures portion of this issue is based on that decision.

NRC staff examination of this subject, and in particular the ASLB decision, leads to the conclusion that a Third Party review of TUGCO procedures is not required. Additionally, there is nothing to indicate that the weld procedure concerns would impact SWEC design practices.

Item number (9) was a design issue closed by the ASLB on December 28, 1983, and is therefore a closed issue. An aspect related to this issue is weld design associated with structural tube outside corner radius. This is discussed in Section 3.2.3.10, Section Properties.

CONCLUSION

There is no need to evaluate the adequacy of TUGCO welding procedures, because the NRC staff and ASLB have concluded they are acceptable with respect to this issue. The design related aspects are addressed in Sections 3.2.3.20 and 3.2.3.25. This issue is closed.

3.2.3.9 A500 Grade B Tube Steel

ISSUE DESCRIPTION

Pipe supports at CPSES, using A-500 Grade B tube steel, were designed based on 42 ksi yield stress. This was in accordance with ASME Supplement 9 of Code Case N71. Supplement 10 lowered the design yield stress to 36 ksi. It was contended that these supports should be redesigned using the allowable based on the lower yield stress in Supplement 10. There was also a concern that the ductility of A-500 Grade B steel was too low.

This issue is evaluated under Engineering DAP-E-P-009 which provides a detailed description of the issue.

SWEC RESOLUTION METHODOLOGY

The methodology used in requalification of pipe supports is as follows:

- Supports designed using A-500, Grade B tube steel will be qualified using an allowable yield stress of 36 ksi.
- Those supports not qualifying with a 36 ksi yield stress will be qualified using an allowable yield stress of 42 ksi and marked "Confirmation Required". The "Confirmation Required" will be removed upon issuance of a later supplement to Code Case N71, which is expected to return the allowable yield stress to 42 ksi.

THIRD PARTY EVALUATION

ASME considers A-500 Grade B tube steel to be an acceptable material for use in support design by virtue of its inclusion in Code Case N71. Since use of the material complies with the Code and the NRC has accepted this code case in Regulatory Guide 1.85, its use is in compliance with TUGCO licensing commitments and is therefore acceptable.

Regarding the concern over an acceptable yield stress for A500 Grade B tube steel, Supplements 9 and 10 of Code Case N71 have been adopted by the NRC under Regulatory Guide 1.85, Revisions 18 and 20, respectively. A response from the ASME regarding this issue confirmed that (1) the yield stress for A-500 Grade B tube steel was reduced to 36 ksi in Code Case N71-10 to address the slight reduction in yield strength which occurs in the heat affected zone of weldments, and (2) 36 ksi was a conservative lower bound value.

The initial SWEC approach, using a design allowable based on 36 ksi yield stress is consistent with the more conservative position taken by the ASME and is acceptable on that basis. The acceptance of 42 ksi by the ASME would be an acceptable basis for allowing the increase in yield stress. The ASME has full knowledge of the issue and their decision constitutes a reasoned industry consensus. If the ASME revises the yield stress to 42 ksi there will be a sufficient basis for removing the "Confirmation Required" status of the supports.

CONCLUSION

The SWEC approach of identifying and tracking those supports that were qualified using the higher allowable yield stress permitted by Code Case N71-9 ensures that appropriate values will be used in the final designs. This issue is closed.

3.2.3.10 Section Properties

ISSUE DESCRIPTION

Section properties of structural tubing are properties entirely dependent upon the geometric configuration and dimensions of the tubing cross section. An example is moment of inertia. Such properties are used in structural calculations of member stresses and stiffness. The values for commercially available structural tubing are tabulated in the *American Institute of Steel Construction* (AISC) Manual of Steel Construction and in various other industry publications; however, the properties differ from publication to publication. The differences can be shown to depend primarily on the corner radius used to calculate the values. Four concerns developed regarding this corner radius:

- CASE contended that steel milled prior to 1980 had a different corner radius than that milled after 1980, the date corresponding to the issuance of the 8th Edition of the AISC Manual.
- CASE contended that the AISC manual was the appropriate source for section properties, but that both the 7th and 8th Editions had to be used, depending on the date that the steel was fabricated.
- There was a concern that flare bevel welds for tube-to-tube connections could be adversely affected by the dimensional fit-up at the corner.
- There was also a concern that the effect of bolt holes on section properties had not been considered.

The section properties issue is evaluated in Engineering Evaluation DAP-E-P-010 which provides a more detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

The technical concerns relating to section properties are addressed as follows:

- SWEC performed an industry survey and determined that standard milling tolerances did not change during the CPSES procurement of structural tubing and the properties assumed are consistent with the 8th Edition of the manual. For the requalification of pipe supports, the section properties of structural tubing are taken from the 8th Edition of the AISC Manual.

- To address the concern related to flare bevel welds, SWEC performed tests to establish a basis for the effective weld throat calculation. A sample of installed supports was measured to determine corner radius. This was compared to the assumed AWS D1.1 configuration, i.e., a corner radius of twice the tube steel thickness. See FIGURE 3.2-3 for samples with the AWS configuration which would provide weld penetration. SWEC uses a throat equal to t minus 1/16 inch where t is the tube steel thickness in inches. For configurations that were more limiting with respect to weld penetration, specimens were welded and the effective throat measured. This resulted in a SWEC requirement to design welds on 2 x 2 x 1/4 and 2 x 2 x 3/16 inch tube steel using an effective throat equal to t minus 1/8 inch. These were the only tube steel sizes requiring a reduction of the effective throat, i.e., less than t minus 1/16 inch.
- SWEC addresses the effect of bolt holes on section properties in accordance with ASME Section III, Appendix XVII, which allows the designer to neglect the effect of a hole, provided the reduction in cross sectional area does not exceed 15 percent of the cross sectional area.

THIRD PARTY EVALUATION

The Third Party evaluation results are summarized as follows:

- The AISC Manual is an acceptable source for section properties. It is a recognized industry standard and is commonly used throughout the nuclear industry for this purpose. The 7th and 8th Editions have slightly different values for section properties. The 8th Edition states that the properties are exact or slightly conservative, and there is no evidence that standard milling practice changed in 1980, or at any other time during CPSES procurement. The AISC Manual chapter titled "Standard Mill Practice" did not change for structural tubing between the 7th and 8th edition, indicating that no milling practice change was noted by the AISC. The SWEC survey also supports this point.
- The 8th Edition properties are based on an assumed outside corner radius equal to twice the tube steel wall thickness. Based on the dimensions taken in the SWEC sample, that assumed radius is a reasonable basis for determining section properties. It had been contended by CASE that a radius of three times the tube steel wall thickness might be more appropriate. This contention was not substantiated by the physical measurements. The AISC Manual, the SWEC survey of milling practice, and the physical measurements taken for a sample of tube steel all support the conclusion that the 8th Edition is an adequate source of section properties for tube steel. In the absence of any data that supports a contrary position, the use of the 8th Edition is evaluated to be acceptable.
- The SWEC procedure generally applied for calculating weld throat, i.e., t minus 1/16 inch, is conservative with respect to the weld throat permitted by AWS D1.1, provided the AWS assumed geometry or a geometry allowing greater weld penetration is achieved. SWEC's method is conservative in such cases, because the throat is reduced 1/16 below the AWS value.
- In the process of sampling tube steel dimensions, a geometric configuration was identified by SWEC that has an effect on the capacity of a flare bevel weld for a matched tube steel connection. FIGURE 3.2-3 depicts the difference between the configuration typically assumed and the actual configuration. As a result of the difference, the opportunity to achieve weld penetration is lessened, which has an adverse effect on weld throat. For such cases the tests performed by SWEC to arrive at a calculation method, i.e., t - 1/8 inch, are an acceptable means for qualifying the welds.

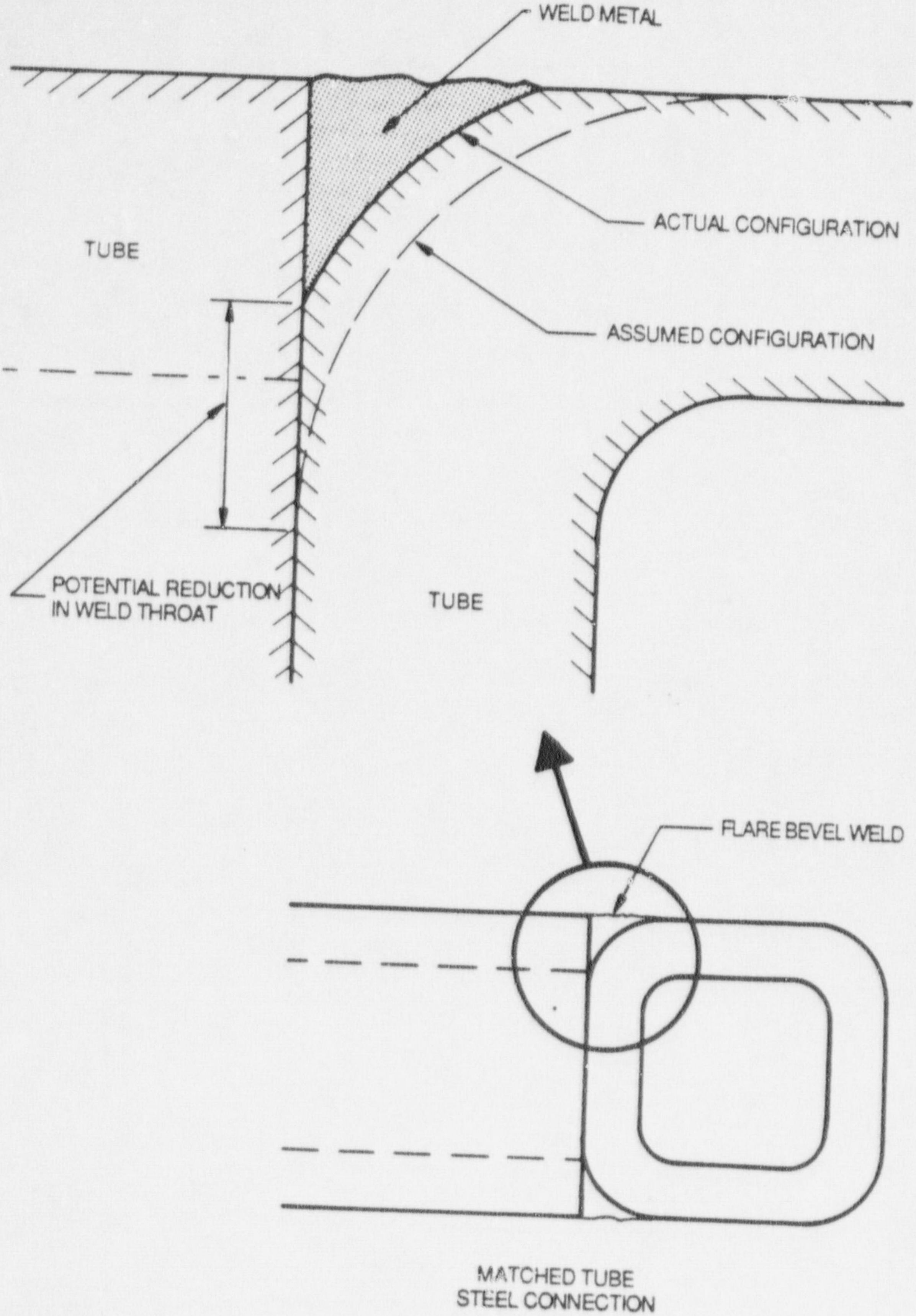

FIGURE 3.2-3

FLARE BEVEL WELD

- Compliance with ASME Section III, Appendix XVII as a means of considering the effect of bolt holes on section properties, is an acceptable basis for addressing the concern. For critical bending sections, the section properties are reduced if the area of the side of the member is reduced by 15%. This is an appropriately conservative interpretation of the ASME rule.

CONCLUSION

The approaches for addressing the three aspects of the section property issue are acceptable. The issue is closed.

3.2.3.11 Cinched U-Bolts

ISSUE DESCRIPTION

U-bolts were used instead of pipe clamps on some single strut or snubber pipe supports in the original design. Stability of these supports was questioned because of the possibility of the U-bolts rotating about the axis of the run pipe. As a response to the stability issue, cinching of the U-bolts (installation to a specific torque) was proposed as a design fix. However, the cinching of U-bolts resulted in additional technical concerns. These included:

- assurance of adequate preload through plant life,
- preload-torque relationship,
- adequacy of SA-36 material for the preload application,
- U-bolt stresses including effects of preload
- radial thermal expansion effects, and
- localized pipe stresses at stiff pipe clamps are also a concern, based on concerns similar to those raised for cinched bolts.

The cinched U-bolt issue is evaluated in Engineering Evaluation DAP-E-P-011 which contains a detailed discussion of the issue. The local pipe stress aspects are evaluated in Engineering Evaluation DAP-E-P-002.

SWEC RESOLUTION METHODOLOGY

SWEC is eliminating all cinched U-bolts at pipe supports.

THIRD PARTY EVALUATION

Eliminating cinched U-bolts eliminates the concerns. The function of the stiff clamp has been reviewed with respect to all concerns raised for cinched U-bolts, and it has been determined that the concerns are not valid based on the SWEC qualification procedures employed for stiff pipe clamps. Local stresses for stiff clamps are discussed in Section 3.2.3.2 and that aspect of stiff clamps is adequately addressed by SWEC.

CONCLUSIONS

SWEC has elected to eliminate the concerns regarding cinched U-bolts by eliminating them. Stiff pipe clamps are adequately addressed for local pipe stress. The issue is closed.

3.2.3.12 Axial/Rotational Restraints

ISSUE DESCRIPTION

Certain axial and/or trapeze type supports at CPSES use welded lug or trunnion attachments to transfer loads to frames or component hardware. The concerns regarding these specific types of supports are summarized as follows:

- Eccentric loading, which can result from effects such as differential snubber lock-up and support steel stiffness variations, must be considered in the design process.
- Snubber end clearance effects may cause significant increase in loads, or invalidate linear analysis results.
- Multiple lug configurations must consider a conservative loading distribution for lug and frame design.
- Insufficient clearances or eccentricities may exert rotational restraint on the pipe.
- Rotational restraint effect must be treated as a primary stress for the support design.

The axial/rotational restraint issue is evaluated in Engineering Evaluation DAP-E-P-012 which contains a detailed discussion of the issue. Related issues are discussed in the following Engineering Evaluations:

- Local Stress (Pipe) - DAP-E-P-002
- Generic Stiffness - DAP-E-P-005
- Gaps - DAP-E-P-013

SWEC RESOLUTION METHODOLOGY

SWEC addressed the above concerns by separately considering integral dual component support, non-integral dual component supports, and lug/frame.

Integrally attached supports (including those which are welded to pads which are welded to the pipe) were addressed by integrating the geometry of the trunnions into the piping model. Additionally the design loads, obtained directly from the analysis, were increased by 20% to account for differential snubber lock-up.

Non-integral dual strut/snubber axial supports (including frame/lug type) are modeled as single translational supports and each component is designed for 75% of the total load from the stress analysis. Four lugs are typically used for non-integral axial clamp supports. Each lug is qualified to 50% of the total load for dual component supports modeled as a single component.

Where significant variations in stiffness exist in the two sides of the support, the support component on the softer side will be physically removed and the eccentricity modeled into the piping analysis. For such eccentrically modeled supports, the load for each lug is based on statics with the assumption that all of the moment is reacted at the lugs, i.e., the clamp to pipe connection does not resist the moment.

Cinched U-Bolt trapeze supports are being eliminated.

Lugs for rigid frame type axial restraints are each qualified for the total load if only two lugs are used, or 50% of the total load if four lugs are present. The total load will be distributed to half the lugs which will produce the most critical stress in the frame.

Analysis of load distribution at lug/frame interfaces will be based on an assumption that will maximize critical stress in the frame.

Support stresses resulting from rotational restraints effects will be treated as primary stress for both integral and non-integral supports.

THIRD PARTY EVALUATION

The use of a 20% increase in load to account for differential snubber lockup on integrally attached supports is appropriate for matched snubbers.

SWEC is reviewing the vendor data to ensure that paired snubbers are matched. Where necessary, modifications will be made to achieve this. SWEC calculations to support the load distribution for dual strut/snubbers modeled as single axial restraint were reviewed, and it is concluded that the 75% load, which assumes an increase of 50% of the load for each half of the dual support, is adequately conservative.

For non-integral dual strut/snubber supports that are modified by removal of one snubber/strut, support eccentricities and configurations are modeled into the piping analysis, thereby adequately addressing the rotational restraint. Load distributions are sufficiently accurate and adequate.

Supports modeled as single/axial (e.g., frame/lug type and clamps with dual snubbers/struts) do not consider rotational restraint of the piping. SWEC has issued a procedure which evaluates pipe/support conditions during final reconciliation to determine if there are conditions which will produce unusually large pipe rotations. Evaluations of supports will be conducted if required to include the effects of pipe rotations.

The SWEC method for determining load distribution on multiple lugs is considered both reasonable and conservative based on the close lug/frame gap tolerances.

The SWEC approach to evaluating support/frame stresses based on a selected, critically applied load distribution is reasonable and acceptable based on simple statics.

The approach to evaluating constraint of free end displacement is consistent with the ASME Code.

End clearance effects are evaluated in the Engineering Evaluation of the Gaps issue (DAP-E-P-013).

CONCLUSION

The SWEC approach to resolving this issue is considered adequate based on the guidance provided in the SWEC procedures. The axial/rotational restraint issue is closed.

3.2.3.13 Gaps

ISSUE DESCRIPTION

The concern was raised that the piping analysis does not adequately account for the effect of gaps in the piping/support system. The specific gaps of concern are:

- excessive clearance between pipe and supports in the loaded directions,
- inadequate lateral clearance for U-bolts,
- excessive clearance between Hilti expansion anchors and the bolt holes in the base plate, and
- excessive clearance between Richmond Insert threaded rods and the tube steel bolt holes.

The first of these is discussed in this section based on Engineering Evaluation DAP-E-P-013. The general concern was the applicability of a linear elastic analysis to predict the piping system response given that the actual system contains gaps.

The adequacy of U-bolt lateral clearance is discussed in Section 3.2.3.6 based on Engineering Evaluation DAP-E-P-006. Bolt hole clearance for Hiltis is discussed in Section 3.2.3.26 based on Engineering Evaluation DAP-E-P-028. Richmond Insert bolt hole clearances are discussed in 3.2.3.1 based on Engineering Evaluation DAP-E-P-001.

SWEC RESOLUTION METHODOLOGY

The pipe/support gap clearances to be used by SWEC in designs are listed in Table 1A, Attachment 4-11 of CPPP-7.

THIRD PARTY EVALUATION

Table 1A, Attachment 4 of CPPP-7, Rev. 2, specifies clearances that allow a maximum 1/8 inch gap. This is consistent with standard industry practice. It is accepted throughout the industry that linear analysis, which does not model gaps, is an appropriate means of analyzing piping and this applies to piping systems that have 1/8 inch gaps. This is predicated on the assumption that the linear analysis is a sufficiently accurate means for calculating the response of piping and loads on supports. On the basis that SWEC is applying accepted industry practices, the practice is considered acceptable.

CONCLUSIONS

The SWEC approach to pipe/support clearances is acceptable. This issue is closed.

3.2.3.14 Seismic Design Load Specification

ISSUE DESCRIPTION

The seismic design load specification issue is comprised of several miscellaneous concerns regarding the adequate specification of conservative design criteria. The external source concerns are summarized as follows:

- Analysis procedures allowed a dynamic amplification factor of 1.0 for equivalent static analysis. No justification was provided, but justification is required by the CPSES FSAR.

- NRC Regulatory Guide 1.61 is not conservative.
- NRC Regulatory Guide 1.61 requires the use of the lower OBE dampening values for the SSE spectra for design of active components, e.g. active valves. External Sources interpret this to apply to analysis of piping systems, which are passive, if an active valve is part of the system.
- Analyses of stress problems with both large and small bore piping incorrectly employed the less conservative, higher dampened spectra for large bore piping.
- Spectra used did not envelope all the applicable spectra.
- Observation that emergency design loads sometimes exceed faulted loads led to a presumption that errors in the determination of the loads may have been made.

The seismic design load specification issue was evaluated in Engineering Evaluation DAP-E-P-014 which provides a detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

SWEC procedures require a dynamic amplification factor of 1.5 for equivalent static analysis, unless otherwise justified.

SWEC's approach to resolving damping concerns is to apply industry accepted standards which specify damping values for qualification of piping systems. This includes NRC Regulatory Guide 1.61 and the NRC-approved (*Reference 7.22*) usage of the more recent ASME Code Case N-411, which recognizes the variable damping relative to systems frequency. The concern regarding reduced damping for active components is not considered to be applicable to piping analysis. Such reductions are not consistent with industry practice for piping. SWEC procedures require that piping systems containing mixed pipe sizes above and below 12 inch nominal be evaluated with the lower damping values.

SWEC envelopes spectra or uses multiple response spectra input. The latter option is not used with N-411 spectra.

Implementation of SWEC corporate quality assurance procedures is intended to resolve concerns regarding random errors.

THIRD PARTY EVALUATION

The concerns raised are of three types:

1) equivalent static analysis criteria,
2) damping criteria, and
3) implementation of various criteria.

The use of a 1.5 factor for equivalent static analysis is the approach accepted by the NRC and used throughout the industry as a conservative calculation. It is an acceptable practice.

The SWEC approach to addressing the spectra damping is considered acceptable. NRC Regulatory Guide 1.61 has long been the industry accepted basis for licensing of nuclear power plants. The results of more recent industry studies are reflected in Code Case N-411 which has been approved for use by the NRC on other nuclear plants and specifically for CPSES *(Reference 7.22).*

Certain requirements were established as NRC conditions for the use of N-411 at CPSES. These were primarily documentation requirements. For example, all pipe stress packages that use Code Case N-411 are to be identified in the FSAR. Compliance with such requirements does not directly relate to the assessment of technical methodology. Other requirements were associated with walkdown programs that follow the completion of analysis. It has been determined that the requirements can be satisfied by SWEC walkdown programs and the stability evaluations included in CPPP-6 and CPPP-9; however, the adequacy of the technical approach to damping is not dependent on completion of such programs. Therefore, the walkdown procedure has not been evaluated as part of this issue. One requirement is that N-411 damping is not to be used for time history analysis. SWEC complies with this.

SWEC's position regarding reduced damping for active components is acceptable and consistent with industry practice.

The other resolutions addressing random errors of incorrectly damped spectra selection and the specific procedure errors are considered to be adequately addressed by SWEC corporate and/or project procedures.

CONCLUSION

SWEC has provided an acceptable approach to address seismic design load specification consistent with that utilized by the industry. The seismic design load specification issue is closed.

3.2.3.15 Support Mass Effects On Piping

ISSUE DESCRIPTION

It was alleged that Gibbs and Hill procedures did not specify how or when support mass should have been included in the CPSES piping analysis. The result was inconsistent and potentially inadequate accounting of support mass effects in the prediction of piping dynamic response and stress. Specific concerns were the related effects of eccentric support mass on piping response for evaluating dynamic loads, including fluid transient induced loads. The support mass issue is evaluated in Engineering Evaluation DAP-E-P-015 which provides a more detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

SWEC will consider support mass in the analysis of all CPSES piping systems. Project procedures have been issued which address common support configurations for standard component type supports, detailing the component mass or portions of mass which are to be modeled concentrically or eccentrically in the piping model. In addition to the guidelines for modeling support mass effects in the piping model, methods for evaluating changes in support mass effect on piping response, due to design or installation deviations, have been described.

THIRD PARTY EVALUATION

The methods described in the SWEC procedures address the majority of support hardware in sufficient detail. Other component support hardware can be addressed by extrapolating from the data in the procedures.. The SWEC procedures do not address certain other types of supports, e.g., structural frames or cantilever supports. The significance of the effect of the mass of these types of supports is dependent on both the mass and stiffness of the support. This aspect has been assessed by reviewing a selection of specific designs and it was determined that the practice of modeling stiffness and evaluating self weight excitation provide an adequate means of considering the mass effect for the type of designs encountered.

As part of the assessment of this issue a review was conducted of an aspect of support mass modeling which extended beyond the level of detail provided in procedures. For certain trapeze design modifications in limited use, it is possible for the support mass to act only in two of the three directions. The NUPIPE-SW Program has the capability to model directional mass. The caution provided by SWEC procedures are adequate for evaluating "special situations." The Third Party considers these adequate for closure of this issue.

CONCLUSION

SWEC has provided guidelines for considering support mass, including eccentric support mass effects, in the piping model which are adequate. The issue of support mass effects on piping analysis is closed.

3.2.3.16 Mass Point Spacing

ISSUE DESCRIPTION

Gibbs & Hill procedures for CPSES established requirements for minimum spacing of mass points in the piping model, to predict an accurate response to dynamic loadings. The piping analysis reviewed by Cygna did not comply with the established requirements. In addition, the computer program used (ADLPIPE Version C) improperly lumped concentrated masses. The primary issue is adherence to established requirements for mass point spacing. The mass point spacing issue was evaluated in Engineering Evaluation DAP-E-P-017 which contains a detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

SWEC modeling guidelines specify where lumped mass points are to be located in the piping analysis . To assure adherence to these requirements, SWEC has included mass point spacing as a review item in the analysis checklists.

THIRD PARTY EVALUATION

The review of the SWEC requirements indicates that the lumped mass points will be sufficiently accurate to capture dynamic characteristics. The evaluation of SWEC formulations is contained in DAP calculation number DAP-C-P-003. The inclusion of mass point spacing as a specific checklist item provides adequate assurance that the established guidelines are verified both for manually derived and automatically generated mass point spacing.

CONCLUSIONS

The SWEC procedures provide adequate guidelines for locating lumped mass points in a piping model. The mass point spacing issue is closed.

3.2.3.17 High Frequency Mass Participation

ISSUE DESCRIPTION

The pipe stress analyses conducted by Gibbs & Hill did not comply with CPSES FSAR requirements in that there was no assurance provided that the potential inclusion of higher frequency modes in response spectrum analyses would not increase system response by more than 10% of that predicted up to the cutoff frequency. This high frequency mass participation issue was evaluated in Engineering Evaluation DAP-E-P-018 which provides a detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

SWEC has addressed this issue by requiring one of the following:

- Perform amplified response spectrum (ARS) modal analysis up to a 50 Hz cutoff frequency using NUPIPE-SW V04/L02 with the high frequency missing mass correction option chosen.
- Perform a NUPIPE ARS analysis with a 50 Hz cutoff frequency without the missing mass correction option chosen. Combine these results with the results from an equivalent static analysis for the zero period acceleration (ZPA). The combination is by SRSS in each of three orthogonal directions.

The above criteria are specified in the current project procedures. In addition, high frequency mass correction is specifically included in SWEC's pipe stress analysis checklist as a review item.

THIRD PARTY EVALUATION

The two methods permitted in SWEC procedures addressing the concern for response of higher frequency modes were reviewed. The NUPIPE missing mass correction is an approach based on technical methods described in published papers that have been subjected to peer review. The methods are in common use and have achieved acceptance by both the NRC and the industry. This is the basis for accepting this method for CPSES.

The second method was in common use prior to the availability of missing mass correction methods. It is a conservative means of bounding the response.

CONCLUSION

SWEC has established an approach to resolution of the high frequency mass participation issue that is acceptable. The high frequency mass participation issue is closed.

3.2.3.18 Fluid Transients

ISSUE DESCRIPTION

Several indirectly related concerns were raised relative to design of piping systems for fluid transients.

Two of the concerns are related to assumptions regarding Main Steam *Safety/Relief Valve* (S/RV) discharge loads. These are:

- flow distribution in Crosby dual-port S/RVs for the purpose of developing moment loads and stresses on the Main Steam line, and
- conservatism of assumptions regarding multiple S/RV actuation sequence used to evaluate the maximum instantaneous stress in the Main Steam piping system.

The remaining concerns are related to analysis/design requirements and acceptance criteria specifically addressing the unique characteristics of fluid transient loads. These are:

- rigid frame gaps in unrestrained directions for fluid transients,
- criteria or requirements to validate time step selection for time history analysis, and
- consideration of steady state versus dynamic fluid transient loads in piping systems supported by snubbers.

The fluid transients issue was evaluated in Engineering Evaluation DAP-E-P-019 which provides a detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

SWEC's approach to addressing the fluid transient issue is to develop conservative design inputs and loading criteria.

Concerns regarding Main Steam S/RV loading have been verified with the vendor, and work is underway to develop conservative piping response to single and multiple S/RV actuation.

The specific concerns regarding analysis/ design requirements and acceptance criteria are addressed in project procedures as follows:

- Clearance requirements are addressed by requiring the transmittal of piping displacements for all pipe loadings, combined in accordance with the loading combinations, to the pipe support design group for acceptance.
- Guidelines are provided for determining time steps and cutoff frequencies in a time history analysis and reviewing results for reasonableness.
- General guidelines are provided for consideration of the type of loading (static or dynamic) for modeling snubbers in the piping analysis.

THIRD PARTY EVALUATION

The SWEC approach to resolving the concerns is sufficiently detailed to provide assurance that specific concerns will be adequately addressed. The more general concern, regarding the adequacy of overall design criteria and procedures to address the consideration of fluid transients, is partially addressed by the procedures. Review of the issues and SWEC procedures indicates that the attention to fluid transient related design requirements is adequately consistent with general practice. However, because it is not general practice to proceduralize most aspects of fluid transients design and analysis activities, implementation review was required to confirm the adequate consideration of all related design criteria.

The Third Party's review of fluid transients implementation was conducted through two tasks which paralleled the SWEC activities: first, the identification of significant events, and; second, the quantification of fluid transient loads from these events. The Chemical and Volume Control System (CVCS) and the Main Steam System were selected as subjects for this review.

Task 1: The first task was a review of the identification of (screening for) significant fluid transient events. The System Information Documents, the supporting calculations and assumptions, and the implementing (fluid transient) analyses were reviewed against a data base of CPRT systems, alignments, and events, independently prepared expressly for the Third Party review. Bases used for the determination of significance as well as system and scope boundaries were also specifically reviewed.

The review indicated an adequate implementation of the SWEC procedures and commitments consistent with industry practice. The SWEC screening process appropriately resulted in the specific design attention to more events than originally addressed. The review also indicated adequate attention to the major aspects of plant design and operations which can result in fluid transients and knowledge of general nuclear plant experience with transients.

Adequacy of the SWEC screening process is dependent on verifying that bounding fluid transient loads are properly evaluated to determine significance on piping and support code compliance. SWEC has issued a calculation and an implementation procedure for evaluating pipe stress. The procedure additionally requires supports to be evaluated in all cases to assure that fluid transient loads, which are screened out based on pipe stress, can be accommodated.

Assurance is also dependent upon verification that some additional events consistent with the FSAR design basis have been reviewed for significance. Specific concerns raised by the Third Party are being addressed by SWEC procedures. The procedures require the following:

- The non-safety piping and supports for the Main Steam line from the moment restraint to the turbine and condenser are to be reviewed to determine if the new turbine trip loads calculated by SWEC are within ANSI B31.1 allowables.
- Recent modifications performed on the Feedwater and Auxiliary Feedwater systems and the effects of these revisions on the piping and supports are to be reviewed for design adequacy.
- The Safety Injection system will be reviewed for potential two phase water hammer loads due to valve leakage. System operating procedure or design analysis remedies will be implemented if necessary. Other Class 2/3 systems will also be reviewed for potential valve leakage fluid transients.
- The piping integrity will be reviewed for the isolation of pipe rupture events occurring in Main Steam and CVCS piping adjacent to SWEC piping scope. The licensing base for CPSES will be reviewed to determine if these events need to be addressed in piping and support design.

The Third Party concludes that these procedures provide sufficient assurance that the fluid transients events identification process is adequate.

Task 2: The second task of the Third Party review of fluid transients implementation verified the adequacy of the development of loadings to be used in pipe stress analysis. Review of the CVCS system analyses, MS turbine trip analysis, and FW break isolation analysis verified a generally adequate and conservative approach to the estimation of fluid transient loadings.

The review verified that the various methods used by SWEC, including computer analyses with Method of Characteristics programs (WATHAM and STEHAM), RELAP, and hand calculations, were suitably selected and applied for the specific events being analyzed. The results for these analyses were verified in magnitude as well as transient behavior to be reasonable by independent calculations. Inputs for the analyses, including equipment data, were verified as to source, consistency, and reasonableness of values. Modeling decisions, including time steps, nodalization, equipment modeling, and duration of analysis were verified as reasonable and generally conservative through a detailed review of implementing calculations.

Modeling assumptions, including the selection of boundary conditions and initial conditions were verified as consistent with system operation by independent review and comparison with system descriptions, range of operating modes, and equipment alignments. During the review it was verified that essential equipment and alignments which dominate the validity of the analytical results were adequately considered.

The analytical models were also reviewed to assure the insensitivity to nodalization and other governing parameters. Sensitivity analyses were specifically done for the FW break isolation analysis model as appropriate for the RELAP program used in that analysis. Sensitivity analyses performed on the Main Steam turbine trip analysis model were also reviewed although turbine trip results are not unduly sensitive. Time steps were verified to be selected small enough so that results are adequate for the the majority of the transients analyzed. Also, a sensitivity analysis representative of SWEC analyses was performed and verified the reasonable insensitivity of the remaining analyses.

Assurance as to the adequacy of the SWEC fluid transients analyses is dependant upon verification that flashing during the majority of depressurization transients analyzed does not increase the calculated loads or impair valve performance. Specific verification that the potential for vapor pocket collapse overpressures and loads are not significant or are bounded by existing load cases will be provided by the implementation of specific project procedures issued to address this concern. SWEC will calculate loads for relevant systems and events (using a method that explicitly addresses vapor pocket formation and collapse) and will include these loads in piping analysis.

Additionally, specific substantiation that the RV's can pass two phase flow (caused by depressurization) and maintain their certified flow consistent with ASME overpressurization requirements will be provided by a review of these valves and systems as guided by SWEC procedures.

Related discussions are contained in the following Engineering Evaluations:

- Mass Point Spacing DAP-E-P-017
- Support Mass Effects on Piping Analysis DAP-E-P-015
- High Frequency Mass Participation DAP-E-P-018
- Valve and Flange Qualification DAP-E-P-025
- Generic Stiffness DAP-E-P-005

CONCLUSION

SWEC's attention to requirements specifically related to fluid transients and the additional review as discussed above are sufficient to provide assurance that all related design/analysis considerations will be addressed. The fluid transients issue is closed.

3.2.3.19 Self-Weight Excitation

ISSUE DESCRIPTION

The qualification of large bore pipe supports did not generally include the pipe support dead weight or loads due to self-weight seismic excitation in the support calculations. Also, adequate justification was not provided for neglecting these loads.

Support self-weight excitation was evaluated in Engineering Evaluation DAP-E-P-019 which contains a more detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

SWEC addressed this issue by the following methodology:

- **Dead Weight Loads** - SWEC has committed to evaluate all large bore pipe supports for dead weight loads. Under this approach, the component dead weight is considered in either the structural (support) analysis or the piping stress analysis.
- **Self-Weight Excitation Loads** - SWEC procedures require that all self-weight excitation loads be included in the support evaluation for all frame supports. The procedures do not require a calculation of these loads for elements of supports attached directly to the building structure, i.e., supports without structural frames. These loads are considered to be insignificant.

THIRD PARTY EVALUATION

The Third Party evaluation is summarized as follows:

- **Dead Weight Loads** - The dead weight load of any component support hardware is included in the piping analysis model or directly in the support design calculations. The dead weight load is not double counted. This adequately addresses this aspect of this issue.
- **Self-Weight Excitation Loads** - The SWEC procedures provide four methods for analyzing supports for seismic loads. Support mass that is not modeled with the piping is modeled with the support. Three of the methods statically analyze the supports using acceleration values derived by SWEC from the CPSES response spectra. A separate Third Party evaluation performed to review this derivation determined that the method and acceleration values are acceptable. The fourth method is a dynamic analysis which normally would not be necessary to calculate self-weight excitation loads because the simpler and more conservative static analysis typically produces loads which are conservative. Dynamic analysis would be used to reduce the loads if necessary. Such dynamic analysis is an appropriate analytical tool; however, it has not been used to date.

The SWEC approach of not requiring a calculation of seismic self-weight excitation for component support hardware attached directly to the building structure is acceptable, because the component part (e.g., snubber rear bracket) which is attached is so rigid that it follows the building motion without amplification and does not produce significant additional load to the support itself. This is considered a valid approach and one which is typical of industry practice.

CONCLUSION

The SWEC procedures establish an acceptable methodology for addressing support dead weight loads and loads due to the self-weight excitation of the support. This issue is closed.

3.2.3.20 Local Stresses In Pipe Support Members

ISSUE DESCRIPTION

Certain types of pipe supports or details of pipe supports have been identified where local stresses may be the limiting design factor, but they were not evaluated during the design process. These include:

- local stresses in cinched U-bolts,
- local stresses in piping anchors,
- local stresses in zero gap box frames,
- tube steel and wide flange web stresses at connections, and
- short beam stresses.

Local stress in pipe support members was evaluated in Engineering Evaluation DAP-E-P-021 which provides a more detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

Local stresses in piping anchors are discussed in Section 3.2.3.2. The resolution methodology for the remaining concerns is as follows:

- **Local Stresses in Cinched U-bolts** - TUGCO has eliminated the use of cinched U-bolts.
- **Local Stresses in Zero Gap Box Frames** - SWEC has committed to eliminate all zero gap box frames.
- **Tube Steel and Wide Flange Stresses at Connections** - SWEC procedures specify that local stresses in tube steel connections and welded bracket connections be designed in accordance with the requirements of AWS D1.1, U-bolt nuts bearing on tube steel walls are qualified through a separate SWEC analysis and attachments to open shapes (e.g., wide flanges) are designed using AISC Specification guidelines.
- **Short Beam Stresses** - Local stresses in short members are evaluated using a qualitative approach which depends on an engineer to correctly judge load transfer behavior of the beam.

THIRD PARTY EVALUATION

The Third Party evaluation is summarized as follows:

- **Local Stresses in Cinched U-bolts** - Elimination of all cinched U-bolts resolves the concern.
- **Local Stresses in Zero Gap Box Frames** - Elimination of all zero gap box frames from the CPSES designs resolves this concern.
- **Tube Steel and Wide Flange Stresses at Connections** - Review of the design procedures, and calculations used in the engineering development of the procedures,

verify that SWEC methodology for the design of tubular connections, including consideration of beta factors and punching shear, and for the design of welded attachments to tube steel is consistent with the requirements of AWS D1.1.

The SWEC analysis performed to develop the methodology for qualification of nuts bearing on tube steel walls was reviewed and determined to be acceptable when appropriate washer plates are used between the nut and the tube steel.

The SWEC procedures provide adequate directions for evaluating the local stresses in open shapes due to welded attachments. The procedures are in accordance with the guidelines presented in the AISC specification.

- **Short Beam Stresses** - The SWEC procedures provide an acceptable qualitative approach to evaluating the local stresses in short beams.

CONCLUSION

The approach used by SWEC for the evaluation of local stresses in pipe supports is acceptable. This issue is closed.

3.2.3.21 Safety Factors

ISSUE DESCRIPTION

The concern relates to possible reduction of built-in safety factors resulting from failure to comply with various applicable regulatory, licensing and code requirements. This diminution results from improper compliance or lack of compliance with various design criteria requirements and practices. The safety factor issue is a concern for failure generally to comply with the requirements, not to any specific, individual issue compliance.

Safety factors are evaluated under Engineering Evaluation DAP-E-P-022 which provides a more detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

The resolution methodology implemented by SWEC is that all generic issues must be resolved before CPSES can invoke the inherent design margins (safety factors) accumulated from the built-in conservatisms in codes, input, and regulatory positions that typically provide sufficient margin so that minor variations or small loads that might potentially occur during normal operation can be neglected. All generic issues have been evaluated and included into CPPP-7 design criteria. With all generic issues appropriately addressed, there is sufficient margin to allow for small potential loads that occur during normal operation.

THIRD PARTY EVALUATION

The safety factor adequacy of codes and regulatory positions per se is not at issue, and in fact is not specified within such documents. Generally, such positions reflect consensus acceptance by a group of experts in the field. Compliance with applicable FSAR, AISC Manual, ASME Code, and Regulatory Guides and Bulletins requirements is sufficient to demonstrate existence of appropriate safety margins. Only in cases where deviation from such requirements occur, or where such requirements fail to provide adequate guidance, should questions regarding safety be a concern. The SWEC CPSES piping and pipe support requalification effort, as defined in CPPP-6 and CPPP-7, is consistent with standard design methods for nuclear generating facilities. These methods include compliance with applicable codes, standards, and regulatory requirements and are supplemented, where necessary, by good engineering practices. SWEC identified the technical issues involved, established the method of resolution, and implemented the resolution by way of CPPP-7 design procedures.

The general safety factor concern is resolved by satisfactory resolution of all individual issues.

CONCLUSION

Based on the fact that individual issues have been satisfactorily resolved, the general issue of safety factors is also resolved. The issue is closed.

3.2.3.22 SA-36 And SA-307 Steels

ISSUE DESCRIPTION

Specific aspects of this issue relating to the use of SA-36 and SA-307 steels in the design of supports are as follows:

- **SA-36 Steel Used in Dynamic Applications** - The use of SA-307 bolting material is not recommended, by code, for use in dynamic applications. CASE contended that since SA-36 material is similar to SA-307, the same cautionary consideration should apply.
- **SA-307 Material Used in Dynamically-Loaded Friction Connections** - SA-307 material has been used in dynamically-loaded friction connections. This is prohibited by the code.
- **Regulatory Guide 1.124 Limitations** - Bolting material has been designed using allowable stresses which exceed the material yield strength under Level D Service Limits. This does not meet the requirements of NRC Regulatory Guide 1.124, which limits load increases to 1.5 times Level A Service limits because of the potential for non-ductile behavior.
- **Use of Low Strength Nuts with High Strength Bolting** - Low strength nuts, A-563 Grade A (companion nuts to SA-307 bolting) were used with high strength (A-193 Grade B7) bolting.

A detailed discussion of this issue is provided in Engineering Evaluation DAP-E-P-023.

SWEC RESOLUTION METHODOLOGY

The SWEC approach to resolve each of the concerns identified above is as follows:

- **SA-36 Used In Dynamic Applications** - SWEC procedures permit the use of SA-36 material in bolted type connections subject to dynamic loads.
- **SA-307 Material Used In Dynamically-Loaded Friction Connections** - SWEC procedures preclude the use of SA-307 material for U-bolt and rod type applications type connections subject to dynamic loading.
- **Regulatory Guide 1.124 Limitations** - SWEC procedures make no direct reference to the Regulatory Guide 1.124 requirement that allowables be limited to 1.5 times Service Level A limits. SWEC has adopted ASME Code paragraph NF-3225.2, Winter 1982 addenda which limits the stresses to yield.

- **Use of Low Strength Nuts With High Strength Bolting** - SWEC procedures require that, for high strength bolting connections using low strength nuts, the tensile allowables of the connection be reduced by 40 percent.

THIRD PARTY EVALUATION

The Third Party evaluation results are summarized as follows:

- **SA-36 Used In Dynamic Applications** - Although SA-36 and SA-307 material are similar, it must be recognized that neither the ASME nor the AISC codes specifically prohibit the use of SA-36 material under dynamic loading. However, since specific loads identified in the SWEC procedures are dynamic, a separate Third Party evaluation was performed to consider high cycle fatigue as required by ASME Section III. This evaluation confirmed that the lower threshold limit of 20,000 cycles, below which fatigue is not a concern, will not be reached.
- **SA-307 Material Used In Dynamically-Loaded Friction Connections** - To implement the resolution, SWEC has undertaken a program to review all applicable Certified Materials Test Reports, Load Capacity Data Sheets, and Certified Design Reports to ensure that SA-307 material is not used. The procedures also require that any SA-307 threaded rod identified on the pipe support drawing be replaced.
- **Regulatory Guide 1.124 Limitations** - The requirements of Regulatory Guide 1.124 apply specifically to ASME Class 1 bolting. However, the intent of the Regulatory Guide has been met through the adoption of a later code paragraph which limits bolt stresses to the material yield strength at temperature under all service loads.
- **Use of Low Strength Nuts With High Strength Bolting** - A separate Third Party evaluation was performed verifying that the reduced allowables for connections using low strength nuts with high strength bolts is acceptable.

CONCLUSION

The approach adopted by SWEC adequately addresses the issues. The issue is closed.

3.2.3.23 Valve And Flange Qualifications And Valve Modeling

ISSUE DESCRIPTION

The issue of qualification of valves and flanges and the correct modeling of valves in the piping analysis raised three areas of concern:

1) The main steam relief valve operator supports (snubbers) are not qualified for as-built loads, and the adequacy of the valve has not been demonstrated for as-built loads through the operator supports.
2) Valves with fundamental frequencies less than 33 Hz which have operator seismic restraints should have accurate modeling of the yoke stiffness to ensure that the valve response is correctly predicted.
3) The validity of a sampling process to assure the acceptability of valve accelerations and flange loads has not been demonstrated.

The valve and flange qualifications and valve modeling issue is evaluated in Engineering Evaluation DAP-E-P-025 which provides a more detailed discussion of the issue. A related issue is the damping used for seismic analysis of piping systems containing active valves. This issue is discussed in Engineering Evaluation DAP-E-P-014, Seismic Design Load.

SWEC RESOLUTION METHODOLOGY

SWEC procedures require as-built data (e.g., support locations) to be incorporated into requalification analysis. All valves are checked by SWEC against acceleration limits as provided by TUGCO. Then all valve accelerations, valve end loads, and valve operator support requirements are transmitted to TUGCO for ultimate acceptance and confirmation.

Valves with fundamental frequencies less than 33 Hz are modeled using a cantilever-based equation to determine an equivalent moment of inertia based on the valve's fundamental frequency. Valve operator supports are treated the same as any pipe support using methods that include support directions, function, stiffness, and mass.

The SWEC procedures require all valves be qualified for applicable acceleration and end load limits. All bolted flange joints are required to be qualified for moment loadings, which includes ASME qualification of the bolts.

THIRD PARTY EVALUATION

The SWEC procedures provide methods and requirements for modeling and qualification of valves, flanges, and associated supports. No specific reference is made to valves with supported motor operators; however, this case is addressed by the general criteria in the procedures. Because SWEC's scope of review requires qualification of all valves and flanges, the issue of use of a sampling process is no longer a concern.

CONCLUSIONS

The SWEC approach to the qualification of valves and flanges is acceptable. Procedural valve and support modeling techniques provide adequate methods of addressing the issue. Therefore, this issue is closed.

3.2.3.24 Piping Model

ISSUE DESCRIPTION

This issue comprises several concerns relating to the accuracy and input of piping analysis models. These concerns are:

- support location tolerances,
- correct identification and input of *Stress Intensification Factors* (SIFs),
- inclusion of valve and flange insulation/fluid mass, and
- location of snubbers adjacent to rigid attachment points.

The piping model issue was evaluated in Engineering Evaluation DAP-E-P-026 which contains a detailed discussion of this issue.

SWEC RESOLUTION METHODOLOGY

SWEC addressed each of these concerns in the project procedures:

- As-built information is to be the basis for all CPSES piping analysis, with differences to be reconciled within the calculations.
- Piping SIFs for the most common components and transitions are specifically identified in the project procedures. The specification of SIFs is noted to be of special concern and is included as an analysis checklist item.
- Procedures contain a general requirement to include mass effects of piping contents and insulation in the analysis model.
- Procedures recommend removal of snubbers near equipment connections. Also included are requirements to evaluate snubber activation for those in close proximity to anchors and equipment connections.

THIRD PARTY EVALUATION

SWEC's method for identifying and documenting reconciliation of deviations in support locations is acceptable and verifiable.

Identification of concern regarding SIFs in general, inclusion of SIFs as an analysis checklist item and specific identification of SIFs for the more common piping components are sufficient to address this concern.

SWEC's general requirement to include mass of contents and insulation is sufficient to address this concern.

SWEC procedures adequately address the concern regarding snubber activation near rigid pipe connections.

CONCLUSION

SWEC procedures are sufficiently detailed to ensure that these piping design/inputs will be evaluated. The piping model issue is closed.

3.2.3.25 Welding

ISSUE DESCRIPTION

Concerns have been raised regarding the adequacy of a) engineering methods which were used for sizing of welds and/or checking of weld stresses, b) violation of applicable code requirements, and c) fabrication practices. Specific aspects of these concerns are as follows:

- **Unsymmetrical Welds** - For three-sided welds, the eccentricity between the center of gravity of the member and the weld was not considered in the weld design, although it could increase weld stresses with a consequent effect on the weld size.
- **Cover Plate Welds** - The weld design methods were inadequate for evaluating shear stresses of welds attaching cover plates to primary members to form composite sections. A related concern involves the failure to consider local loading effects of component rear bracket attachments.
- **Undersized Fillet Welds** - Some welds did not meet the minimum size requirements specified in the Code of Record.

- **Combination Bolted and Welded Connections** - Connections which combine structural bolting and welds did not meet the Code criteria requiring welds to be designed to carry the entire shear force.
- **Skewed "T" Joint Welds** - The design of skewed "T" joints in accordance with the ASME Code did not adequately consider reduction factors for determining the effective throat and angularity limits as prescribed by *American Welding Society* (AWS) Code D1.1.
- **Fabrication Practices** - Concerns were raised relating to inadequate welding practices, including weave welding, downhill welding, preheat requirements, lap joint requirements, cap welding, and weld cracking.

This issue is discussed in detail in Engineering Evaluation DAP-E-P-027.

SWEC RESOLUTION METHODOLOGY

The SWEC resolution methodology for each of the design issues is as follows:

- **Unsymmetrical Welds** - SWEC procedures require that any eccentricity between the center of gravity of a member and the associated weld be evaluated when determining the total weld loading. Alternatively, for symmetric weld patterns with different weld sizes, eccentricity need not be considered if the weld evaluation uses the smallest effective throat.
- **Cover Plate Welds** - SWEC procedures require that cover plate welds be qualified for shear flow.
- **Undersized Fillet Welds** - SWEC has adopted ASME code Case N-413 which excludes the minimum fillet or partial penetration weld size requirements.
- **Combination Bolt and Weld Connections** - SWEC procedures require that, on base plates using bolt and weld combinations, the weld be designed to carry the entire shear load on the face of the plate.
- **Skewed "T" Joint Welds** - SWEC procedures identify specific requirements for the design of skewed "T" joints.
- **Fabrication Practices** - Concerns regarding the fabrication practices have not been addressed by SWEC in design procedures. These concerns are discussed under the "AWS vs. ASME Issue Summary."

THIRD PARTY EVALUATION

The Third Party evaluation results are summarized as follows:

- **Unsymmetrical Welds** - SWEC procedures for evaluating unsymmetrical welds are acceptable because proper weld stresses will be calculated when the eccentricity is considered, and conservative results will be obtained when using the smallest effective weld throat for patterns made up of different weld sizes.
- **Cover Plate Welds** - SWEC procedures identify specific instructions for calculating maximum weld stress. Although the procedures require that cover plate attachment welds be qualified for shear flow, no specific guidelines or instructions are provided for performing this evaluation. Normally, pipe support design practices do not involve the

use of composite members; therefore, the absence of specific guidelines is not considered significant.

- **Undersized Fillet Welds** - Code Case N-413 (which has been incorporated into later Code revisions) recognizes the differences in ASME and AISC weld joint qualification. The ASME requirement to qualify all construction joints obviates the need for specifying minimum weld sizes in the Code. This Code Case has been endorsed by the NRC in Regulatory Guide 1.84, Revision 24. (Reference 7.28).
- **Combination Bolt and Weld Connections** - The SWEC requirements for evaluating combination bolted and welded connections are consistent with ASME Section III, Appendix XVII, Paragraph XVII-2442 (*Reference 7.7*) and are acceptable.
- **Skewed "T" Joint Welds** - SWEC procedures adequately address the design of skewed "T" joints, including specific requirements for determining effective throats of welds and applying reduction factors to welds based on the angularity between members. These requirements are consistent with AWS D1.1.

CONCLUSION

Where necessary SWEC has established specific requirements which adequately address the welding design issues. This issue is closed.

3.2.3.26 Anchor Bolts

ISSUE DESCRIPTION

Concerns identified regarding the design of anchor bolts at CPSES are the following:

- **Friction vs. Bearing Connections** - Whether base plates fastened with Hilti expansion anchors should be designed as friction or bearing connections. If the connections are bearing connections, there is a question regarding unequal shear load distribution on the anchors and the effect on support stiffness caused by oversized bolt holes (See FIGURE 3.2-4).
- **Anchor Bolt Location Tolerances** - Construction tolerances for anchor bolts or attachment steel installation were not considered in the original design. Neglecting these tolerances may result in unconservatively predicted stresses.
- **Anchorage Embedment** - The embedment lengths on some support sketches do not match those used in the respective calculations.

This issue is discussed in detail in Engineering Evaluation DAP-E-P-028.

SWEC RESOLUTION METHODOLOGY

The SWEC methodology for addressing the items above is as follows:

- **Friction vs. Bearing Connections** - SWEC procedures require that only bearing connections be used in pipe support design. SWEC has adopted Subsection NF-4721, Summer 1985 addenda (*Reference 7.23*) which defines the allowable bolt hole sizes for such bearing connections.
- **Anchor Bolt Location Tolerances** - In addition to specifying minimum edge distances for holes in base plates, SWEC provides a procedure for verifying the acceptance of as-

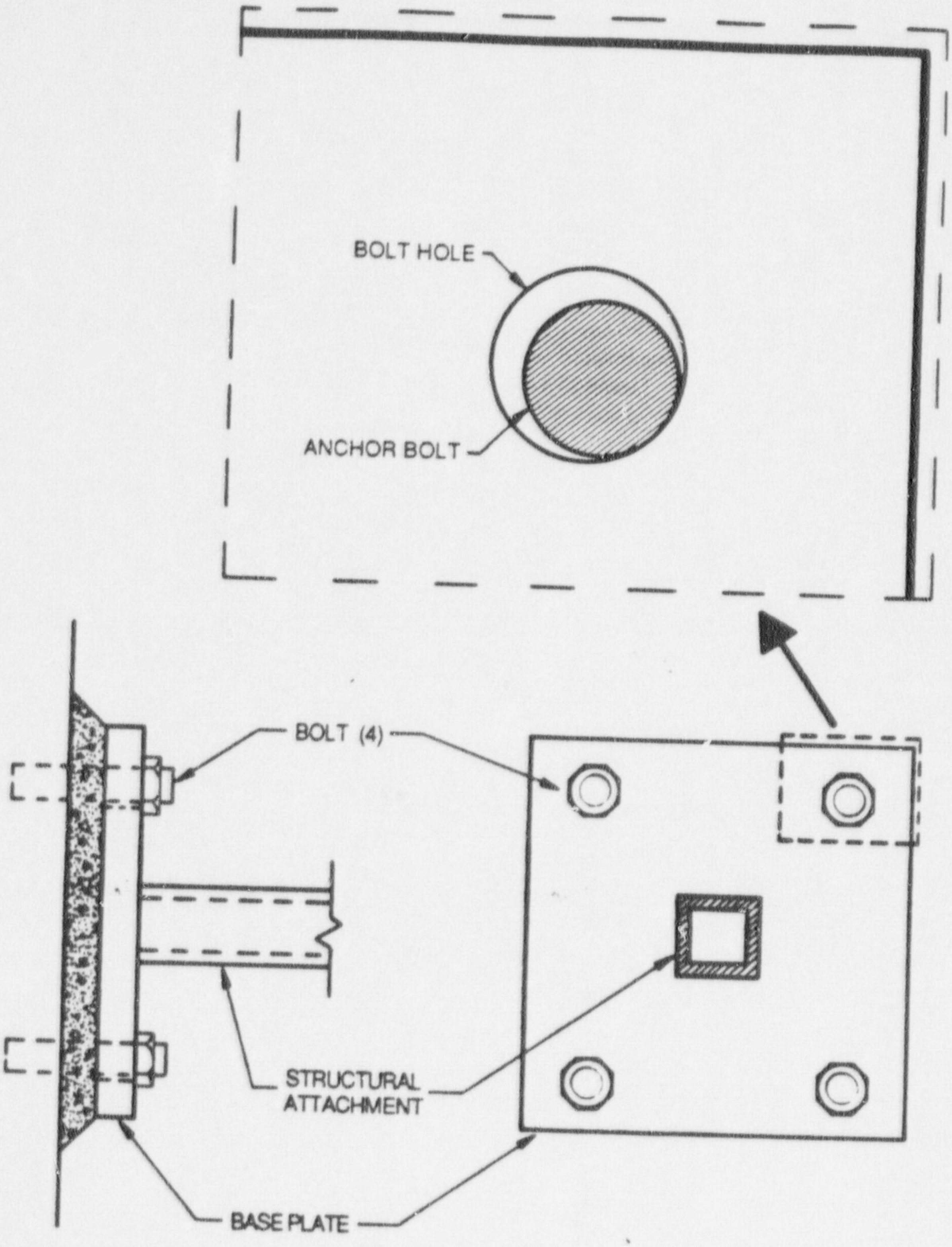

FIGURE 3.2-4

ANCHOR BOLT GAPS

built plates that were designed without consideration of possible bolt and attachment location tolerances.

- **Anchorage Embedment** - SWEC procedures provide specific requirements for the design of anchor bolts including establishing minimum embedments.

THIRD PARTY EVALUATION

The Third Party evaluation results are summarized as follows:

- **Friction vs. Bearing Connections** - The concern related to the connection of base plates to the concrete surface has been evaluated using the requirements of subsection NF of the ASME Code based on NRC staff acceptance of the adoption of subsection NF-4721, Summer 1985 addenda. SWEC procedures and design requirements comply with subsection NF, and are therefore acceptable. Such connections are used without exception in all commercial nuclear facilities in the United States.

  The CPSES Hilti installation procedure requires preloads which correspond to a level which was shown by test to have no effect on local-displacement behavior and thus no effect on anchor stiffness.

- **Anchor Bolt Location Tolerances** - SWEC procedures define specific calculation requirements which conservatively consider all possible design combinations of attachment and bolt location changes. The design combinations provide for converting the specific member shape into an equivalent square member.

- **Anchorage Embedment** - SWEC procedures provide adequate requirements for determining the embedment depths on anchors. These requirements include reductions in embedment length for concrete topping, as well as specific methods for calculating embedments when the depth is not indicated on the drawing. In such cases the specified bolt length is used as input to the calculation which will then conservatively determine minimum embedment.

CONCLUSION

The SWEC methodology is consistent with ASME and AISC Codes and provides adequate consideration of the issue. This issue is closed with respect to external source concerns.

Anchor bolts are also the subject of the self-initiated review documented in DAP-E-C/S-514 (*Reference 7.24*) and 515 (*Reference 7.17*).

3.2.3.27 Strut Angularity

ISSUE DESCRIPTION

Standard component supports, such as snubbers and struts, may transmit an additional ("kick") load component resulting from relative pipe displacement(s). A "kick" load occurs whenever the component orientation is other than normal (at 90° to) or parallel with the pipe axis. Angular swing results from relative pipe movements (caused by thermal, seismic and/or fluid transients) or relocation permitted by installation tolerances.

The issue is whether or not the "kick" load component associated with the angular swing tolerance must be considered in the support design. The strut angularity issue is evaluated in Engineering Evaluation DAP-E-P-029 which provides a detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

SWEC addressed this issue by establishing the following requirements:

- Struts and snubbers installed with swing angle exceeding ± 2° tolerance will be documented in the as-built program.
- Angular swing of struts and snubbers from relative movements caused by thermal, seismic, and/or fluid transients combined with the as-built installation angle will be assessed.
- The load component associated with swing angle will be considered for all support designs.
- Angular swings exceeding ± 5° will be additionally evaluated to ensure proper function and load rating of support components.
- Support Design Checklists include an evaluation for the swing angle effects of load components.

THIRD PARTY EVALUATION

The approach taken by SWEC addresses both the concern regarding consideration of load component associated with angular swing and the concern that the support component's function and load rating is evaluated. The approach is therefore acceptable.

CONCLUSION

SWEC has established acceptable guidelines to address the design consideration associated with strut and snubber angularity variations. This issue is closed.

3.2.3.28 Structural Modeling For Frame Analysis

ISSUE DESCRIPTION

The computer modeling of pipe support frames by TUGCO engineers and engineering contractors at CPSES did not reflect actual conditions under the following circumstances:

- **Torsion Evaluation** - To evaluate the wide flange member torsional stresses conservatively, a procedure was implemented which overpredicted the torsional loads by using an extremely high value for the torsional resistance. This method, when used with actual member torsional properties, resulted in conservative estimates of flange torsional stresses and unconservative estimates of deflections. Further, evaluations of local effects in the wide flange members at locations of torsional loading were not done.
- **Member End Restraints/Boundary Condition Modeling for Richmond Inserts** - Three different approaches were used to model member end restraints at Richmond Inserts connections.

  1) Release all rotational degrees of freedom (DOF) at member end.
  2) Release rotational DOF along axis of member and along axis of the Richmond Insert, and restrain rotational DOF normal to the member and the Richmond Insert.
  3) Restrain all rotational DOF at member end.

- **Pipe Support Boundary Conditions** - CASE identified several supports that had been evaluated assuming questionable boundary conditions. Analyses used engineering experience/practice in defining support boundary conditions.

This issue is evaluated in Engineering Evaluation DAP-E-P-031 which provides a detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

SWEC addressed this issue with the following methodology:

- **Torsion Evaluation** - The SWEC approach to modeling and evaluating structural members in pipe supports is based on using values for torsional resistance determined from dimensions provided in the AISC Manual of Steel Construction. Equations are provided in the design procedure for evaluating wide flange members and local effects due to torsional loading. A stiffness criterion is used in lieu of deflections; therefore, actual torsional resistance values are required to be used in the support stiffness determination.
- **Member End Restraints/Boundary Condition Modeling for Richmond Inserts** - SWEC procedures identify specific modeling requirements for Richmond Insert-Tube steel connections. These requirements are discussed in Section 3.2.3.1 where it is concluded that the SWEC approach is adequate.
- **Pipe Support Boundary Conditions** - SWEC requires the individual support designers to establish the boundary conditions appropriate for the model used.

THIRD PARTY EVALUATION

The Third Party evaluation results are summarized as follows:

- **Torsion Evaluation** - The SWEC procedure provides a conservative approach to evaluating member stresses induced by torsion. Torsional shear, warping shear, and warping normal stresses are all conservatively evaluated by assuming each stress is produced by the full torsional moment. These stresses are also conservatively combined with other stresses by assuming that all maximums occur at the same point in the wide flange cross section. By using AISC torsional resistance values for wide flange members in structural models, pipe support stiffnesses will be calculated appropriately.
- **Member End Restraints/Boundary Condition Modeling** - The SWEC approach to modeling the Richmond Insert/Tube steel connection includes the threaded rod in the structural model and uses realistic section properties for the rod. Any offset between the centerlines of the rod and tube steel is modeled as a fictitious member. This modeling approach acceptably addresses the flexibility of connections to unmodeled structures in accordance with the requirements of ASME Section III, Paragraph XVII-2420, "Connection Design".
- **Support Boundary Conditions** - Modeling assumptions for boundary conditions at connections of structural elements in a support are typically made by the support designer. It is not appropriate to attempt to describe typical boundary conditions for the multitude of conditions encountered. The adequacy of the modeling is dependent upon the use of sufficiently experienced designers and checkers. This is common practice for such design efforts and SWEC's dependence on their designers' judgments is an acceptable practice.

CONCLUSION

SWEC has established an adequate approach to structural modeling through:

- use of representative section properties of wide flanges for structural analysis of pipe supports,
- conservative calculation of member torsional stress and conservative combination of them in evaluating member stresses in accordance with code requirements, and
- accurate specification of boundary conditions for modeling of Richmond Insert/tube steel connections.

The issue is closed.

3.2.3.29 Computer Program Verification And Use

ISSUE DESCRIPTION

Concerns were raised regarding the existence of adequate program verification (quality assurance) and use of the appropriate program versions for the following computer programs:

- ADLPIPE Version 2c (Date: 4/77) (a piping analysis program)
- FUB-II (an ITT-Grinnell base plate qualification program)
- Corner and Lada Base Plate Qualification Program

The computer program verification and use issue was evaluated in Engineering Evaluation DAP-E-P-032 which provides a more detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

SWEC addressed the computer program verification issue in the following ways:

- All computer program verification is documented for the identified programs and the verification documentation addresses all project applications. Also, these programs are qualified for the purpose for which they are to be used.
- All computer programs and applicable program versions used for Piping/Support analysis are appropriately identified in the project procedures and/or the FSAR.

THIRD PARTY EVALUATION

The computer programs about which specific concerns were raised are not being utilized in the SWEC requalification effort. However, the original acceptance criteria still apply to the SWEC programs. SWEC's use of computer programs is verified in accordance with SWEC standard QA program requirements with regard to verification, technical adequacy, and use of appropriate version. The methods used to control computer program use are acceptable.

CONCLUSION

SWEC's approach to addressing the issues related to computer program verification and use is acceptable. This issue is closed.

3.2.3.30 Hydrotest

ISSUE DESCRIPTION

Concerns were raised that hydrostatic test loading conditions for specific piping and support designs were not adequately considered. Specifically, the following concerns were raised:

- Damage observed during or subsequent to a hydrotest of the component cooling system was attributed to hydrotesting.
- The Cygna review indicated a lack of consideration for hydrotest conditions in piping analysis and support design calculations.

The hydrotest issue was evaluated in Engineering Evaluation DAP-E-P-034 which provides a more detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

Procedurally, SWEC addressed the hydrotest issue by evaluation of piping and supports for hydrotest conditions in accordance with the Code of Record (*Reference 7.6*), except for the Classes 2 and 3 hydrostatic test pressure, which was taken as 1.25 times the design pressures instead of 1.5.

THIRD PARTY EVALUATION

SWEC's method of evaluating Classes 2 and 3 piping systems for hydrostatic test conditions is in accordance with the ASME Code. ASME Classes 2 and 3 piping were tested and analyzed at 1.25 times the system design pressure. Classes 5 and 6 piping are tested and analyzed using a Classes 2 and 3 hydrostatic test pressure of 1.5 times the design pressure. All hydrostatic testing is in accordance with a later Code version, which is less stringent than the Code of Record. This code update is acceptable based on the Project meeting requirements of ASME Code NA-1140. This criterion was confirmed by the Third Party in the Engineering Evaluation DAP-E-P-034.

CONCLUSION

SWEC has adequately established and defined requirements for inclusion of hydrotest loading conditions for piping and support evaluations. The hydrotest issue is closed.

3.2.3.31 Seismic/Non-Seismic Interface

ISSUE DESCRIPTION

This issue, identified by the NRC and addressed in the CPRT ISAP V.c, (*Reference 7.5*) involves the adequacy and implementation of seismic/non-seismic piping interface design criteria. The issue was transferred to DSAP IX. Specific concerns were the following:

- Safety related piping is routed between seismic Category I buildings and non-seismic Category I buildings without seismic isolation.
- Postulated Turbine Building failure, due to an earthquake, was not addressed for safety related piping routed between seismic Category I buildings and the Turbine Building, which is a non-seismic Category I building.

- The seismic effects of non-safety related piping attached to safety related piping may not have been adequately considered in the associated piping and anchor support design.

The seismic/non-seismic interface issue was evaluated in Engineering Evaluation DAP-E-P-038 which contains a detailed discussion of the issue.

SWEC RESOLUTION METHODOLOGY

SWEC procedures address ASME piping as described in Section 2.0 of this report. The criteria and methods for assuring seismic isolation and designing against postulated Turbine Building failure as well as the interface between seismic and non-seismic piping are also addressed. There are three basic methods described for the design of seismic piping at non-seismic interfaces. Two methods assume a collapse of this non-seismic pipe: one method assumes a collapse adjacent to the seismic interface anchor whereas the other assumes a collapse at a point separated from the seismic interface anchor by seismically designed non-seismic Category I piping and supports. The third method requires that all attached non-seismic Category I piping be seismically analyzed and supported to the next anchor.

THIRD PARTY EVALUATION

The three methods described by SWEC provide a reasonable basis for design of seismic/non-seismic interfaces where interface anchors are present. The first two methods can be used to address Turbine Building failure. Although SWEC procedures do not specifically address seismic/non-seismic interfaces without anchors, the procedures do contain overlapping methods for seismic piping interfaces. This method is acceptable if applied to seismic/non-seismic interfaces where non-seismic piping is seismically analyzed.

CONCLUSION

The methods defined by SWEC are an adequate way to address the seismic/non-seismic interface. The seismic/non-seismic interface issue is closed.

3.2.3.32 Programmatic Aspects And QA

ISSUE DESCRIPTION

The programmatic aspects and QA issue comprises various concerns identified in public documents. The external source programmatic concerns are summarized as follows:

- **Interfaces** - A significant number of the technical concerns that were raised at CPSES result from inadequate interface control between the numerous organizational interfaces.
- **Iterative Design** - Identification and correction of design errors should not be put off until the end of the iterative design process.
- **Quality Assurance** - Calculations did not follow industry or project guidelines for Quality Assurance.
- **Timeliness** - Generic concerns which affect numerous designs were not evaluated in a timely manner, leading to widespread design deficiencies of similar types.
- **Field Changes** - Field changes were made without obtaining proper approvals, leading to unconventional designs being evaluated for adequacy "after the fact."

- **Personnel** - Qualifications of personnel approving design/modifications were inadequate due to insufficient procedures defining qualifications required to perform at various levels of responsibility.
- **Procedures** - Procedures and instructions at CPSES were changed frequently, inadequately controlled and often not in place resulting in a chaotic situation in which procedures were often violated, relying on the final review to identify design criteria changes.
- **Construction** - Procedures and documents controlling installation/construction were inadequate and/or not kept up-to-date.
- **Calculation Errors** - Numerous random calculation errors were identified which may imply programmatic deficiencies.
- **Miscellaneous** - Various other concerns were raised regarding the updating of criteria and the adequacy of various practices used in design/qualification activities.

SWEC RESOLUTION METHODOLOGY

SWEC's approach to resolving the various programmatic issues is through procedures which document responsibilities, interface control requirements and quality assurance programs. The plan is outlined in project procedure CPPP-1, the Management Plan for Project Quality (*Reference 7.26*), which addresses each of the eighteen criteria of 10CFR50, Appendix B. The plan is implemented through issuance of Project Procedures, Engineering Assurance Procedures and Quality Standards.

THIRD PARTY EVALUATION

The Third Party evaluation is summarized as follows:

- **Interfaces** - The Project Procedures controlling interfaces and defining responsibilities provide detailed descriptions of responsibilities and specific definition of interface information to be transmitted between various design organizations within the CPSES project. The controls delineated in SWEC procedures are acceptable since they provide requirements at all applicable interfaces. The significant reduction of the number of external interfaces also enhances the implementation of these procedures.
- **Iterative Design** - The SWEC Procedure Controls provide an acceptable basis for the iterative design process since all stages from design to as-built are tracked to identify design deficiencies and open items. This will assure that design changes and errors are closed, and that any preliminary information that was used is confirmed.
- **Quality Assurance** - The SWEC Management Plan for Project Quality establishes a program to assure project quality consistent with industry guidelines. Implementation of the plan is an acceptable basis for closure of this issue.
- **Timeliness** - SWEC procedure CPPP-13 (*Reference 7.27*) provides adequate assurance that changes due to design iterations or disposition of non-conformances will be addressed and/or incorporated within a reasonable time frame by providing a tracking mechanism on forms used to document such changes. Implementation of the Management Plan for Project Quality will assure that concerns regarding trending and generic implications are appropriately addressed.

- **Field Changes** - Requirements contained in SWEC Project Procedures are adequate to ensure that new designs, modifications, or reconciliations with as-built conditions are documented and approved by a qualified responsible engineer/designer.
- **Personnel** - SWEC procedures for project personnel training and indoctrination provide the means to ensure that the design is performed to acceptable standards by qualified people.
- **Procedures** - SWEC has published guidelines for issue and control of procedures. Strict adherence to these guidelines will ensure that proper procedures are in place for the design of safety related items.
- **Construction** - Initial walkdowns performed to Project Procedures to verify the accuracy of analysis input data to identify additional technical issues combined with a final reconciliation walkdown/analysis review will ensure that the as-built condition of piping and supports is properly evaluated.
- **Calculation Errors** - The detailed Project Procedures for documentation, review, and control of calculations provide a means to identify random types of errors. The review of the implementation of these procedures during the TU Electric QA Technical Audits will provide additional assurance that random errors will be minimized.
- **Miscellaneous** - Standard SWEC procedures are adequate to ensure that criteria and design practices used for qualification of CPSES piping and supports address these miscellaneous concerns.

CONCLUSION

The SWEC procedures establish adequate methods and controls to eliminate the reoccurrance of programmatic concerns raised over the initial design effort. A review of the implementation of these procedures by the TU Electric Quality Assurance Technical Audit Program and the SWEC Engineering Functional Evaluation will provide added assurance that similar concerns do not reoccur. This issue is closed.

3.2.3.33 Other DIRs

In addition to the DIRs addressed by the thirty-two Primary Issue evaluations, fifty-one DIRs unrelated to the Primary issues were reviewed. A list of these DIRs and a description of the resolutions are included as Attachment B of this Report. Detailed resolutions are documented on each respective DIR. Each of the fifty-one DIRs is resolved and closed.

4.0 SELF-INITIATED REVIEW

All of the Third Party review activities required by DSAP IX are external source issue reviews or corrective action overviews. There are no self-initiated reviews.

5.0 CORRECTIVE ACTION

The SWEC resolution methodology and Third Party evaluation for external source issues are discussed in Section 3.0 of this report. The implementation of that methodology for the scope of work defined in Attachment 2 of DSAP IX is the corrective action for the piping and supports discipline. The Third Party evaluated this methodology in conjunction with the resolution of the External Source Issues and determined that the methodology resolves external source issues and meets applicable criteria and commitments. Among the purposes of the corrective action overview described in Appendix H of the CPRT Program Plan was the evaluation of the implementation of procedures. In accordance with direction from the Senior Review Team, Third Party activities under Appendix H have been modified (*Reference* 7.1). Documentation of the completed Third Party Corrective Action overview is being transmitted to Texas Utilities Quality Assurance, including recommendations for further consideration under their Technical Audit Program.

6.0 CONCLUSIONS

This report presents the results of a Third Party review of the adequacy of certain large bore piping and pipe supports as related to issues raised in external source documents. The Third Party categorized these issues into thirty-two issue categories which formed the basis for the scope of the review. Resolution methodology for all these issues is provided in the SWEC Generic Issue Report and the SWEC procedures. The evaluation of adequacy comprised an evaluation based on the CPSES FSAR and licensing commitments of the SWEC resolution methodology. The Third Party has concluded that the SWEC large bore pipe stress reanalysis and pipe support requalification program is comprehensive and capable of resolving known technical issues. Proper implementation will ensure that the CPSES large bore piping and supports will meet the FSAR and licensing commitments. Where criteria changes are proposed by the Project final verification of compliance is subject to review of NRC approved amendments. The overview of the implementation of the program by the TU Electric QA Technical Audit Program provides assurance that the technical issues will be resolved.

7.0 REFERENCES

7.1 Comanche Peak Response Team Program Plan, Rev. 4, June 18, 1987.

7.2 Memorandum from John W. Beck (Chairman, SRT) to Howard A. Levin, DAP-RTL re: DAP Piping and Piping Supports Results Report, August 12, 1987.

7.3 Report on SWEC's Evaluation and Resolution of Generic Issues, Rev. 1, April 6, 1987.

7.4 Letter from Vincent Noonan (NRC) to William Counsil (TUGCO) re: Proposed FSAR Change - Piping/Pipe Supports, November 4, 1986.

7.5 ISAP V.c, "Design Consideration for Piping Systems Between Seismic Category I and Non-Seismic Category I Buildings," Rev. 2, January 24, 1986.

7.6 ASME Boiler and Pressure Vessel Code, Section III, Division 1, 1974 Edition including Summer 1974 Addenda, Subsection NC and ND (as documented in Section 2.0 of Reference 7.8).

7.7 ASME Boiler and Pressure Vessel Code, Section III, Division I, 1974 Edition including Winter 1974 Addenda, Subsection NF.

7.8 CPPP-7, "Design Criteria for Pipe Stress and Pipe Supports," Rev. 2, April 25, 1986.

7.9 CPPP-6, "Pipe Stress/Support Requalification Procedure - Unit No. 1," Rev. 3, November 28, 1986.

7.10 CPPP-9, "Pipe Stress/Support As-Built Procedure - Unit No. 2," Rev. 3, November 28, 1986.

7.11 DAP-10, "Development and Use of DAP Procedures and Discipline Instructions," Rev. 4, March 31, 1987.

7.12 DAP-2, "Documentation and Tracking of Issues and Discrepancies," Rev. 6, May 19, 1987.

7.13 Design Criteria List DAP-CR-P-001, Rev. 2, May 8, 1987.

7.14 R.L. Cloud and Associates Report RLCA/P142/01-86/008, "Richmond Insert/Structural Tube Steel Connection Design Interaction Equation for Bolt/Threaded Rods," Rev. 0, September 10, 1986, including Errata dated September 11, 1986 (1 page).

7.15 American Concrete Institute (ACI) Standard 349-85.

7.16 ISAP II.b Results Report "Concrete Compressive Strength," Rev. 1, February 28, 1986.

7.17 Third Party Issue Resolution Report (IRR) DAP-E-C/S-515, Rev. 0, October 2, 1986.

7.18 R.L. Cloud and Associates Report RCLA/P142/01-86/009, "Richmond Insert/Structural Tube Steel Connection, Effect of Thermal Expansion of Tube Steel on Richmond Inserts and Bolts," Rev. 0, April 6, 1987.

7.19 K.R. Wichman et al. "Local Stresses in Spherical and Cylindrical Shells due to External Loadings." Welding Research Council Bulletin 107, August 1965.

7.20 SWEC Calculation 15454-NP(C) - GENX-117, "Verification of Generic Stiffness Criteria in the Analysis of Piping System," Rev. 1, May 26, 1987.

7.21 CASE's Proposed Findings of Fact and Conclusions of Law (Walsh/Doyle Allegations) before the ASLB dated August 22, 1983.

7.22 Letter from Vincent Noonan (NRC) to W.G. Council (TUGCO), March 13, 1986.

7.23 ASME Boiler and Pressure Vessel Code, Section III, Division I, 1983 Edition including Summer 1985 Addenda, Subsection NF, Paragraph 4721.

7.24 Third Party Issue Resolution Report (IRR) DAP-E-C/S-514, Rev. 1, March 20, 1987.

7.25 CPPP-35, "Piping and Pipe Support Qualification Procedure for Secondary Wall Displacement," Rev. 0, June 8, 1987.

7.26 CPPP-1, "Management Plan for Project Quality," Rev. 7, March 25, 1987.

7.27 CPPP-13, "Site Construction Support Activities Procedures," Rev. 1, December 6, 1986.

7.28 USNRC Regulatory Guide 1.84, "Design and Fabrication Code Case Acceptability ASME Section III Division 1" Revision 24, June 1986.

7.29 Comanche Peak Steam Electric Station, Final Safety Analysis Report with amendments through 55.

ATTACHMENT A
EXTERNAL SOURCE DOCUMENTS

ATTACHMENT A
EXTERNAL SOURCE DOCUMENTS

Source Document	Date	Document Title
ASLB-1	09/01/83	BOARD MEMORANDUM AND ORDER - MOTION TO REOPEN THE RECORD AND TO STRIKE
ASLB-2	12/28/83	BOARD ORDER AND MEMORANDUM LBP-83-81: (QUALITY ASSURANCE FOR DESIGN)
ASLB-3	02/08/84	MEMORANDUM AND BOARD ORDER LBP-84-10: (RECONSIDERATION CONCERNING QUALITY ASSURANCE FOR DESIGN)
ASLB-4	06/29/84	ASLB MEMORANDUM AND ORDER LBP-84-25 (WRITTEN-FILING DECISIONS, #1: SOME AWS/ASME ISSUES)
ASLB-5	12/18/84	BOARD MEMORANDUM CONCERNING WELDING ISSUES
ASLB-6	12/18/84	BOARD MEMORANDUM - REOPENING DISCOVERY: MISLEADING STATEMENT
ASLB-7	07/29/82	ASLB PROCEEDINGS TRANSCRIPT
ASLB-8	07/30/82	ASLB PROCEEDINGS TRANSCRIPT
ASLB-9	09/13/82	ASLB PROCEEDINGS TRANSCRIPT
ASLB-10	09/13/82	ASLB PROCEEDINGS TRANSCRIPT
ASLB-11	09/14/82	ASLB PROCEEDINGS TRANSCRIPT
ASLB-12	09/15/82	ASLB PROCEEDINGS TRANSCRIPT
ASLB-13	09/16/82	ASLB PROCEEDINGS TRANSCRIPT
ASLB-14	04/25/83	ASLB PROCEEDINGS TRANSCRIPT
ASLB-15	05/16/83	ASLB PROCEEDINGS TRANSCRIPT
ASLB-16	05/17/83	ASLB PROCEEDINGS TRANSCRIPT
ASLB-17	05/17/83	ASLB PROCEEDINGS TRANSCRIPT
ASLB-18	05/18/83	ASLB PROCEEDINGS TRANSCRIPT
ASLB-19	05/19/83	ASLB PROCEEDINGS TRANSCRIPT
ASLB-20	05/20/83	ASLB PROCEEDINGS TRANSCRIPT
ASLB-21	06/13/83	ASLB PROCEEDINGS TRANSCRIPT
ASLB-22	06/14/83	ASLB PROCEEDINGS TRANSCRIPT
ASLB-23	06/15/83	ASLB PROCEEDINGS TRANSCRIPT
ASLB-24	06/16/83	ASLB PROCEEDINGS TRANSCRIPT
ASLB-25	10/17/83	ASLB PROCEEDINGS TRANSCRIPT
ASLB-26	10/18/83	ASLB PROCEEDINGS TRANSCRIPT

ATTACHMENT A — *Continued*

Source Document	Date	Document Title
ASLB-27	02/20/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-28	02/21/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-29	02/23/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-30	03/19/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-31	03/20/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-32	03/21/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-33	03/22/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-34	03/23/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-35	03/30/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-36	04/18/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-37	04/24/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-38	04/25/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-39	04/26/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-40	04/27/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-41	05/01/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-42	05/02/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-43	05/03/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-44	02/22/84	ASLB PROCEEDINGS TRANSCRIPT
ASLB-45	10/31/85	ASLB MEMORANDUM AND ORDER LBP-85-14 (PROCEDURAL RULING BOARD CONCERN ABOUT QA FOR DESIGN).
ASLB-46	02/28/84	TELEPHONE CONFERENCE - TO DISCUSS SCHEDULING MATTERS RELATED TO MARCH 12 THROUGH MARCH 16 HEARINGS
CASE-1	07/29/82	CASE EXHIBIT 659 - WALSH TESTIMONY (EXH 659A-H)
CASE-2	08/19/82	CASE EXHIBIT 669 - DOYLE ORAL DEPOSITION (VOLUME I), EXHIBIT 669A - (VOLUME II), AND EXHIBIT 669B - (DEPOSITION EXHIBITS)
CASE-3	09/13/82	CASE EXHIBIT 683 - DOYLE SUPPLEMENTAL TESTIMONY
CASE-4	07/28/83	OBJECTION TO BOARD'S FINDINGS AND CASE'S ANSWER TO APPLICANTS' 07/15/83 SUMMARY OF THE RECORD REGARDING WEAVE AND DOWNHILL WELDING
CASE-5	08/22/83	CASE PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW

Source Document	Date	Document Title
CASE-6	09/03/83	CASE'S MOTION REGARDING 09/07/83 CONFERENCE CALL
CASE-7	11/10/83	CASE'S RESPONSE TO (1) APPLICANTS' BRIEF REGARDING BOARD INQUIRY INTO APPLICABILITY OF AWS AND CODES TO WELDING ON PIPE SUPPORTS AT CPSES: (2) NRC RESPONSE TO BOARD QUESTION ON CPSES WELDING CODE
CASE-8	11/23/83	CASE'S MOTION FOR RECONSIDERATION (AFFIDAVITS ON OPEN ITEMS RELATING TO WALSH/DOYLE ALLEGATIONS)
CASE-9	08/06/84	CASE'S ANSWER TO APPLICANTS MOTION FOR SUMMARY DISPOSITION REGARDING CONSIDERATION OF FRICTION FORCES IN THE DESIGN OF PIPE SUPPORTS WITH SMALL THERMAL MOVEMENTS
CASE-10	08/06/84	CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION OF CERTAIN CASE ALLEGATIONS REGARDING AWS AND ASME CODE PROVISIONS RELATED TO DESIGN ISSUES
CASE-11	08/06/84	CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING ALLEGED ERRORS MADE IN DETERMINING DAMPING FACTORS FOR OBE AND SSE LOADING CONDITIONS
CASE-12	08/13/84	CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING CASE ALLEGATIONS REGARDING SECTION PROPERTY VALUES
CASE-13	08/20/84	CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION OF CASE'S ALLEGATIONS REGARDING U-BOLTS ACTING AS TWO-WAY RESTRAINTS
CASE-14	08/27/84	CASE'S PARTIAL ANSWER TO APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE REGARDING THE UPPER LATERAL RESTRAINT BEAM
CASE-15	08/27/84	CASE'S PARTIAL ANSWER TO APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE REGARDING ALLEGATIONS CONCERNING CONSIDERATION OF FORCE DISTRIBUTION IN AXIAL RESTRAINTS

Source Document	Date	Document Title
CASE-16	08/27/84	CASE'S PARTIAL ANSWER TO APPLICANTS' STATEMENT OF MATERIAL FACT AS TO WHICH THERE IS NO GENUINE ISSUE REGARDING APPLICANTS' USE OF GENERIC STIFFNESSES INSTEAD OF ACTUAL IN PIPING ANALYSIS
CASE-17	08/27/84	CASE'S PARTIAL ANSWER TO APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE REGARDING DIFFERENTIAL DISPLACEMENT OF LARGE-FRAMED, WALL-TO-WALL AND FLOOR-TO-CEILING SUPPORTS
CASE-18	08/27/84	CASE'S PARTIAL ANSWER TO APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE REGARDING SAFETY FACTORS
CASE-19	08/29/84	CASE'S ANSWER TO APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE REGARDING CONSIDERATION OF LOCAL DISPLACEMENTS AND STRESSES
CASE-20	09/10/84	CASE'S ANSWER TO APPLICANTS' STATEMENT OF MATERIAL FACTS RELATING TO RICHMOND INSERTS AS TO WHICH THERE ARE NO MATERIAL ISSUES
CASE-21	10/01/84	CASE'S ANSWER TO APPLICANTS' REPLY TO CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING CONSIDERATION OF FRICTION FORCES
CASE-22	10/08/84	CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING CONSIDERATION OF CINCHING DOWN OF U-BOLTS
CASE-23	10/09/84	CASE'S ANSWER TO APPLICANTS' REPLY TO CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING LOCAL DISPLACEMENTS AND STRESSES
CASE-24	10/13/84	ATTACHMENTS TO CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING CONSIDERATION OF CINCHING DOWN OF U-BOLTS

Source Document	Date	Document Title
CASE-25	10/15/84	DOCUMENTS AND INFORMATION REQUESTED BY CASE REGARDING APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING STABILITY OF PIPE SUPPORTS
CASE-26	10/18/84	CASE'S PARTIAL ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING APPLICANTS' QUALITY ASSURANCE PROGRAM FOR DESIGN OF PIPING AND PIPE SUPPORTS FOR CPSES
CASE-27	10/18/84	CASE'S DISCOVERY REQUESTS TO APPLICANTS REGARDING CROSS-OVER LEG RESTRAINTS
CASE-28	10/30/84	CASE'S 2ND PARTIAL ANSWER TO APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE REGARDING APPLICANTS' QUALITY ASSURANCE PROGRAM FOR DESIGN OF PIPING AND PIPE SUPPORTS
CASE-29	11/20/84	CASE'S ANSWER TO APPLICANTS' REPLY TO CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING THE UPPER LATERAL RESTRAINT BEAM
CASE-30	12/19/84	CASE'S 4TH ROUND ANSWER TO APPLICANTS' REPLY TO CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING THE EFFECTS OF GAPS
CASE-31	01/17/85	CASE'S FIRST SET OF INTERROGATORIES TO APPLICANTS AND REQUESTS TO PRODUCE
CASE-32	02/04/85	CASE'S SECOND SET OF INTERROGATORIES TO APPLICANTS AND REQUESTS TO PRODUCE RE: CREDIBILITY
CASE-33	02/25/85	CASE'S FOURTH SET OF INTERROGATORIES TO APPLICANTS AND REQUESTS TO PRODUCE
CASE-34	02/25/85	CASE'S THIRD SET OF INTERROGATORIES TO APPLICANTS AND REQUESTS TO PRODUCE
CASE-35	03/04/85	CASE'S FIFTH SET OF INTERROGATORIES TO APPLICANTS AND REQUESTS TO PRODUCE
CASE-36	04/26/83	SURREBUTTAL TESTIMONY OF JACK DOYLE (CASE EXHIBIT 761 AND ATTACHMENTS)
CASE-37	04/28/83	SUPPLEMENTARY SURREBUTTAL TESTIMONY OF JACK DOYLE (CASE EXHIBIT 762)

Source Document	Date	Document Title
CASE-38	05/04/83	SUPPLEMENTARY SURREBUTTAL TESTIMONY OF JACK DOYLE (CASE EXHIBIT 763 AND ATTACHMENTS)
CASE-39	11/04/83	CASE RESPONSE TO NRC AFFIDAVITS ON OPEN ITEMS RELATING TO WALSH/DOYLE ALLEGATIONS
CASE-40	11/28/83	CASE'S ANSWER TO BOARD's 10/25/83 MEMORANDUM (PROCEDURE CONCERNING QUALITY ASSURANCE)
CASE-41	02/01/84	CASE'S ANSWER TO MOTIONS FOR RECONSIDERATION OF BOARD'S MEMORANDUM AND ORDER (QUALITY ASSURANCE FOR DESIGN) BY APPLICANTS AND NRC STAFF
CASE-42	08/13/84	CASE'S ANSWER TO APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE REGARDING THE EFFECTS OF GAPS ON STRUCTURAL BEHAVIOR UNDER SEISMIC LOADING CONDITIONS
CASE-43	05/04/83	SURREBUTTAL TESTIMONY OF MARK ANTHONY WALSH
CASE-44	10/02/84	CASE'S ANSWER TO APPLICANTS' REPLY TO CASES'S ANSWER TO APPLICANTS' MOTION REGARDING ALLEGED ERRORS MADE IN DETERMINING DAMPING FACTORS FOR OBE AND SSE LOADING CONDITIONS.
CASE-45	12/19/85	CASE'S RESPONSE TO APPLICANTS' 11/12/85 CHANGES TO AFFIDAVITS IN SUPPORT OF APPLICANTS' MOTIONS FOR SUMMARY DISPOSITION.
IAP-1	10/12/84	COMANCHE PEAK INDEPENDENT ASSESSMENT PROGRAM FINAL REPORT TR-83090-01, REV. 0
IAP-2	11/20/84	COMANCHE PEAK INDEPENDENT ASSESSMENT PROGRAM FINAL REPORT (PHASE 3) TR-84042-01
IAP-3	03/14/85	TUGCO/CPRT MEETING TO DISCUSS FINDINGS FROM INDEPENDENT ASSESSMENT PROGRAM
IAP-4	04/04/85	REVIEW ISSUES LIST TRANSMITTAL - PIPE STRESS & PIPE SUPPORTS
IAP-5	04/04/85	REVIEW ISSUES LIST TRANSMITTAL - CABLE TRAY SUPPORTS & CONDUIT SUPPORTS
IAP-6	04/04/85	REVIEW ISSUES LIST TRANSMITTAL - ELECTRICAL/I&C

Source Document	Date	Document Title
IAP-7	04/04/85	REVIEW ISSUES LIST TRANSMITTAL - MECHANICAL SYSTEMS
IAP-8	04/04/85	REVIEW ISSUES LIST TRANSMITTAL - DESIGN CONTROL
IAP-9	04/23/85	REVIEW ISSUES LIST TRANSMITTAL - PIPE STRESS (REV. 1) & PIPE SUPPORTS (REV. 1)
IAP-10	04/23/85	REVIEW ISSUES LIST TRANSMITTAL - CABLE TRAY SUPPORTS (REV. 9) & CONDUIT SUPPORTS (REV. 1)
IAP-11	04/23/85	REVIEW ISSUES LIST TRANSMITTAL - ELECTRICAL/I&C, REVISION 1
IAP-12	04/23/85	REVIEW ISSUES LIST TRANSMITTAL - MECHANICAL SYSTEMS, REVISION 1
IAP-13	04/23/85	REVIEW ISSUES LIST TRANSMITTAL - DESIGN CONTROL, REVISION 0
IAP-14	06/21/85	REVIEW ISSUES LIST TRANSMITTAL - CABLE TRAY SUPPORTS, REVISION 10
IAP-15	06/21/85	REVIEW ISSUES LIST TRANSMITTAL - DESIGN CONTROL, REVISION 1
IAP-16	08/13/85	REVIEW ISSUES LIST TRANSMITTAL - CABLE TRAY SUPPORTS (REV. 11) & CONDUIT SUPPORTS (REV. 2)
IAP-17	08/13/85	REVIEW ISSUES LIST TRANSMITTAL - MECHANICAL SYSTEMS, REVISION 2
IAP-18	08/13/85	REVIEW ISSUES LIST TRANSMITTAL - ELECTRICAL/I&C, REVISION 2
IAP-19	05/15/84	IAP PHASE 4 - SUPPLEMENT TO APPLICANTS' PLAN TO RESPOND TO MEMORANDUM AND ORDER (QUALITY ASSURANCE FOR DESIGN), MARCH 13, 1984
IAP-20	10/09/84	CYGNA LTR. 84056.032 - REACTOR COOLANT THERMAL BARRIER RUPTURE
IAP-21	10/22/84	CYGNA LTR. 84056.035 - REACTOR COOLANT PUMP THERMAL BARRIER RUPTURE - CLARIFICATION
IAP-22	01/18/85	CYGNA LTR. 84042.022 - OPEN ITEMS ASSOCIATED WITH WALSH/DOYLE ALLEGATIONS
IAP-23	01/25/85	CYGNA LTR. 84056.050 - STATUS OF IAP CONCLUSIONS, ALL PHASES

Source Document	Date	Document Title
IAP-24	01/31/85	CYGNA LTR. 84042.025 - PHASE 3 - WALSH/DOYLE ALLEGATIONS (RICHMOND INSERT ALLOWABLES AND BENDING STRESSES)
IAP-25	01/31/85	CYGNA LTR. 84056.053 - PHASE 4 OPEN ITEMS (PUNCHING SHEAR)
IAP-26	02/08/85	CYGNA LTR. 84042.021 - PHASE 3 OPEN ITEMS (MASS PARTICIPATION AND MASS POINT SPACING)
IAP-27	02/12/85	CYGNA LTR. 84056.041 - CABLE TRAY SUPPORT REVIEW QUESTIONS
IAP-28	02/19/85	CYGNA LTR. 84042.035 - STABILITY OF PIPE SUPPORTS
IAP-29	03/08/85	CYGNA LTR. 83090.023 - RESPONSE TO NRC QUESTIONS, IAP PHASES 1 AND 2
IAP-30	03/12/85	CYGNA LTR. 84056.058 - PHASE 4 OPEN ITEMS (PUNCHING SHEAR)
IAP-31	03/25/85	CYGNA LTR. 84042.036 - PHASE 3 OPEN ITEMS (CINCHING OF U-BOLTS)
IAP-32	03/29/85	CYGNA LTR. 84056.060 - GENERIC ISSUES SUMMARY, IAP - ALL PHASES
IAP-33	11/20/85	REVIEW ISSUES LIST TRANSMITTAL - CABLE TRAY SUPPORTS (REV. 12)
IAP-34	11/20/85	REVIEW ISSUES LIST TRANSMITTAL - CONDUIT SUPPORTS (REV. 3)
MAC-1	05/17/78	MANAGEMENT QUALITY ASSURANCE AUDIT
NRC-1	02/15/83	NRC SPECIAL INSPECTION TEAM (SIT) REPORT (50-445/82-26)(50-446/82-14) AS A RESULT OF WALSH/DOYLE CONCERNS
NRC-2	04/11/83	CONSTRUCTION APPRAISAL INSPECTION (CAT) 50-445/83-18, 50-446/83-12
NRC-3	08/29/83	NRC STAFF OBJECTIONS TO PROPOSED INITIAL DECISION
NRC-4	08/30/83	NRC STAFF'S PROPOSED FINDINGS OF FACT IN THE FORM OF A PARTIAL INITIAL DECISION
NRC-5	10/03/83	REGION IV CAT FOLLOW-UP REPORT
NRC-6	10/28/83	NRC STAFF RESPONSE TO BOARD QUESTION REGARDING APPLICABLE WELDING CODES AT CPSES

Source Document	Date	Document Title
NRC-7	07/13/84	COMANCHE PEAK SPECIAL REVIEW TEAM REPORT
NRC-8	11/02/84	NRC STAFF RESPONSE TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION ON AWS AND ASME CODE PROVISIONS ON WELD DESIGN
NRC-9	09/30/85	STAFF EVALUATION OF CPRT PROGRAM PLAN, REVISION 2, DETAILED COMMENTS/CONCERNS
NRC-10	07/01/81	SAFETY EVALUATION REPORT - CPSES UNITS 1 & 2 (NUREG-0797)
NRC-11	10/01/81	SAFETY EVALUATION REPORT - CPSES UNITS 1 & 2 (NUREG-0797) SUPPLEMENT NO. 1
NRC-12	01/01/82	SAFETY EVALUATION REPORT - CPSES UNITS 1 & 2 (NUREG-0797) SUPPLEMENT NO. 2
NRC-13	03/01/83	SAFETY EVALUATION REPORT - CPSES UNITS 1 & 2 (NUREG-0797) SUPPLEMENT NO. 3
NRC-14	11/01/83	SAFETY EVALUATION REPORT - CPSES UNITS 1 & 2 (NUREG-0797) SUPPLEMENT NO. 4
NRC-15	11/01/84	SAFETY EVALUATION REPORT - CPSES UNITS 1 & 2 (NUREG-0797) SUPPLEMENT NO. 6
NRC-16	01/01/85	SAFETY EVALUATION REPORT - CPSES UNITS 1 & 2 (NUREG-0797) SUPPLEMENT NO. 7
NRC-17	02/01/85	SAFETY EVALUATION REPORT - CPSES UNITS 1 & 2 (NUREG-0797) SUPPLEMENT NO. 8
NRC-18	03/01/85	SAFETY EVALUATION REPORT - CPSES UNITS 1 & 2 (NUREG-0797) SUPPLEMENT NO. 9
NRC-19	04/01/85	SAFETY EVALUATION REPORT - CPSES UNITS 1 & 2 (NUREG-0797) SUPPLEMENT NO. 10
NRC-20	05/01/85	SAFETY EVALUATION REPORT - CPSES UNITS 1 & 2 (NUREG-0797) SUPPLEMENT NO. 11
NRC-21	09/02/82	NRC STAFF TESTIMONY OF JOSEPH I. TAPIA AND W. PAUL CHEN IN REBUTTAL TO THE TESTIMONY OF MARK ANTHONY WALSH CONCERNING THE DESIGN OF PIPE SUPPORTS
NRC-22	05/13/83	INSPECTION REPORT 50-445/83-12: 50-446/83-07 -- INSPECTION CONDUCTED BY J. I. TAPIA AND W. PAUL CHEN
NRC-23	12/13/83	AFFIDAVITS OF JOSEPH I. TAPIA AND W. PAUL CHEN ON OPEN ITEMS RELATING TO WALSH/DOYLE CONCERNS
NRC-24	/ /	NRC INSPECTION REPORT 82-30

Source Document	Date	Document Title
NRC-25	01/08/85	NRC LETTER TO TUGCO RE: TRT QA/QC FINDINGS (ATTACHED TO NRCT-6).
NRC-26	05/30/85	NRC REGION IV INSPECTION REPORTS 2/17/84 THROUGH 5/30/85.
NRC-27	10/11/84	NRC INSPECTION REPORT (50-445/84-22)(50-446/84-07) - INSPECTIONS CONDUCTED UNDER RESIDENT INSPECTION PROGRAM 05/19/84 THROUGH 07/21/84
NRC-28	02/27/79	SUMMARY OF FEBRUARY 13, 1979 MEETING ON AUXILIARY SYSTEMS BRANCH QUESTIONS
NRC-29	11/17/80	LETTER, R.L. TEDESCO TO R.J. GARY RE: SERVICE INSPECTION OF PRESSURE ISOLATION VALVES
NRC-30	01/14/81	LETTER, R.L. TEDESCO TO R.J. GARY RE: PRESERVICE INSPECTION AND TESTING OF SNUBBERS
NRC-31	10/14/82	TRIP REPORT-AUDIT OF TUSI DOCUMENTATION FOR ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED EQUIPMENT FOR CPSES 1 AND 2.
NRC-32	10/29/82	SSER INPUT ON SEISMIC AND DYNAMIC QUALIFICATION OF SAFETY-RELATED ELECTRIC AND MECHANICAL EQUIPMENT
NRC-33	01/31/83	REGION IV RESPONSE TO R.J. GARY LETTER ON SYSTEMATIC ASSESSMENT OF LICENSEE PERFORMANCE (SALP)
NRC-34	07/06/83	SUBMITTAL OF INTERIM STAFF EVALUATION OF THE ALTERNATE SHUTDOWN DESIGN FOR THE CPSES
NRC-35	01/24/84	SER UNRESOLVED ISSUES REQUIRING RESOLUTION PRIOR TO LICENSING CPSES UNIT 1
NRC-36	01/24/84	SER OUTSTANDING ISSUE (1), "PROTECTION AGAINST EFFECTS ASSOCIATED WITH THE POSTULATED RUPTURE OF PIPING OUTSIDE CONTAINMENT"
NRC-37	02/13/84	ADDITIONAL INFORMATION ON ENVIRONMENTAL QUALIFICATION
NRC-38	05/17/84	TRANSMITTAL OF PROPOSED SUPPLEMENT TO APPENDIX C OF THE SER FOR COMANCHE PEAK STEAM ELECTRIC STATION (UNITS 1 AND 2)
NRC-39	09/12/84	NRC STAFF CONTROL ROOM DESIGN REVIEW REPORT FOR THE CPSES

Source Document	Date	Document Title
NRC-40	09/18/84	COMANCHE PEAK REVIEW
NRC-41	11/13/84	ACCEPTABILITY OF ASME CODE RELIEF REQUESTS PERTAINING TO THE PRESERVICE INSPECTION (PSI) PROGRAM FOR COMANCHE PEAK STEAM ELECTRIC STATION, UNIT 1
NRC-42	11/19/84	ISSUANCE OF SUPPLEMENT NO. 6 TO THE COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2 SAFETY EVALUATION REPORT
NRC-43	06/05/85	USE OF ASME CODE CASES N-397 AND N-411 FOR THE CPSES (UNITS 1 AND 2)
NRC-44	06/07/85	SUMMARY OF MEETING BETWEEN NRC STAFF AND TUGCO TO DISCUSS THE COMANCHE PEAK FIRE PROTECTION PROGRAM
NRC-45	06/10/85	ISSUANCE OF SUPPLEMENT NO. 11 TO NUREG-0797 COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2
NRC-46	07/24/85	RESPONSE TO L.D. BUTTERFIELD'S MAY 16, 1985 REQUEST FOR COMMENTS ON THE WESTINGHOUSE OWNERS GROUP (WOG) GUIDELINES FOR PREPARING SUBMITTALS REQUESTING NRC APPROVAL OF REACTOR TRIP TECH. SPEC. CHANGES
NRC-47	09/25/85	USE OF ASME CODE CASES N-397 AND N-411 FOR THE CPSES (UNITS 1 AND 2)
NRCT-1	09/18/84	NRC-152 TECHNICAL REVIEW TEAM BRIEFING: COMANCHE PEAK REVIEW
NRCT-2	11/01/84	SUMMARY OF MEETING TO DISCUSS THE APPLICANTS' PLAN FOR RESOLUTION OF REQUESTS FOR ADDITIONAL INFORMATION FROM THE COMANCHE PEAK TECHNICAL REVIEW TEAM EFFORT DESCRIBED IN LETTER DATED 09/18/84
NRCT-3	12/20/84	TRANSCRIPT CYGNA/NRC MEETING - INDEPENDENT ASSESSMENT PROGRAM
NRCT-4	01/10/85	MEETING WITH CYGNA ON CPSES INDEPENDENT ASSESSMENT PROGRAM (PHASE 3)
NRCT-5	01/15/85	MEETING WITH TUGCO CONCERNING THE MOTION FOR SUMMARY DISPOSITION ON QA/QC PROGRAM FOR DESIGN OF PIPING AND PIPE SUPPORTS FOR COMANCHE PEAK

ATTACHMENT A — *Continued*

Source Document	Date	Document Title
NRCT-6	01/17/85	MEETING TO DISCUSS TECHNICAL REVIEW TEAM STAFF FINDINGS - COMANCHE PEAK
NRCT-7	02/07/85	SUMMARY OF MEETING WITH CASE, TUGCO AND NRC CONTENTION 5 PANEL CONCERNING COMANCHE PEAK STEAM ELECTRIC STATION AND TECHNICAL ISSUES RAISED IN THE ASLB HEARINGS THURSDAY, FEBRUARY 7, 1985
NRCT-8	02/26/85	MEETING BETWEEN TEXAS UTILITIES AND THE NUCLEAR REGULATORY COMMISSION REGARDING COMANCHE PEAK STEAM ELECTRIC STATION - PIPING AND SUPPORT DESIGN
NRCT-9	02/27/85	MEETING BETWEEN TEXAS UTILITIES AND THE NUCLEAR REGULATORY COMMISSION REGARDING COMANCHE PEAK STEAM ELECTRIC STATION - PIPING AND SUPPORT DESIGN
NRCT-10	03/06/85	MEETING BETWEEN TEXAS UTILITIES AND THE NUCLEAR REGULATORY COMMISSION REGARDING CPSES - TRT TESTING PROGRAM ISSUES
NRCT-11	03/07/85	MEETING BETWEEN TEXAS UTILITIES AND THE NUCLEAR REGULATORY COMMISSION REGARDING CPSES - MECHANICAL AND MISCELLANEOUS
NRCT-12	04/26/85	CYGNA BRIEFING TO NRC MANAGEMENT ON COMANCHE PEAK STEAM ELECTRIC STATION INDEPENDENT ASSESSMENT PROGRAM
NRCT-13	06/06/84	TELEPHONE CONFERENCE CALL (06/06/84) TO DISCUSS VARIOUS MOTIONS FOR SUMMARY DISPOSITION ON PIPE SUPPORT DESIGN AND QA ISSUES WHICH HAVE BEEN SUBMITTED BY THE APPLICANT
NRCT-14	06/08/84	MEETING IN BETHESDA ON TECHNICAL DATA AND SUPPORTING MOTIONS FOR SUMMARY DISPOSITIONS
NRCT-15	06/11/84	TELEPHONE CONFERENCE (NRC, CASE, TUGCO) TO DISCUSS MOTIONS FOR SUMMARY DISPOSITION ON PIPE SUPPORT DESIGN AND DESIGN QA

Source Document	Date	Document Title
NRCT-16	10/23/84	MEETING TO DISCUSS THE APPLICANT'S PLAN FOR RESOLUTION OF REQUESTS FOR ADDITIONAL INFORMATION FROM THE COMANCHE PEAK TECHNICAL REVIEW TEAM (TRT) EFFORT
NRCT-17	03/23/85	MEETING TO CONDUCT FEEDBACK DISCUSSION WITH MESSRS. WALSH AND DOYLE REGARDING CONCERNS ABOUT THE COMANCHE PEAK PLANT
NRCT-18	04/19/84	MEETING WITH CYGNA ENERGY SERVICES ON INDEPENDENT ASSESSMENT PROGRAM (IAP) FOR COMANCHE PEAK
NRCT-19	07/03/84	MEETING BETWEEN NRC STAFF AND CYGNA - 07/03/84
NRCT-20	03/05/85	MEETING BETWEEN TEXAS UTILITIES AND THE NUCLEAR REGULATORY COMMISSION REGARDING COMANCHE PEAK STEAM ELECTRIC STATION - QA/QC, APPLICANTS' PROGRAM PLAN
NRCT-21	06/20/84	NRC MEETING TO DISCUSS SUBMITTED SUMMARY DISPOSITIONS
NRCT-22	10/19/84	TUGCO MEETING WITH NRC STAFF
NRCT-23	11/13/84	PREHEARING BRIEFING
NRCT-24	08/06/84	DISCUSSION ON MOTIONS FOR SUMMARY DISPOSITION FILED BY APPLICANT, COMANCHE PEAK
NRCT-25	08/08/84	QUESTIONS ON SUMMARY DISPOSITIONS FILED BY TEXAS UTILITIES ON COMANCHE PEAK
NRCT-26	08/09/84	(HEARING TRANSCRIPT) IN THE MATTER OF COMANCHE PEAK, TEXAS UTILITY
NRCT-27	08/23/84	COMANCHE PEAK MEETING BETWEEN NUCLEAR REGULATORY COMMISSION STAFF AND TEXAS UTILITIES - MOTIONS FOR SUMMARY DISPOSITION
NRCT-28	06/13/85	NRC/TUGCO MEETING OF 06/13/85 AND 06/14/85
NRCT-29	10/02/85	PUBLIC HEARING RE: HOMOGENEOUS HARDWARE POPULATION FOR CONSTRUCTION ADEQUACY REVIEW AND SWEC REANALYSIS PROGRAM.
NRCT-30	06/13/85	NRC/TUGCO MEETING - VOLUME I - MORNING SESSION

ATTACHMENT A — *Continued*

Source Document	Date	Document Title
NRCT-31	06/13/85	NRC/TUGCO MEETING - VOLUME II - AFTERNOON SESSION
NRCT-32	06/14/85	NRC/TUGCO MEETING - VOLUME I - MORNING SESSION
NRCT-33	06/14/85	NRC/TUGCO MEETING - VOLUME II - AFTERNOON SESSION
NRCT-34	06/18/85	MEETING ON RECALCULATION OF SEISMIC RESPONSE SPECTRA: COMANCHE PEAK
NRCT-35	08/14/85	SUMMARY OF MEETING BETWEEN THE NRC COMANCHE PEAK INTIMIDATION PANEL, THE APPLICANT, AND THE INTERVENER TO BRIEF THE COMANCHE PEAK PANEL ON THE ALLEGED INTIMIDATION ISSUES AT COMANCHE PEAK
NRCT-36	09/17/85	MEETING BETWEEN NRC STAFF AND TEXAS UTILITIES GENERATING COMPANY TO DISCUSS THE OFFICIAL INSPECTION OF PAINTED SUPPORT WELDS
NRCT-37	10/18/85	SUMMARY OF 10/2-3/85 MEETING - BASIS FOR ESTABLISHING THE HOMOGENEOUS HARDWARE POPULATIONS FOR THE CONSTRUCTION ADEQUACY REVIEW, AND THE STONE AND WEBSTER PIPE AND PIPE SUPPORT REANALYSIS PROGRAM
NRCT-38	11/05/85	TUGCO MEETING WITH NRC - CPRT MONTHLY STATUS - NOVEMBER 5-6, 1985 - VOLUME I
NRCT-39	11/06/85	TUGCO MEETING WITH NRC - CPRT MONTHLY STATUS - NOVEMBER 5-6, 1985 - VOLUME II
NRCT-40	11/05/85	HANDOUTS FROM PUBLIC MEETING IN GRANBURY NOVEMBER 5-6, 1985
NRCT-41	11/12/85	TRANSCRIPT OF PUBLIC HEARING HELD IN DALLAS, TEXAS
NRCT-42	12/18/85	TUGCO MEETING WITH NRC - CPRT MONTHLY STATUS
NRCT-43	02/06/86	TUGCO-NRC PUBLIC MEETING, ARLINGTON, TEXAS
TUGC-1	08/05/83	APPLICANTS' PROPOSED FINDINGS OF FACT IN THE FORM OF A PARTIAL INITIAL DECISION
TUGC-2	08/29/83	TRANSMITTAL OF "DIRECTOR'S DECISION UNDER 10CFR2.206" DENYING PETITION FILED BY MRS. ELLIS ON BEHALF OF CASE

Source Document	Date	Document Title
TUGC-3	08/30/83	APPLICANTS' MOTION TO ESTABLISH SCHEDULE FOR SPECIAL PROCEEDING, FURTHER PROCEEDINGS (IF NECESSARY), AND FOR CLOSING RECORD AND FOR EXPEDITED REPLY
TUGC-4	08/31/83	APPLICANTS' (1) ANSWER TO CASE'S MOTION TO SUPPLEMENT THE RECORD (REGARDING WALSH/DOYLE ALLEGATIONS) (2) REQUEST FOR EXPEDITED RULING AND (3) MOTION FOR NOTICE OF INTENT TO IMPOSE SANCTIONS
TUGC-5	09/06/83	APPLICANTS' REPLY TO CASE'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW (WALSH/DOYLE ALLEGATIONS)
TUGC-6	10/28/83	APPLICANTS' BRIEF REGARDING BOARD INQUIRY INTO APPLICABILITY OF AWS AND ASME CODES TO WELDING ON PIPE SUPPORTS AT COMANCHE PEAK
TUGC-7	05/16/84	APPLICANTS' MOTION FOR SUMMARY DEPOSIT REGARDING ALLEGED ERRORS MADE IN DETERMINING DAMPING FACTORS FOR OBE AND SSE LOADING CONDITIONS
TUGC-8	05/17/84	APPLICANTS' MOTION FOR SUMMARY DISPOSITION OF CERTAIN CASE ALLEGATIONS REGARDING AWS AND ASME CODE PROVISIONS RELATED TO DESIGN ISSUES
TUGC-9	05/18/84	APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING THE EFFECTS OF GAPS ON STRUCTURAL BEHAVIOR UNDER SEISMIC LOADING CONDITIONS
TUGC-10	05/18/84	APPLICANTS' MOTION FOR SUMMARY DISPOSITION OF CASE ALLEGATION REGARDING SECTION PROPERTY VALUES
TUGC-11	05/20/84	APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING UPPER LATERAL RESTRAINT BEAM
TUGC-12	05/20/84	APPLICANTS' MOTION FOR SUMMARY DISPOSITION OF CASE'S ALLEGATIONS REGARDING SAFETY FACTORS
TUGC-13	05/21/84	APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING USE OF GENERIC STIFFNESSES INSTEAD OF ACTUAL STIFFNESSES IN PIPING ANALYSIS

Source Document	Date	Document Title
TUGC-14	05/23/84	APPLICANTS' MOTION FOR SUMMARY DISPOSITION OF CASE'S ALLEGATIONS REGARDING U-BOLTS ACTING AS TWO-WAY RESTRAINTS
TUGC-15	06/02/84	APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING DESIGN OF RICHMOND INSERTS AND THEIR APPLICATION TO SUPPORT DESIGN
TUGC-16	06/17/84	APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING STABILITY OF PIPE SUPPORTS
TUGC-17	06/18/84	APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING CONSIDERATION OF LOCAL DISPLACEMENTS AND STRESSES
TUGC-18	06/22/84	APPLICANTS' MOTION FOR SUMMARY DISPOSITION OF CASE ALLEGATIONS REGARDING DIFFERENTIAL DISPLACEMENT OF LARGE-FRAMED, WALL-TO-WALL, AND FLOOR-TO-CEILING PIPE SUPPORTS
TUGC-19	06/29/84	APPLICANTS' MOTION FOR SUMMARY DISPOSITION OF CASE'S ALLEGATIONS REGARDING CINCHING DOWN OF U-BOLTS
TUGC-20	07/03/84	APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING ALLEGATIONS CONCERNING QUALITY ASSURANCE PROGRAM FOR DESIGN OF PIPING AND PIPE SUPPORTS FOR COMANCHE PEAK STEAM ELECTRIC STATION
TUGC-21	07/09/84	APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING ALLEGATIONS CONCERNING CONSIDERATION OF FORCE DISTRIBUTION IN AXIAL RESTRAINTS
TUGC-22	08/31/84	CORRECTIONS TO THE RICHMOND INSERT MOTION FOR SUMMARY DISPOSITION
TUGC-23	09/19/84	APPLICANTS' REPLY TO CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING CONSIDERATION OF FRICTION FORCES
TUGC-24	09/21/84	APPLICANTS' REPLY TO CASE'S ANSWER TO APPLICANTS' MOTION REGARDING ALLEGED ERRORS MADE IN DETERMINING DAMPING FACTORS FOR OBE AND SSE LOADING CONDITIONS

Source Document	Date	Document Title
TUGC-25	09/28/84	APPLICANTS' REPLY TO CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING LOCAL DISPLACEMENTS AND STRESSES
TUGC-26	10/01/84	APPLICANTS' REPLY TO CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING DIFFERENTIAL DISPLACEMENTS OF LARGE-FRAMED, WALL-TO-WALL, AND FLOOR-TO-CEILING PIPE SUPPORTS
TUGC-27	10/26/84	APPLICANTS' REPLY TO CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING THE UPPER LATERAL RESTRAINT BEAM
TUGC-28	10/26/84	APPLICANTS' REPLY TO (1) CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING THE EFFECTS OF GAPS AND (2) BOARD CHAIRMAN'S "PRELIMINARY VIEWS" REGARDING ADDITIONAL PLEADINGS
TUGC-29	11/02/84	APPLICANTS' REPLY TO CASE'S PARTIAL ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING SAFETY FACTORS
TUGC-30	11/12/84	APPLICANTS' REPLY TO CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING SECTION PROPERTIES
TUGC-31	06/06/83	APPLICANT'S RESPONSE TO BOARD INQUIRY REGARDING ITERATIVE DESIGN PROCESS FOR PIPING
TUGC-32	09/14/82	TESTIMONY OF KENNETH L. SCHEPPELE, ROGER F. REEDY, PETER S. Y. CHANG, JOHN C. FINNERAN, AND GARY KRISHNAN REGARDING WALSH ALLEGATIONS
TUGC-33	09/14/82	SUPPLEMENTAL TESTIMONY OF KENNETH L. SCHEPPELE, ROGER F. REEDY, PETER S. Y. CHANG, JOHN C. FINNERAN, AND GARY KRISHNAN REGARDING DOYLE ALLEGATIONS
TUGC-34	09/13/84	DISCUSSION BETWEEN CYGNA ENERGY SERVICES AND TEXAS UTILITIES GENERATING COMPANY AND EBASCO SERVICES, INC.
TUGC-35	05/21/85	TEXAS UTILITIES CPRT MEETING - CYGNA ENERGY SERVICES 05/21/85 AND 05/22/85

ATTACHMENT A — *Continued*

Source Document	Date	Document Title
TUGC-36	10/01/82	COMANCHE PEAK STEAM ELECTRIC STATION, DESIGN AND CONSTRUCTION, SELF-INITIATED EVALUATION
TUGC-37	08/01/78	LETTER, H.R. ROCK TO H.C. SCHMIDT RE: PRESSURIZER DISCHARGE PIPING CLASSIFICATION
TUGC-38	08/17/78	LETTER, H.R. ROCK TO H.C. SCHMIDT RE: LICENSING QUESTION
TUGC-39	08/24/78	LETTER, H.R. ROCK TO H.C. SCHMIDT RE: CONFIRMATION OF INSTRUCTIONS - CLASSIFICATION OF PRESSURIZER SAFETY RELIEF VALVE DISCHARGE PIPING
TUGC-40	03/19/79	LETTER, R.J. GARY TO W.C. SEIDLE RE: UNIT NO. 1 REACTOR VESSEL NOZZLE WELD METAL DEFECTS
TUGC-41	08/10/79	LETTER, R.J. GARY TO W.C. SEIDLE RE: PIPE SUPPORTS
TUGC-42	09/11/79	LETTER, R.J. GARY TO W.C. SEIDLE RE: PIPE WALL THICKNESS
TUGC-43	01/23/80	LETTER, R.J. GARY TO W.C. SEIDLE RE: PIPING MINIMUM WALL
TUGC-44	03/28/80	LETTER, R.J. GARY TO W.C. SEIDLE RE: PIPING MINIMUM WALL
TUGC-45	04/21/80	LETTER, R.J. GARY TO W.C. SEIDLE RE: CLASS V PIPING SUPPORTS
TUGC-46	04/15/80	LETTER, R.J. GARY TO W.C. SEIDLE RE: PIPING MINIMUM WALL
TUGC-47	06/19/80	LETTER, R.J. GARY TO W.C. SEIDLE RE: PIPING MINIMUM WALL
TUGC-48	07/14/80	LETTER, R.J. GARY TO W.C. SEIDLE RE: CLASS V PIPING SUPPORTS
TUGC-49	09/18/80	LETTER, R.J. GARY TO W.C. SEIDLE RE: CLASS V PIPING SUPPORTS
TUGC-50	10/21/80	LETTER, R.J. GARY TO W.C. SEIDLE RE: DIESEL GENERATOR PIPE SUPPORTS
TUGC-51	12/16/80	LETTER, R.J. GARY TO W.C. SEIDLE RE: PIPING MINIMUM WALL
TUGC-52	01/12/81	LETTER, R.J. GARY TO W.C. SEIDLE RE: DIESEL GENERATOR PIPE SUPPORTS

Source Document	Date	Document Title
TUGC-53	04/13/81	LETTER, J.S. MARSHALL TO R.L. TEDESCO RE: PRESERVICE INSPECTION AND TESTING OF SNUBBERS
TUGC-54	07/29/81	LETTER, R.J. GARY TO G.L. MADSEN RE: DIESEL GENERATOR PIPE SUPPORTS
TUGC-55	06/03/81	LETTER, R.J. GARY TO G.L. MADSEN RE: PIPING MINIMUM WALL
TUGC-56	10/02/81	LETTER, R.J. GARY TO G.L. MADSEN RE: DIESEL GENERATOR PIPE SUPPORTS
TUGC-57	03/31/82	LETTER, H.C. SCHMIDT TO S.B. BURWELL RE: FUNCTIONAL CAPABILITY OF CLASS 2 AND 3 BENDS AND ELBOWS
TUGC-58	08/16/82	LETTER, R.J. GARY TO H.R. DENTON RE: DESIGN CERTIFICATION
TUGC-59	05/13/82	LETTER, H.C. SCHMIDT TO S. BURWELL RE: STEAM GENERATOR LEVEL CONTROL
TUGC-60	03/08/83	LETTER, H.C. SCHMIDT TO B.J. YOUNGBLOOD RE: ACCIDENT MONITORING - STEAM GENERATOR SAFETY VALVE POSITION INDICATION
TUGC-61	03/29/83	LETTER, R.J. GARY TO G.L. MADSEN RE: VENDOR INSTALLED HVAC SYSTEM (SDAR-106 CP-83-06)
TUGC-62	06/21/83	LETTER, R.J. GARY TO G.L. MADSEN RE: COMPONENT COOLING WATER CLASS V PIPING (QA FILE: CP-83-11, SDAR-111)
TUGC-63	07/22/83	ALTERNATE SHUTDOWN - INTERIM STAFF EVALUATION
TUGC-64	08/31/83	RESPONSE TO NRC NOTICE OF VIOLATION - INSPECTION REPORT NO. 83-23, FINDING NO. 1
TUGC-65	10/06/83	SER TABLES ON EQUIPMENT QUALIFICATION
TUGC-66	01/05/84	LETTER, H.C. SCHMIDT TO B.J. YOUNGBLOOD RE: HIGH/MODERATE ENERGY PIPE BREAK ANALYSIS
TUGC-67	02/17/84	LETTER, R.J. GARY TO B.J. YOUNGBLOOD RE: REQUEST FOR PARTIAL EXEMPTION
TUGC-68	03/08/84	HUMAN FACTORS CONTROL ROOM DESIGN REVIEW - FINAL REPORT
TUGC-69	04/06/84	TUGCO COMMENTS ON CYGNA'S INDEPENDENT ASSESSMENT PROGRAM

ATTACHMENT A — *Continued*

Source Document	Date	Document Title
TUGC-70	06/29/84	LETTER, H.C. SCHMIDT TO B.J. YOUNGBLOOD RE: EQUIPMENT ENVIRONMENTAL QUALIFICATION - JUSTIFICATIONS FOR INTERIM OPERATION
TUGC-71	09/28/84	LETTER, J.W. BECK TO B.J. YOUNGBLOOD RE: IMPACT OF TEMPERATURE DUE TO MAIN STEAM LINE BREAK OUTSIDE CONTAINMENT ON EQUIPMENT THAT REQUIRES ENVIRONMENTAL QUALIFICATION
TUGC-72	01/17/85	LETTER, J.W. BECK TO B.J. YOUNGBLOOD RE: ENGINEERING AND CONSTRUCTION STATUS REPORT
TUGC-73	02/14/85	LETTER, J.W. BECK TO B.J. YOUNGBLOOD RE: MAIN STEAM LINE BREAKS OUTSIDE CONTAINMENT
TUGC-74	04/09/85	LETTER, J.W. BECK TO B.J. YOUNGBLOOD RE: FINAL DRAFT TECHNICAL SPECIFICATIONS
TUGC-75	04/23/85	LETTER, J.W.BECK TO B.J. YOUNGBLOOD RE: TEMPORARY CHANGES TO PROCEDURES
TUGC-76	05/02/85	LETTER, J.W. BECK TO V.S. NOONAN RE: ARBITRARY INTERMEDIATE PIPE BREAKS
TUGC-77	06/07/85	LETTER, J.W. BECK TO V.S. NOONAN RE: NRC GENERIC LETTER 83-28
TUGC-78	07/10/85	LETTER, W.G. COUNSEL TO V.S. NOONAN RE: RESOLUTION OF TMI ACTION ITEMS II.K.3.30 AND II.K.3.31 RELATED TO SMALL BREAK LOCA ANALYSIS
TUGC-79	07/15/85	LETTER, W.G. COUNSEL TO V.S. NOONAN RE: CLARIFICATION TO TEXAS UTILITIES LETTER TXX-4426
TUGC-80	10/14/85	LETTER, W.G. COUNSEL TO V.S. NOONAN RE: RESPONSE TO GENERIC LETTER 85-06 (ANTICIPATED TRANSIENTS WITHOUT SCRAM)
TUGC-81	12/20/85	LETTER, J.W. BECK TO E.H. JOHNSON RE: DAMAGE STUDY EVALUATION OF WESTINGHOUSE SDAR: CP-85-46
TUGC-82	02/28/86	LETTER, W.G. COUNSEL TO V.S. NOONAN RE: USE OF ASME CODE EDITION AND ADDENDA
TUGC-83	12/15/86	TRANSCRIPT OF CYNGA/SWEC MEETING IN GLEN ROSE, TEXAS

Source Document	Date	Document Title
TUGC-84	04/05/84	APPLICANTS' MOTION FOR SUMMARY DISPOSITION OF CERTAIN CASE ALLEGATIONS REGARDING AWS AND ASME CODE PROVISIONS RELATED TO WELDING ISSUES REQUEST FOR EXPEDITED RESPONSE
XASL-001	08/19/83	MEMORANDUM AND ORDER - MOTION FOR CLARIFICATION ON THERMAL STRESS IN PIPE SUPPORTS
XASL-002	07/06/83	MEMORANDUM AND ORDER - THERMAL STRESS IN PIPE SUPPORTS
XASL-003	10/18/84	MEMORANDUM AND ORDER - MORE DETAIL ON INDIVIDUAL PIPE SUPPORTS
XASL-004	11/10/83	AFFIDAVIT OF JACK DOYLE
XASL-005	10/06/83	PARTIAL INITIAL DECISION (CHANGE IN MATERIAL PROPERTIES FOR A500 STEEL)
XCAS-001	08/16/83	CASE'S ANSWER TO APPLICANTS' MOTION FOR CLARIFICATION OF MEMORANDUM AND ORDER ON THERMAL STRESS AND PIPE SUPPORTS
XCAS-002	07/15/83	MOTION FOR RECONSIDERATION OF BOARD'S 07/06/87 MEMORANDUM AND ORDER - THERMAL STRESS IN PIPE SUPPORTS
XCAS-003	05/09/83	CASE'S RESPONSE TO BOARD's REQUEST FOR DISCUSSION OF INTERRELATIONSHIP OF ASME APPENDIX XVII, 2271.3, TO REST OF ASME CODE
XCAS-004	10/06/84	CASE'S STATEMENT OF MATERIAL FACT AS TO WHICH THERE IS NO GENUINE ISSUE REGARDING CASE'S FIRST MOTION FOR SUMMARY DISPOSITION REGARDING CERTAIN ASPECTS OF THE IMPLEMENTATION OF APPLICANTS' DESIGN
XCAS-005	09/26/84	CASE'S ANSWER TO APPLICANTS' RESPONSE TO BOARD'S PARTIAL INITIAL DECISION REGARDING A500 STEEL
XCAS-006	05/14/84	CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION OF CERTAIN CASE ALLEGATIONS REGARDING AWS AND ASME CODE PROVISIONS RELATED TO WELDING ISSUES
XCAS-007	01/17/85	CASE'S 01/17/85 SUPPLEMENT TO CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING LOCAL DISPLACEMENTS AND STRESSES

Source Document	Date	Document Title
XCAS-008	11/05/84	CASES ANSWER TO APPLICANTS' RESPONSE TO BOARD REQUEST FOR INFORMATION REGARDING CINCHING DOWN U-BOLTS
XNRC-001	05/11/83	NRC STAFF RESPONSE TO BOARD INQUIRY REGARDING APPENDIX XVII OF THE ASME BOILER AND PRESSURE VESSEL CODE
XNRC-002	05/03/83	NRC STAFF REPLY TO CASE'S BRIEF REGARDING CONSIDERATION OF LOCA IN DESIGN CRITERIA FOR PIPE SUPPORTS
XNRC-003	04/29/83	NRC STAFF MOTION FOR PROTECTIVE ORDER
XNRC-004	04/20/83	NRC STAFF ANSWER TO CASE MOTIONS SEEKING ADMISSION OF DOCUMENTS
XNRC-005	06/02/82	NRC STAFF'S ANSWER SUPPORTING APPLICANTS' MOTION FOR SUMMARY DISPOSITION OF CONTENTION 5
XNRC-006	03/15/82	NRC STAFF'S ANSWER TO CFUR'S MOTION FOR VOLUNTARY DISMISSAL
XNRC-007	09/28/84	NRC STAFF RESPONSE TO APPLICANTS' AND CASE'S FINDINGS OF FACT ON WELD FABRICATION
XNRC-008	02/02/84	NRC STAFF'S RESPONSE TO CASE'S (1) DECEMBER 23, 1983 RESPONSE TO APPLICANTS' IDENTIFICATION OF ISSUES, AND (2) JANUARY 16, 1984 CLARIFICATION OF ISSUES IN 12/23/83 PLEADING
XNRC-009	02/06/84	NRC STAFF RESPONSE TO CASE'S MOTION FOR RECONSIDERATION OF BOARD'S 12/28/83 MEMORANDUM AND ORDER (QUALITY ASSURANCE FOR DESIGN)
XNRC-010	01/27/84	NRC STAFF RESPONSE TO APPLICANTS' MOTION FOR RECONSIDERATION OF MEMORANDUM AND ORDER (QUALITY ASSURANCE FOR DESIGN)
XNRC-011	12/13/83	NRC STAFF MOTION TO REOPEN RECORD TO ADMIT THE AFFIDAVIT OF DR. JAI RAJ N. RAJAN
XNRC-012	12/13/83	NRC STAFF RESPONSE TO CASE'S MOTION FOR RECONSIDERATION (AFFIDAVITS ON OPEN ITEMS RELATING TO WALSH/DOYLE ALLEGATIONS)
XNRC-013	10/28/83	NRC STAFF RESPONSE TO BOARD QUESTION REGARDING APPLICABLE WELDING CODES AT CPSES

Source Document	Date	Document Title
XNRC-014	09/12/83	NRC INSPECTION REPORT 50-445/83-24, 50-446/83-15
XNRC-015	02/17/83	LETTER FROM G. L. MADSEN, CHIEF, REACTOR PROJECT BRANCH 1, TO R. J. GARY, EXECUTIVE VICE PRESIDENT AND GENERAL MANAGER, TUGCO
XNRC-016	04/13/83	LETTER FROM COUNSEL FOR NRC STAFF TO ASLB IN THE MATTER OF TEXAS UTILITIES GENERATING COMPANY, ET AL. (COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2) DOCKET NOS. 50-445 AND 50-446
XNRC-017	03/17/83	LETTER FROM COUNSEL FOR NRC STAFF TO ASLB IN THE MATTER OF TEXAS UTILITIES GENERATING COMPANY, ET AL. (COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2) DOCKET NOS. 50-445 AND 50-446
XNRC-018	02/22/83	COUNSEL FOR NRC STAFF - IN THE MATTER OF TEXAS UTILITIES GENERATING COMPANY, ET AL. (COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2) DOCKET NOS. 50-445 AND 50-446
XNRC-019	02/08/83	LETTER FROM NRC STAFF COUNSEL TO ASLB IN THE MATTER OF TEXAS UTILITIES GENERATING COMPANY, ET AL. (COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2) DOCKET NOS. 50-445 AND 50-446
XNRC-020	02/18/82	LETTER FROM NRC STAFF COUNSEL TO ASLB IN THE MATTER OF TEXAS UTILITIES GENERATING COMPANY, ET AL. (COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2) DOCKET NOS. 50-445 AND 50-446
XNRC-021	03/27/83	LETTER AND REPORT ENTITLED "REVIEW OF CONCERNS EXPRESSED BY CITIZENS ASSOCIATION FOR SOUND ENERGY ABOUT CONDUCT OF REGION IV INVESTIGATIONS/INSPECTION TO ASLB"
XNRC-022	11/04/83	COUNSEL FOR NRC STAFF IN THE MATTER OF TEXAS UTILITIES GENERATING COMPANY, ET AL. (COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2) DOCKET NOS. 50-445 AND 50-446

ATTACHMENT A — *Continued*

Source Document	Date	Document Title
XNRC-023	11/01/83	COUNSEL FOR NRC STAFF IN THE MATTER OF TEXAS UTILITIES GENERATING COMPANY, ET AL. (COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2) DOCKET NOS. 50-445 AND 50-446
XNRC-024	10/14/83	COUNSEL FOR NRC STAFF IN THE MATTER OF TEXAS UTILITIES GENERATING COMPANY, ET AL. (COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2) DOCKET NOS. 50-445 AND 50-446
XNRC-025	12/31/84	LETTER FROM D. R. HUNTER, CHIEF, REACTOR PROJECT BRANCH 2, TO M. D. SPENCE, PRESIDENT, TUGCO
XNRC-026	05/17/84	LETTER FROM COUNSEL FOR NRC STAFF TO ASLB IN THE MATTER OF TEXAS UTILITIES ELECTRIC COMPANY, ET AL. COMANCHE PEAK STEAM ELECTRIC COMPANY, ET AL. (COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2)
XNRC-027	05/11/84	ADDENDUM TO PAGE 27 OF NRC STAFF TESTIMONY ON WELDING FABRICATION CONCERNS RAISED BY MR. AND MRS STINES.
XNRC-028	04/24/84	LETTER FROM NRC TO APPLICATNT IN THE MATTER OF THE NRC STAFF RECEIVING ALLEGATIONS OF IMPROPER CONSTRUCTION PRACTICES, ET. AL. (COMANCHE PEAK STEAM ELECTRIC COMPANY, UNIT 1 AND 2). DOCKET NS. 50-445 AND 50-446.
XTUG-001	02/18/87	APPLICANTS' INTERROGATORIES TO INTERVENER. (SET NO. 1987-4)
XTUG-002	08/02/83	APPLICANTS MOTION FOR CLARIFICATION OF MEMORANDUM AND ORDER ON THERMAL STRESS AND PIPE SUPPORTS
XTUG-003	05/11/83	APPLICANTS' SUPPLEMENTAL REPLY BRIEF REGARDING PIPE SUPPORT DESIGN
XTUG-004	05/03/83	APPLICANTS' REPLY BRIEF REGARDING CONSIDERATION OF LOCA IN DESIGN CRITERIA FOR PIPE SUPPORTS
XTUG-005	04/21/83	APPLICANTS' BRIEF REGARDING CONSIDERATION OF THERMAL STRESSES IN DESIGN OF PIPE SUPPORTS

Source Document	Date	Document Title
XTUG-006	07/03/84	APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE RE APPLICANTS' QUALITY ASSURANCE PROGRAM FOR DESIGN OF PIPING AND PIPE SUPPORTS FOR COMANCHE PEAK STEAM ELECTRIC STATION
XTUG-007	06/29/84	APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE REGARDING CONSIDERATION OF CINCHING U-BOLTS
XTUG-008	06/18/84	APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE REGARDING CONSIDERATION OF LOCAL DISPLACEMENTS AND STRESSES
XTUG-009	06/17/84	APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE REGARDING STABILITY OF PIPE SUPPORTS
XTUG-010	06/02/84	APPLICANTS' STATEMENT OF MATERIAL FACTS RELATING TO RICHMOND INSERTS AS TO WHICH THERE ARE NO MATERIAL ISSUES
XTUG-011	05/20/84	APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE
XTUG-012	05/16/84	APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE
XTUG-013	05/16/84	APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE REGARDING CONSIDERATION OF FRICTION FORCES IN THE DESIGN OF PIPE SUPPORTS WITH SMALL THERMAL MOVEMENTS
XTUG-014	05/16/84	APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE REGARDING APPLICANTS' CONSIDERATION OF DAMPING FACTORS FOR OBE AND SSE LOADING CONDITIONS
XTUG-015	06/01/83	COUNSEL FOR TUGCO - RE: TEXAS UTILITIES GENERATING CO., ET AL. (COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2) DOCKET NOS. 50-445 AND 50-446
XTUG-016	11/19/84	APPLICANTS' REPLY TO CASE'S MOTION CONCERNING INFORMATION REGARDING CINCHING DOWN U-BOLTS

ATTACHMENT A — *Continued*

Source Document	Date	Document Title
XTUG-017	11/16/84	APPLICANTS' REPLY TO CASE'S ANSWER TO APPLICANTS' RESPONSE TO BOARD'S PARTIAL INITIAL DECISION REGARDING A500 STEEL
XTUG-018	11/05/84	APPLICANTS' MOTION FOR RECONSIDERATION OF MEMORANDUM AND ORDER (MORE DETAIL ON INDIVIDUAL PIPE SUPPORTS)
XTUG-019	07/11/84	COUNSEL FOR APPLICANTS RE: TEXAS UTILITIES COMPANY, ET AL. (COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2), DOCKET NOS. 50-445 AND 50-446
XTUG-020	06/29/84	COUNSEL FOR APPLICANTS - SUBJ. TEXAS UTILITIES ELECTRIC, ET AL. (COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2 DOCKET NOS. 50-445 AND 50-446)
XTUG-021	06/17/84	LETTER FROM APPLICANTS' COUNSEL TO ASLB - SUBJ. TEXAS UTILITIES COMPANY, ET AL. (COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2) DOCKET NOS. 50-445 AND 50-446
XTUG-022	04/11/84	APPLICANTS' RESPONSE TO PARTIAL INITIAL DECISION REGARDING A500 STEEL
XTUG-023	06/02/84	LETTER FROM COUNSEL FOR APPLICANT TO ASLB IN THE MATTER OF ALLEGATIONS REGARDING SAFETY FACTORS, ET. AL. (COMANCHE PEAK STEAM ELECTRIC COMPANY, UNIT 1 AND UNIT 2) DOCKET NOS. 50-445 AND 50-446.

ATTACHMENT B

OTHER DIRs

ATTACHMENT B

The following three categories were established for DIRs which were not covered by External Source Issues/Primary DIRs. Each DIR was resolved individually. A summary of the closures follows:

CATEGORY — MISCELLANEOUS (#36)

1. DIRs with no specific concern identified. These DIRs are classified as unsubstantiated:

DIR E-0323	Subject:	Cygna desire to complete review of procedures.
	Resolution:	No concern identified.
DIR E-0812	Subject:	Overthickness in pipe.
	Resolution:	No specifics identified; only mentioned as a subject to be covered later.
DIR E-0940	Subject:	Responsiveness of SIT Report to Walsh/Doyle items.
	Resolution:	All Walsh/Doyle items are addressed by SWEC's GTIR.
DIR E-1198	Subject:	Assymetric dynamic loads on Reactor Coolant System.
	Resolution:	Issue was indicated as "undergoing staff review" in SSER 6. Limited information is provided for DAP review.
DIR E-1199	Subject:	NRC review of WECAN computer program not complete.
	Resolution:	Program not used in SWEC's requalification program.
DIR E-1200	Subject:	Resolution of TMI Action Items.
	Resolution:	Document (TUGCO-78) describes resolution - FSAR revision. Any further resolution required will be identified by the NRC in subsequent SSERs.
DIR E-1201	Subject:	Use of Code Cases N-397 and N-411.
	Resolution:	Per NRC letter from V.S. Noonan to W.G. Council dated 3/13/86, the NRC approves use of these Code Cases, provided listed requirements are met.

2. Concerns closed outside of DSAP IX review and/or closed as invalid. These DIRs are classified as Observations or Unsubstantiated:

DIR E-0242	Subject:	Functional capability of austenitic bends/elbows.
	Resolution:	NRC raised the issue in the SER; a method was developed and applied on a sampling basis; NRC closed it in SSER #3.
DIR E-0347	Subject:	Improper use of temporary supports, and the erection process in general, could have damaged Main Steam pipes
	Resolution:	Per ISAP V.e. Results Report the issue is closed.
DIR E-0354	Subject:	Snubber failure after steam/water hammer.
	Resolution:	Snubbers are load rated by vendors. Given that piping loads are properly determined and correct snubber size is chosen, the supports should not fail.
DIR E-0586	Subject:	Combined load evaluation for AWS weld evaluation.
	Resolution:	TUGCO satisfies CASE's question later in the external source document (NRCT-13).

DIR E-0858	Subject:	ANI is responsible for interpretation of ASME Code.
	Resolution:	DAP disagrees with Doyle. ANI does not interpret engineering related matters; the only design related responsibility is to ensure that the required analysis has been done and is properly certified.
DIR E-0936	Subject:	OBE vs. SSE loads.
	Resolution:	No error occurred. Damping values were based on Reg. Guide 1.61. The Reg. Guide damping values are noted as being conservative per recent WRC studies (WRC-300).
DIR E-1176	Subject:	Incorrectly calculated pipe stress allowable.
	Resolution:	Per ASLB-43, the allowables are shown to be correctly calculated.
DIR E-1191	Subject:	Whether or not all seismic restraints must be +/–.
	Resolution:	Third Party agrees with TUGCO's response - that uni-directional supports can be used if dead weight is larger than the +Y loads.

3. Concerns with TUGCO arguments that are not pertinent to SWEC resolutions. These DIRs are classified as Unclassified Deviations:

DIR E-0560	Subject:	Snubber capacity test results.
	Resolution:	Per CPPP-7, the allowable loads are stated in vendor LCD sheets or certified design report summaries. These test results are not used.
DIR E-0778	Subject:	Inelastic deformation in bolts used to justify shear distribution among base plate bolts.
	Resolution:	SWEC does not use bolt deformation to justify shear distribution among base plate bolts, but bases their procedure/resolution on NF-4721.
DIR E-0843	Subject:	Effects of bolt hole gaps on material and impact damping.
	Resolution:	SWEC does not use impact or material damping to justify their approach to the bolt hole gap issue, but bases their procedure/resolution on NF-4721.
DIR E-1195	Subject:	U-bolt cinching; can torqueing or paint be used for locking.
	Resolution:	Per PM-82 Rev 1, cinched U-bolts are eliminated. Jam nuts or lock nuts are used on stiff clamps.

4. Calculation/Procedural concerns. Addressed by SWEC in CPPP-6 and 7:

DIR E-0062	Subject:	STRUDL analysis guidelines.
	Resolution:	Supports analyzed using STRUDL are checked against NF Code requirements.
DIR E-0134	Subject:	Member bearing may be inappropriately considered for compression loads on welds.
	Resolution:	CPPP-7, Att. 4-2 requires compression to be considered.

DIR E-0295 Subject: Combining SRV and seismic loads in Emergency for Main Steam pipe.

Resolution: CPPP-7, Table 3.5-1 and 3.5-2 requires SRV and SSE to be combined in the Faulted condition. This change in load combination required an FSAR change, which was incorporated in Amendment 61 (per DIR C-0024).

DIR E-0313, DIR E-0734, DIR E-0823, DIR E-1188 Subject: Spring travel, frame gap, and swing angle evaluation for seismic and fluid transients.

Resolution: CPPP-7, Att. 4-1 requires that displacements be calculated for spring travel evaluation using Table 4.7.2-1 combinations (which include seismic and fluid transient). Frame gaps are addressed in DAP-E-P-019, and swing angles in DAP-E-P-004.

DIR E-0322 Subject: Embedded plates - connections assumed as pinned, and stiffeners required for moment connections.

Resolution: CPPP-7 does not require that attachments to embedded plates be assumed as pinned, and per CPPP-6, calculated loads are transmitted to SWEC-CAP for evaluation.

DIR E-0735 Subject: Spacing of attachments to embedded plates.

Resolution: Per CPPP-6, support reactions on embedded plates are transmitted to SWEC-CAP for evaluation.

DIR E-0969 Subject: Gang supports pinned to building structures were not considered interactively between attached piping.

Resolution: CPPP-7, Att. 4-9 requires elimination of pinned attachments of ganged supports to building structures.

DIR E-1174 Subject: Stresses due to reduced pipe wall thickness.

Resolution: Reduced wall thickness is evaluated per CPPP-7, Att. 3-14 and PM-137.

CATEGORY — GENERIC/CUMULATIVE (#37)

1. Concern with inconsistent and nonstandard criteria. Addressed by SWEC requalification program use of CPPP Procedures:

DIR E-0008 Subject: Inconsistent criteria for STRUDL.

Resolution: CPPP-7 defines criteria and methods for requalification of supports. SWEC uses its own version of STRUDL, and has issued controlled user's manuals.

DIR E-0331 Subject: Non-standard pipe support designs invalidate standard engineering assumptions and practices.

Resolution: CPPP-7 defines criteria and methods for requalification of supports, ensuring all supports in SWEC's scope are re-evaluated based on industry codes/standards.

DIR E-0523 Subject: Unresolved issues related to provisions of GDC-1.
Resolution: Specific items were addressed under SWEC's requalification program, including: Skewed "T" joint welds, Flare bevel welds, Punching shear, and Tube-to-tube welds. (See DAP-E-P-008 and DAP-E-P-027).

DIR E-0884 Subject: Piping analysis techniques have changed.
Resolution: CPPP-7 defines criteria and methods for requalification of piping. Loads generated in these analyses will be incorporated into support designs.

2. Concern with cumulative effects of specific concerns. Each specific concern was individually addressed by SWEC, thereby eliminating the cumulative effects concern:

DIR E-0658,
DIR E-0720,
DIR E-0730,
DIR E-0731

Subject:	Resolution:
SIFs	See DAP-E-P-026
Fluid/insulation weights of valves and flanges	See DAP-E-P-026
Mass point spacing	See DAP-E-P-017
Support mass	See DAP-E-P-015
Support stiffness	See DAP-E-P-005
Valve acc. generic study	See DAP-E-P-025
Flange load generic study	See DAP-E-P-025
Welded attachments	See DAP-E-P-002
SS elbow functional capability	CPPP-7, Att. 3-16
Support self-weight excitation	See DAP-E-P-020

CATEGORY — WESTINGHOUSE

Concern with seismic damping in Westinghouse piping analysis:

DIR E-0035,
DIR E-0121,
DIR E-0135,
DIR E-0230,
DIR E-0526,
DIR E-0527,
DIR E-0528,
DIR E-0583,
DIR E-0641,
DIR E-0785,
DIR E-0787,
DIR E-0972,
DIR E-0983

Subject: Loads on one support were greater for Norm/Upset than Emerg/Fault. The damping values used in the OBE/SSE analysis of a 3" pipe were questioned (2,4%)

Resolution: FSAR specifies 2% and 4% damping for OBE and SSE for 12" and larger piping; it also permits CC N-411 damping. Westinghouse memo TCX-SDI-150 notes damping used for RCL analysis is justified/documented in FSAR Sect. 1A(N)-34, and that the specific analysis in question (1-41) is based on N-411 damping. (All DIRs in this category were transferred to DIR E-0121.)

ATTACHMENT C

PROJECT MEMORANDA

ATTACHMENT C

Procedure No.	Title	Rev. No.	Date of Issue
	REVIEWED AS PART OF CPPP-7, REVISION 2		
PM-001	Pipe Support Computer Program Usage	1	0[illegible]/08/86
PM-003	Design Information Request Procedure	0	1[illegible]/18/85
PM-016	Qualification of Two (2) Bolt Base Plates	0	01/24/86
PM-025	Gang Hanger and Terminal Anchor Procedure - Unit 2	0	02/28/86
PM-026	Impact Testing of Integral Attachments	0	02/28/86
PM-039	Administrative Procedure for Qualifying Wall-to-Wall, Floor-to-Floor, and Corner Pipe Supports	2	07/21/86
PM-050	Procedure to Adjust the Seismic Response Acceleration for Valve Qualification	1	06/16/86
PM-051	Integral Welded Attachment (IWA) Task Group	0	05/09/86
PM-052	Through-Bolt Allowable Load Criteria	0	05/09/86
PM-053	CPPP-7, Rev. 2, Sec. 3.6.4 (Essential Systems)	0	05/15/86
PM-054	Project Engineering Assurance Engineer Responsibilities	0	05/15/86
PM-055	Weld Design Criteria for Pipe Supports	0	05/19/86
PM-056	Simplified Method for Qualification of As-Built Small Bore Piping	1	12/03/86
PM-057	Floor Slabs with 2" Concrete Topping	0	06/16/86
PM-058	Pipe Support Member Stress due to LOCA for CT and SI Systems	0	06/18/86
PM-059	Two-Bolt Baseplate Qualification Procedure	0	06/18/86
PM-060	Revised Pad Width Requirements for Attachment 4-6A of CPPP-7	0	06/18/86
PM-061	Mismatch SIFs	0	06/23/86
PM-062	Calculation of Support Loads for Non-Nuclear Safety Related Piping Attached to an ASME III Support	0	06/24/86
PM-063	Pipe Support Clearance Requirements	0	06/24/86
PM-064	As-Built Verification of Base Plate Using Drilled-In Expansion-Type Concrete Anchors	1	07/14/86
PM-065	Use of Hardened Beveled Washers	0	06/24/86
PM-066	Pipe Wall Thinning Criteria	2	10/09/86

ATTACHMENT C — *Continued*

Procedure No.	Title	Rev. No.	Date of Issue
PM-067	Suggested Distance Between Mass Points	0	06/24/86
PM-068	Weld Termination at Member Edges	0	06/24/86
PM-071	Local Stress Evaluation for Dual Trunnion Anchors	0	06/25/86
PM-072	Anchor Stiffness for APE (ST-378) Computer Program	0	06/25/86
PM-074	Code Case N318 Computer Program	1	11/21/86
PM-075	Design Considerations for E-Systems and Western Piping Stiff Clamps used on Main Steam and Feedwater Piping	0	07/07/86
PM-076	Local Stress Check in Tube Section	0	07/07/86
PM-077	Code Case 392 Computer Program	0	07/07/86
PM-079	Revised NF17 Code Check Equation Tables	0	07/14/86
PM-080	Clarification of Attachment 4-2 of CPPP-7	0	07/14/86
PM-081	New Release of STRUDAT/SANDUL	0	07/14/86
PM-082	Modifications to Cinched U-Bolts	1	12/26/86
PM-083	Procedure for Evaluating Cinched U-Bolt Supports	1	09/23/86
PM-084	Clarification of S^{**} for CT and SI Piping Systems	0	07/21/86
PM-085	Local Stress Evaluation for Pipe-to-Pipe Bearing	0	07/21/86
PM-086	CPPP-11, Administrative Control of Calculations	1	02/13/87
PM-087	Analytical Requirements for Penetration Sleeve Seals and Boots	0	07/21/86
PM-088	Correction of Typographical Errors - CPPP-7	0	07/21/86
PM-089	Elimination of Hanger Engineering Data Report (HEDR)	1	02/13/87
PM-090	Review of NCRs for Potential Reportability	1	12/16/86
PM-091	Problem Boundary Modifications	0	07/31/86
PM-092	Computer Program for Pipe Support Analyses	0	07/31/86
PM-093	Allowables For 3/8-in. Diameter Hilti Kwik Bolts with 1 5/8 in. Embedment Depth	0	07/31/86
PM-094	Revised Procedure for the Qualification of Clamp Anchors	0	07/31/86
PM-095	Cinched U-Bolt Analysis Computer Program	0	08/13/86
PM-096	Piping Decoupling Criteria	1	09/10/86

ATTACHMENT C — *Continued*

Procedure No.	Title	Rev. No.	Date of Issue
PM-097	Pipe Support Welded Tube Steel Joints	0	08/20/86
PM-098	Local Stress Evaluation for Uncinched U-Bolt Supports	0	08/20/86
PM-099	Allowables for Hilti Anchors Having Edge Distance Less Than 5D	0	08/20/86
PM-100	Additional Direction for Self-Weight Computer Input	0	08/20/86
PM-102	Local Pipe Stresses Due to Longitudinal Bearing Loads	1	10/09/86
PM-103	Allowable Valve Accelerations	0	08/21/86
PM-104	Stress Intensification Factors	0	08/26/86
PM-105	Thermal Expansion Range Stress for Run Pipe Local Stress Evaluation	0	08/28/86
PM-106	Proposed Modification Reports	0	09/09/86
PM-107	Reactor Coolant Loop (RCL) Movements	0	09/10/86
PM-108	Local Stress Evaluation Procedure	1	10/01/86
PM-109	Local Member Stress Induced by Nuts Bearing Against Tube Steel Wall	0	09/08/86
PM-110	Allowable Loads for A193 Grade B7 Threaded Rods	0	09/10/86
PM-111	Procedure for Modeling Tie-Back Supports	0	09/08/86
PM-112	Thermal Expansion of Long Tube Steel	0	09/18/86
PM-113	Additional Plastic Moments for Interface Anchors	0	09/30/86
PM-114	Cinched U-Bolt Computer Program Clarification	0	09/30/86
PM-115	Code Case N318-2 and N413 Usage	0	09/30/86
PM-116	Self-Weight Excitation Loads for Tie-Back Supports	0	09/30/86
PM-117	New Release of SANDUL	0	09/30/86
PM-118	Calculation Transmittals and Distribution Requirements	0	10/09/86
PM-119	Allowable Stress Range for Expansion Stresses S_A	0	10/09/86
PM-120	Small Bore Pipe Strap Stiffness	0	10/09/86
PM-121	Loads and Movements Required to be Shown on Pipe Support Drawings	0	10/09/86
PM-122	Effect of Construction Tolerance on Pipe Support Stiffness	0	10/20/86

Procedure No.	Title	Rev. No.	Date of Issue
PM-123	Effective Fillet Weld Length for Trunnion-to-Elbow Connection	0	10/20/86
PM-124	Procedures for Qualifying Decoupled Vent/Drain and Free-End Connections	0	10/20/86
PM-126	SA, PSM, and PSC - Memos	0	10/20/86
	REVIEWED AS PART OF ISSUE RESOLUTION		
PM-039	Administrative Procedure for Qualifying Wall-to-Wall, Floor-to-Floor, and Corner Pipe Supports	3	6-02-87
PM-103	Allowable Valve Accelerations	0	8-21-86
PM-110	Allowable Loads for A193 Grade B7 Threaded Rods	0	4-14-87
PM-133	Final Reconciliation Check List	1	5-27-87
PM-135	Sections of CPPP-7, Rev. 3, Which Require Confirmation	0	2-23-87
PM-137	Wall Thinning Criteria	0	3-18-87
PM-138	Dynamic Analysis of Fluid Transient Loading	0	3-31-87
PM-139	Procedure for Evaluating Pipe Stresses at Stiff Clamp Supports	0	3-31-87
PM-140	Flare Bevel Groove Welds	1	05-01-87
PM-141	Unequal Shear Loading Effect on Richmond Inserts and Threaded Rods Used in Conjunction with Tube Steel		3-25-87
PM-146	The Use of Galvanized Nuts on CPSES	0	4-20-87
PM-151	PSAP RELAP 5, and REPIPE Computer Programs	0	5-01-87
PM-154	Axial Restraints with Lugs	0	5-07-87
PM-155	SIF Evaluation of Branch Connections	0	6-08-87
PM-157	Break/Crack Postulation, Pipe Stress Analysis, and Pipe Qualification Requirements for Class 5 High and Moderate Energy Lines - Units 1 and 2	0	5-13-87
PM-162	Circular Trunnion Attachments to Elbows	0	5-22-87
PM-163	CPPP-7 Piping and Pipe Supports Code Applicability Changes	0	5-27-87
PM-164	Overall Final Assessment Review of Piping Systems	1	6-19-87
PM-165	Screening Procedure - Fluid Transient Cutoff Loads	1	6-25-87

ATTACHMENT C — *Continued*

Procedure No.	Title	Rev. No.	Date of Issue
PM-166	Pipe Stress and Support System Review Checklist	0	5-28-87
PM-167	Use of Computer Program PITRIFE (ME-211)	0	6-03-87
PM-170	Revised Procedure for Qualification of Elbows with Branch Connections	0	6-08-87
PM-178	Resolution of TERA Fluid Transients Issues	0	6-25-87

ATTACHMENT D

ABBREVIATIONS AND ACRONYMS LIST

ATTACHMENT D

ABBREVIATIONS AND ACRONYMS LIST

Abbreviation or Acronym	Explanation
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ARS	Amplified Response Spectra
ASLB	Atomic Safety and Licensing Board
ASME	American Society of Mechanical Engineers
AWS	American Welding Society
CAP	Corrective Action Program
CASE	Citizens Association for Sound Energy
CFR	Code of Federal Regulations
CPPP	Comanche Peak Project Procedures
CPRT	Comanche Peak Response Team
CPSES	Comanche Peak Steam Electric Station
CVCS	Chemical and Volume Control System
DAP	Design Adequacy Program
DIR	Discrepancy/Issue Resolution Report
DOF	Degrees of Freedom
DSAP	Discipline Specific Action Plan
ESIS	Exernal Source Issue Summary
FSAR	Final Safety Analysis Report
FW	Feedwater
GENX	Stone & Webster Generic Calculation Number
GIR	Generic Issues Report
Hz	Hertz (Cycles per Second)
IRR	Issue Resolution Report
ISAP	Issue Specific Action Plan
KSI	KIPs (Thousand Pounds) Per Square Inch
LOCA	Loss of Coolant Accident
MS	Main Steam
N/A	Not Applicable
N/C	Not Checked
NRC	United States Nuclear Regulatory Commission

Abbreviation or Acronym	Explanation
OBE	Operating Base Earthquake
PCI	Prestressed Concrete Institute
QA	Quality Assurance
RLCA	R.L. Cloud Associates
RTL	Review Team Leaders
RV	Relief Valves
S/RV	Safety/Relief Valve
SAT	Satisfactory
SER	Safety Evaluation Report
SSER	Supplemental Safety Evaluation Report
SIF	Stress Intensification Factors
SRSS	Square Root Sum of the Squares
SRT	Senior Review Team
SSE	Safe Shutdown Earthquake
SWEC	Stone and Webster Engineering Corporation
TRT	Technical Review Team
TU	Texas Utilities
TUGCO	Texas Utilities Generating Company
UNSAT	Unsatisfactory
WRC	Welding Research Counsil
ZPA	Zero Period Acceleration