U. S. NUCLEAR REGULATORY COMMISSION

OFFICE OF NUCLEAR REACTOR REGULATION

NRC Inspection Report: 50-445/89-54
50-446/89-54

Permits: CPPR-126
CPPR-127

Dockets: 50-445
50-446

Construction Permit
Expiration Dates:
Unit 1: August 1, 1991
Unit 2: August 1, 1992

Applicant: TU Electric
Skyway Tower
400 North Olive Street
Lock Box 81
Dallas, Texas 75201

Facility Name: Comanche Peak Steam Electric Station (CPSES), Units 1 & 2

Inspection At: Comanche Peak Site, Glen Rose, Texas

Inspection Conducted: July 6 through August 1, 1989

Inspection conducted by NRC consultants:

W. P. Chen - Parameter (paragraph 5)
P. Stanish - Parameter (paragraphs 2-4)

Reviewed by: H. H. Livermore
H. H. Livermore, Lead Senior Inspector

8-24-89
Date

Inspection Summary:

Inspection Conducted: July 6 through August 1, 1989 (Report 50-445/89-54; 50-446/89-54)

Areas Inspected: Unannounced, resident safety inspection of applicant's actions on previous inspection findings; follow-up on violations/deviations; inspections of conduit supports Train C 2-inch and under; review of design and installation of instrumentation tubing and supports; and plant tours.

Results: Within the areas inspected, no significant strengths or weaknesses were identified. No violations or deviations, open items, or unresolved items were identified.

DETAILS

1. Persons Contacted

*J. L. Barker, Manager, ISEG, TU Electric
*J. W. Beck, Vice President, Nuclear Engineering, TU Electric
*O. Bhatty, Issue Interface Coordinator, TU Electric
*M. R. Blevins, Manager of Nuclear Operations Support, TU Electric
*H. D. Bruner, Senior Vice President, TU Electric
*H. M. Carmichael, Senior QA Program Manager, CECO
*D. J. Chamberlain, Licensing Lead Engineer, Unit 2, CECO
*J. T. Conly, APE-Licensing, Stone and Webster Engineering Corporation (SWEC)
*W. G. Counsil, Vice Chairman, Nuclear, TU Electric
*B. S. Dacko, Licensing Engineer, TU Electric
*D. L. Davis, Nuclear Operations, Results Engineer Manager, TU Electric
*R. J. Daly, Manager, Startup, TU Electric
*G. G. Davis, Nuclear Operations Inspection Report Item Coordinator, TU Electric
*G. L. Edgar, Attorney, Newman and Holtzinger
*D. M. Ehat, Consultant, TU Electric
*J. C. Finneran, Jr., Manager, Civil Engineering, TU Electric
*C. A. Fonseca, Deputy Director, CECO
*B. P. Garde, Attorney, CASE
*J. H. Greene, Site Licensing, TU Electric
*W. G. Guldemond, Manager of Site Licensing, TU Electric
*P. E. Halstead, QC Manager, TU Electric
*J. C. Hicks, Licensing Compliance Manager, TU Electric
*C. B. Hogg, Chief Manager, TU Electric
*R. T. Jenkins, Manager, Mechanical Engineering, TU Electric
*J. J. Kelley, Manager, Plant Operations, TU Electric
*J. J. LaMarca, Electrical Engineering Manager, TU Electric
*D. M. McAfee, Manager, QA, TU Electric
*S. G. McBee, NRC Interface, TU Electric
*W. E. Nyer, Consultant, TU Electric
*G. Ondriska, Startup, TU Electric
*E. F. Ottney, Program Manager, CASE
*S. S. Palmer, Project Manager, TU Electric
*P. R. Raysircar, Deputy Director/Senior Engineer Manager, CECO
*D. M. Reynerson, Director of Construction, TU Electric
*A. H. Saunders, Quality Surveillance, TU Electric
*A. B. Scott, Vice President, Nuclear Operations, TU Electric
*J. C. Smith, Plant Operations Staff, TU Electric
*J. F. Streeter, Director, QA, TU Electric
*C. L. Terry, Unit 1 Project Manager, TU Electric
*R. D. Walker, Manager of Nuclear Licensing, TU Electric
*J. R. Waters, Site Licensing Engineer, TU Electric
*R. G. Withrow, EA Systems Manager, TU Electric

The NRC inspectors also interviewed other applicant employees during this inspection period.

*Denotes personnel present at the August 1, 1989, exit meeting.

2. Applicant's Action on Previous Inspection Findings (92701B)

a. (Closed) Open Item (445/8516-O-52): During ERC reinspection of Verification Package I-S-COSP-071, which was witnessed by the NRC inspector, ERC identified the following conditions as subject to evaluation as potential deviations:

(1) A plate size was incorrect.
(2) A nut was bottomed out on Hilti bolt threads.

As a result of these observations, the applicant issued Nonconformance Report (NCR)-M-86-100359SX which was dispositioned to replace the conduit support in question (C14W13102-05).

The NRC inspector has reviewed Design Change Authorization (DCA) 29860, Revision 4, which details the new support, as well as the inspection report that documents the installation and QC inspection of the support. Based on the above reviews, this item is closed.

b. (Closed) Open Item (445/8914-O-01; 446/8914-O-01): NRC review of the mechanical equipment commodity revealed that coupling and alignment requirements related to connecting rotating equipment was not identified as an inspection attribute on the commodity attribute matrix (CAM).

TU Electric stated that alignment of mechanical equipment was not included in the Post-Construction Hardware Validation Program (PCHVP) since all safety-related equipment would be realigned prior to plant operation by startup and operations. The NRC could not verify if all realignments would be performed.

In this inspection period, the applicant provided a list of all safety-related rotating equipment annotated with the realignment status. This list indicates that either realignments were not necessary, as in the case of direct drive equipment (i.e., no couplings), CPRT verified alignment and the equipment was not disassembled, or that vibration sensitive equipment was tested and if no vibration problems were detected alignment was considered to be adequate. The NRC inspector concurs with the

applicant's assessment that the attribute was adequately addressed. This item is closed.

c. (Closed) Unresolved Item (445/8875-U-01; 446/8871-U-01): During a plant tour, the NRC inspector identified a sway strut clamp on support SW-1-102-007-S48R which had ears that were visibly not parallel. The concern with this clamp was that bending stresses in the load pin may exceed the conditions analyzed by the vendor.

In this inspection period, the NRC inspector reviewed the corrective actions taken by the applicant in response to Violation 445/8912-V-03 (See paragraph 3.a). The inspections and rework undertaken in response to this violation fully address the concern addressed above. Based on those actions, this item is closed.

3. Follow-up on Violations/Deviations (35960, 92702)

a. (Closed) Violation (445/8912-V-03): The NRC inspector had previously identified the following examples of inadequate inspection of pipe supports:

(1) MS-1-003-001-C72S - The beam attachment had one ear that was bent.

(2) FW-1-018-718-C72K - The snubber clamp on this support does not provide the necessary clearance to allow for the full range of angular motion.

(3) CT-1-038-418-C62S - The spring load column is cocked beyond the tolerance of ASTM-A-125.

(4) CS-1-002-700-C52S - No sight hole in one of the spring load couplings.

(5) CC-1-258-003-C53R - The spherical bearing in the sway strut paddle end is partially dislodged.

(6) RC-1-135-004-C51K - The clamp for this snubber will not allow the full range of angular movement.

(7) CC-1-207-020-C53R - The space between the ears of the clamp exceeds maximum tolerance.

(8) FW-1-096-002-C62K - Inadequate clearance between the clamp and snubber body to allow the full range of angular movement.

(9) FW-1-096-002-C62R - Space between the ears of the clamp exceeds the maximum tolerance.

(10) MS-1-340-001-C52S - The eye nut is bound against the top of the pipe clamp.

(11) CC-1-269-700-C53A - One of the welds has a fit-up gap that exceeds the criteria of the weld procedure specification.

(12) MS-1-344-700-C52K - The spherical bearing on the paddle end of the snubber is completely dislodged.

(13) RC-1-018-038-C51K - The space between the ears of the clamp exceeds the maximum tolerance.

(14) FW-1-098-701-C62K - The jam nuts on both sway strut bodies are loose.

(15) MS-1-RB019-005-2 - The clamp ears are bent to less than the minimum allowable dimension.

(16) CT-1-014-001-S22S - The threaded rod on this support interferes with the supporting steel.

(17) SI-1-070-006-S22R - The ears on the cotter pin are not spread.

(18) BR-X-106-064-S43R - Baseplate not grouted properly.

(19) CS-1-908-702-S42R - Jam nut for the sway strut body not tightened properly.

(20) SI-1-060-006-S42R - Clamp ears not parallel and load pin not parallel to clamp bolt.

(21) CS-1-106-717-C42R - Cotter pin missing.

(22) CS-1-106-723-C42R - Cotter pin missing.

(23) CC-1-016-700-A43R - Cotter pin ears not spread (previous inspection finding 445/8865-O-01).

In response to this violation, the applicant's Senior Management directed the performance of a walkdown of all reasonably accessible pipe supports by engineering to identify potential programmatic problems. The general conclusion of the evaluation of the observations was that the CPSES pipe support installation program is effective in assuring that design requirements are properly implemented.

Specific details relating to the number of observations, categories and root causes were contained in Project Technical Report (PTR)-06, "Engineering Evaluation of Pipe Support

Inspection Issues," which was included as an attachment to Corrective Action Request (CAR)89-004.

Corrective actions included rework for those items deemed to have been the result of isolated circumstances or damage due to ongoing construction and maintenance. It was determined that the reason for several of the identified descrepancies was insufficient QC inspection criteria. This necessitated changes to Specification 2323-MS-100 and inspection Procedure AQP 11.3 to address attributes necessary to ensure sufficient clearance to accommodate angular rotation of mechanical snubbers, and sway struts. These additional/revised attributes required QC reinspection of certain pipe supports affected by this revision to the specification.

Corrective steps taken to preclude repetition of these conditions include:

- TU Electric has established a surveillance program to monitor completed commodities to assure they are maintained in an acceptable condition.

- TU Electric has implemented an increased awareness program which includes:

  Instructing the appropriate Construction Department personnel to emphasize the general policy memorandum which cautions against damage to installed hardware.

  Posting of clearly visible signs highlighting the general policy memorandum in various rooms/areas of the plant.

- The QA Department will develop a procedure to provide QA involvement in the Room/Area turnover programs and in monitoring of commodities to assure they are maintained in an acceptable condition.

- ASME QA Procedure AQP 11.5, "ASME Component Installation Verification," was revised to include verification of completeness of pipe supports within the NIS-2/N-5 boundary prior to finalizing the NIS-2/N-5 ASME Code Certification.

The NRC inspector has reviewed CAR-89-004, the Engineering Report PTR-06, Revision 0, as well as Consolidated Engineering and Construction Organization (CECO) letter CECO-0942. These documents ultimately conclude that the conditions addressed in Significant Deficiency Analysis Report (SDAR) CP-89-11 are reportable. The NRC inspector also reviewed DCA-17041, Revision 1, which details the changes made to Specification MS-100 and details the required reinspections along with the changes to AQP-11.3, "Fabrication, Installation, Repair,

Replacement, and Modification Inspection of Component Supports," and the specific NCRs generated in response to the documented NRC inspection findings. Based on the above actions, this violation is closed.

4. Conduit Supports Train C Less than or Equal to 2" (35960, 37055, 48053)

In this inspection period, the NRC inspector reviewed Comanche Peak Engineering, Engineering Assessment Procedure CPE-CPE-EAP-CS-018, Revision 0, "Train C 2-Inch Diameter and Under Program Maintenance Reduction." This procedure was initiated due to the fact that Train C conduit less than or equal to 2-inch diameter located in Unit 1 and common areas was qualified for system interaction considerations under the Corrective Action Program (CAP). The CAP validated Train C by either qualifying: (1) the potential interaction of the conduit system and associated safety-related equipment as a result of postulated seismic collapse or lateral sway of Train C or (2) the conduit support structure design ensures seismic integrity. If conduits and conduit supports were qualified by (1) above a comprehensive maintenance effort would be required during the life of the plant to ensure that new unacceptable interactions are not introduced when new safety-related equipment is installed or (2) when existing structures, which may have been utilized as protective barriers, are altered or removed.

As an alternative to continuously monitoring and updating Train C design documentation, a maintenance reduction program is being implemented to minimize future maintenance of Train C conduits and conduit supports. This program should demonstrate that the majority of conduit systems are supported on supports whose structural integrity has been demonstrated during implementation of the CAP and are not seismic hazards, as such, need not be monitored throughout the life of the plant. Only the "unique" supports whose structural integrity has not been demonstrated will require future maintenance or qualification. This program is being implemented by a walkdown to identify and document the location of unique supports, as well as identification of all unacceptable interactions with unique supports and unacceptable sway interactions with pendulum type light fixtures.

The NRC inspector accompanied applicant personnel on a field demonstration of the implementation of Procedure EAP-018 to determine how walkdown engineers were evaluating "acceptable" deviations of regular supports, impact of isolated unique supports, and acceptability of rugged supports (supports which are inherently rugged due to a high degree of redundancy - i.e., ratio of attachments to concrete, bracing, etc. to number of conduits supported). Subsequent to this

demonstration, a meeting was held to discuss NRC questions/concerns relative to performance of this EAP as well as interface requirements relative to shared conduit supports and junction boxes. In this meeting, the applicant was able to adequately address and resolve all the NRC concerns with the exception of a concern relative to the procedural guidelines for the supporting scheme for small diameter Train C conduit connecting to junction boxes with Train C conduit larger than 2 inches.

To resolve the concern over how the loads from the small bore conduit were factored into the analysis of the "mixed" junction boxes, which are the responsibility of Ebasco, a meeting was held with Ebasco's conduit group. In this meeting, it was determined that Ebasco had defined the design requirements that formed the basis of Impell's walkdown criteria for conduit attached to mixed junction boxes. When asked if the small diameter Train C conduit loads were factored into their analysis, Ebasco stated that they had qualified these junction boxes based on their engineering judgement. However, since the Systems Interaction Program (SIP) had identified 91 Train C junction boxes that, if they were to fall, could damage safety-related components, the NRC inspector stated that objective evidence of structural adequacy for the junction boxes or their supports would be required. In response to this, Ebasco reviewed the 91 junction boxes in question and determined that 1 junction box is supported on a cable seismic restraint (CSR) and detailed analysis was available for this configuration, 39 junction boxes are supported on "nonis supports," which only support dead weight, and 51 are supported on seismic (S-0910) supports. Ebasco performed an analysis for each of the 51 junction boxes that were supported seismically. This analysis included the applicable loads from the junction box itself and all the conduits attached to it, this total load was then compared to the capacity of the appropriate S-0910 support. Ebasco concluded based on this analysis that all of these boxes were adequately supported. For the boxes supported on "nonis" type supports, a somewhat different analysis technique was utilized. Ebasco screened all of the junction boxes and identified five worst-case examples. These examples were selected using the following criteria: (1) junction boxes with the largest loads, combined with (2) the least number of conduits greater than 2-inch diameter. This selection made the following assumptions: (1) small diameter Train C conduit would provide no support to the junction boxes and that (2) the "nonis" support for the junction boxes failed so that the load from the junction box was supported from the larger diameter conduit supports. Again, this analysis determined that the junction boxes, even if their supports failed, would be adequately supported by the

associated conduits and not fall and cause damage to safety-related equipment.

Based on the NRC inspector's review of the analysis performed by Ebasco, it was concluded that the walkdown instructions provided to Impell for the shared junction boxes are adequate.

No deviations or violations were identified.

5. Design and Installation of Instrumentation Tubing and Support (52051, 52053, 52055)

During this report period, the NRC inspector conducted a review to assess the adequacy of the program developed by TU Electric relating to the design and installation of safety-related Seismic Category I instrumentation and controls (I&C) tubing and tubing supports. Particular attention was given to the TU Electric resolution of Comanche Peak Response Team (CPRT) and external issues and SDAR issues as identified in Appendix A and B, respectively, of the TU Electric's CAP I&C Project Status Report (PSR).

As described in the PSR, the issues were to be resolved on the basis of: (1) design criteria consolidated in Design Basis Documents (DBDs) developed under the Design Basis Consolidation Program (DBCP) portion of the CAP and (2) inspections (including Field Verification Method [FVM] inspections) and engineering evaluations performed under the PCHVP portion of CAP.

During the review, the NRC inspector found that as committed to in the PSR, instrumentation specification had been issued and both the tubing supports and support placement series drawings had been modified to reflect the design requirements of the DBDs. Further, the NRC inspector found that of the approximately 430 safety-related instrumentation loops in Unit 1 and common areas which were designed and installed prior to the CAP only a few had been found to be acceptable, even with extensive support modifications, during FVM inspections. The majority of the loops required extensive design verification analyses of the tubing layout and support hardware modifications to be in accordance with the CAP validated design requirements.

Accordingly, the NRC inspector evaluated applicable CAP related specifications, DBDs, FVM inspection procedures and results, drawings and calculations, and performed walkdowns of tubing and tubing supports.

The NRC inspector reviewed design basis documents DBD-EE-15, "Instrument Installation and Separation," Revision 2,

August 31, 1988, and DBD-CS-089, "Instrument and Tubing Support Design," Revision 2, March 10, 1988. The review found that Section 3.0, Codes and Standards, of DBD-EE-15 required the design, procurement, and installation for instrument tubing system be in accordance with the ASME B&PV Code. In addition, Section 5.0, "Functional Requirements," of DBD-EE-15 specified detailed requirements for slope of tubing, tubing and support installation, materials of construction, seismic instrument racks, stands and supports in Seismic Category I buildings, flexible hose assemblies, and expansion loops. The review also found that Section 3.0, "Codes and Standards," of DBD-CS-089 required the design of Seismic Category I tubing supports be in accordance with the AISC and AISI specifications and the AWS welding code. Furthermore, Section 4.0, Design Criteria and "Functional Requirements," of DBD-CS-089 specified detailed design requirements including loading combinations, seismic amplification factors, allowable stresses, and design interfacing requirements. In particular: (1) both the 2323-I-001, "Seismic Tubing Support Package," and the 2323-I-002, "Criteria for Seismic Tubing Support Placement," series drawings were referenced for the placement and type of tubing supports; and (2) the 2323-M1/M2-2100, "Instrument Installation Details"; 2323-M1/M2-2600, "Instrument Locations"; and 2323-M1/M2-2800, "Instrument Rack Drawings" series drawings were referenced for the location of racks, individually mounted instruments and panels. The review concluded that the design and installation requirements specified in DBD-EE-15 and DBD-CS-089 for the safety-related instrumentation tubing and supports were adequate to assure that the design and installation would be accomplished in a controlled manner and the tubing and supports perform their intended safety function. The review also concluded that these DBD-EE-15 and DBD-CS-089 requirements adequately address related CPRT, external, and SDAR issues.

The NRC inspector reviewed the revised specification issued during the CAP: Specification CPES-I-1018, "Installation of Piping/Tubing and Instrumentation," Revision 3, October 10, 1988, and related DCA 78372, Revision 5, February 14, 1989. The review found that the specification adequately reflected the design criteria in DBD-EE-15 and DBD-CS-089 as committed to in the CAP PSR. Subsections 2.1 and 2.12 of Section II, "Piping/Tubing and Instrumentation, Safety Class 1, 2, and 3," of Specification CPES-I-1018 defined installation requirements relating to tubing (impulse lines), flexible hose assemblies and expansion loops, piping, tubing supports, seismic rack assemblies and local stands, instrument mounting, welding, pressure tests, and documentation. Specifically, this specification required that: (1) tubing be installed and connected in accordance with the 2323-M1-2100 series drawings; (2) flexible metal hose assemblies be installed in accordance with the ECE-M1-2100 series general notes and the applicable

2323-M1-2500, "Instrument Tabulation Sheets," series drawings; (3) Seismic Category I tubing supports be in accordance with the 2323-I-001 series drawings and tubing span and support placement be governed by the 2323-I-002 series drawings and the TNE-I1-0069, "Seismic Tubing Support Span Lengths," drawing; and (4) Seismic Category I instrument racks and local stands be in accordance with the 2323-M1-2800 series drawings and the TNE-I1-0071, -0078, and -2804 drawings, respectively.

Subsequently, the NRC inspector conducted a detailed review of the TU Electric process for the design of safety-related instrumentation tubing and supports:

First, it was determined that the design of tubing layouts was based on the guidelines of Impell Corporation (formerly EDS Nuclear, Inc.) Report No. 01-0210-1065, "Tubing Support Criteria," Revision 4, March 13, 1987, and SWEC Calculation 16345-EM(B)-041, "Uniform Methods of Analyzing Special Tubing Configurations," Revision 3, June 3, 1988. The Impell report provided guidelines for the layout and placement of supports for instrument tubing based on simplified conservative methods of analysis which have been incorporated into the standard routing and support placement configurations in the 2323-I-002 series drawings. Loadings considered were pressure, weight, seismic, and thermal expansion. Allowable stresses and load combinations were in accordance with ASME B&PV Code, Section III, Class 2 and 3 criteria. SWEC Calculation 16345-EM(B)-041 provided a uniform method for analyzing tubing configurations which did not satisfy the conservative guidelines of the Impell report. (During the review, the NRC inspector found that this method of analysis was used primarily by SWEC to validate the design of tubing between instrument root valves and the first three dimensional [3D] restraint downstream of the valves.) The SWEC method of analysis was based on the applicable section of SWEC-PSAS Procedure CPPP-7, "Design Criteria for Pipe Stress and Pipe Supports," Revision 4, February 10, 1988. Procedure CPPP-7 was developed as part of the CAP in response to the many piping and pipe support issues and was based on ASME B&PV Code criteria. Specification of the ASME Code for the design of tubing layouts was found to be in accordance with requirements of DBD-EE-15, DBD-CS-089, and Specification CPES-I-1018 and hence acceptable.

Second, it was determined that the design of tube supports was based on the criteria in SWEC Calculation 16345-EM(B)-034 "Design Criteria for Evaluating Instrument Tubing Supports," Revision 2, June 15, 1988. The requirements specified in this document include design loads, load combinations, allowable stresses, connection design, seismic accelerations, and tubing clamp design. The SWEC Calculation 16345-EM(B)-034 criteria were utilized in SWEC Calculations 16345-EM(B)-008 through -021, and other calculations to validate the design of the

standard tubing support configurations shown in the 2323-I-001 series drawings. The design criteria in SWEC Calculation 16345-EM(B)-034 were consistent with the criteria in DBD-EE-15, DBD-CS-089, and Specification CPES-I-1018 and hence acceptable and their utilization in the SWEC support design validation calculations was in accordance with CAP PSR commitments.

The 2323-I-001 series drawings have been revised to incorporate design changes including changes necessary to resolve CAP related issues. For example, drawings 2323-I-01-T02, -T03, -T05, -T06, T09, -T09B, -T11, -T12, and -T13 contain specific requirements for bolt materials. Specification of these requirements was part of the preventive action in the resolution of SDAR CP-87-44, "Unistrut Tubing Support Bolting," reported by TU Electric on January 29, 1988, (See Issue No. B2 of Appendix D to the I&C PSR). Additionally, drawings 2323-I-001-T08A, "Single and Double Tube Supports, Type 8," Revision CP-2, November 30, 1988, and 2323-I-001-T08B, "Single and Double Tube Supports, Type 8," Revision CP-3, December 6, 1988, showed the 3-D tube clamp design developed to resolve SDAR CP-88-21, "Instrument Tubing Clamp," reported by TU Electric on January 29, 1988, (See Issue No. B10 of Appendix B to the I&C PSR). The issue in the SDAR was that J. C. White 3-D tube clamps were functionally inadequate if attached directly to concrete or unistrut channels. This construction deficiency is currently under review by the NRC.

Third, a review was conducted to verify the compliance of the designs for instrument tubing and tube supports with the design criteria. The review was based on a sample of design validated loops for the following three instruments: X-PI-268B, 1-PI-4762, 1-LS-4795. Results of the review were as follows:

<u>X-PI-268B</u>: The review found that the design of the loop for this instrument was verified during a FVM inspection performed in 1988 except for local damage (kinking) of the tubing, incorrect tagging of the instrument plate and five of the seven supports not being installed in accordance with the 2323-I-001 tubing support series drawings. Results of the inspection were documented in FVM Package X-PI-268B-(IWP)-308, Revision 0, dated February 11, 1988. The package indicated that the loop installed prior to the CAP was acceptable from a stress viewpoint, i.e., the loop routing and support locations were acceptable on the basis of the 2323-I-002 support placement series drawings and the Impell Tubing Support Criteria Report No. 01-0210-1065. Calculations performed in Section 5 of the package to assess the root valve tubing configuration had concluded that the configuration was

acceptable. Additionally, Section 5 of the package had also concluded that: (1) the tubing spans were in accordance with drawing TNE-I-0069, Revision CP-1, and thus acceptable; and (2) the layout of the tubing from support No. 5 to support No. 2 was in accordance with the 2323-I-002 series drawing and also thus acceptable.

Deviations from the tube support installation requirements specified in the 2323-I-001 series drawings were found during the inspection and were documented in Section 8.3 of the FVM package. They required the initiation of nonconformance reports (NCRs) or design change authorizations (DCAs) for their disposition.

The review concluded that the FVM inspection utilized in evaluating the instrument loop for instrument X-PI-268B was acceptable to assure compliance with the applicable design criteria.

1-PI-4762: The review found that the design of the loop was approved by Design Change Authorization - Confirmation Required (DCA-CR) No. 23532, Revision 2, dated September 27, 1988. Initially, the loop was inspected during the FVM program and the results documented in FVM package No. 1-PI-4762-IWP-200, Revision 0, dated August 23, 1983.

The tubing routing and support placement found during the inspection, as modified by the support relocation per item 3 of the DCA-CR, were evaluated in SWEC Calculation 16345-EM(S)-107, Revision 0, dated October 7, 1988, and found to be acceptable. Stress levels in the tubing between the root valve and the first 3-D support downstream of the valve were evaluated on the basis of the SWEC Calculation 16345-EM(B)-041 analysis method.

The evaluation indicated that the ASME B&PVC, Section III, Class 2, NC-3600, Equation (10), Sa allowable stress was exceeded on the basis of the use of the ASME Code stress intensification factor (SIF, i) value of 2.3 for threaded Swagelok tube fittings (Section 10.A.1.c of the calculation). Use of a lower SIF value of 1.5, however, indicated that the Sa allowable stress was not exceeded (Section 11 of the calculation). Use of the lower SIF value was based on SWEC generic Calculation NP(B)-139, Revision 0, September 29, 1985. A review of this generic SWEC calculation found that the lower SIF value was developed on the basis of fatigue testing in accordance with paragraph NC-3673.2 of the ASME Code and hence acceptable. Stress levels in the remainder of the loop were evaluated on the basis of the 2323-I-002 series drawings and found to be acceptable.

Based on the results of SWEC Calculation 16435-EM(S)-107, Revision 0, and the support relocation and modifications defined in Section 7 of DCA-CR No. 23532, Revision 2, the design of the loop was approved subject to implementation of the rework identified. The support modifications specified in the DCA-CR were in accordance with the 2323-I-001 tubing support series of drawings.

The review concluded that DCA-CR 23532, Revision 2, provided an acceptable basis for assuring compliance of the design of the instrument loop for instrument No. 1-PI-4762 with the applicable design criteria.

1-LS-4795: The review found that the design of the loop for this instrument was approved by a DCA-CR process similar to that utilized for instrument No. 1-PI-4762. The pre-CAP configuration of the loop was also inspected during the FVM and the results documented in FVM package Nos. 1-LS-4795-IWP-399, Revision 0, dated August 9, 1988, and supplementary package No. 1-LS-4795-IWP-399 SP1 dated March 3, 1989. These FVM packages indicated that flexible hose and all four supports were not in accordance with installation requirements. Subsequently, SWEC Calculation 16345-EM(S)-098, Revision 0, dated October 2, 1988, verified the acceptability of the tubing routing and support spacing on the basis of the 2323-I-002 support placement series of drawings and Section 7 of DCA-CR No. 77387, Revision 4, dated May 26, 1989, specified modifications to the supports based on the 2323-I-001 tubing support series drawings. DCA-CR No. 77387, Revision 4, approved the design subject to implementation of the rework specified therein.

The review concluded that CA-CR No. 77387, Revision 4, provided an acceptable basis for assuring compliance of the design of the instrument loop for instrument No. 1-LS-4795 with applicable design criteria.

Fourth, walkdowns were conducted to verify compliance of the modified as-built configurations of the instrumentation loops with the modified designs required by the CAP. Walkdowns (in full or in part) were performed of the following five instrumentation loops: 1-FT-619, 1-PI-02468, 1-PI-2486, 1-PI-4762, and X-PI-268B. During the walkdown the tubing installation (including routing and support location, location and type of fittings, and damage to and slope of tubing) and support installation (including design details, type, function, welding, and damage) were inspected and found to be in accordance with the design and construction requirements as required by the applicable DCA-CRs. One item not inspected was the flexible hose in loop 1-LS-4795. The flexible hose was enclosed in a temporary housing for protection against

damage due to traffic through and ongoing construction activities in the area.

Based on the preceding results of reviews and walkdowns, it was concluded that the design and installation of instrumentation tubing and supports was in accordance with TU Electric CAP commitments. The reviews found that: (1) applicable specifications and criteria documents were modified to reflect DBD requirements; (2) instrumentation loops designed and installed prior to the CAP were FVM inspected during the PCHVP program in accordance with DBD requirements; and (3) loop designs, modified as necessary by NCRs or DCAs, were validated on the basis on calculations or prevalidated standard design configurations contained in the 2323-I-001 and 2323-I-002 series drawings. Additionally, the walkdowns found that instrumentation loops were installed in accordance with their designs. Instrumentation loops designed and installed in accordance with the TU Electric CAP program will perform their intended safety function.

6. Plant Tours (37051, 37055, 48053, 49063, 50073)

The NRC inspectors made frequent tours of Unit 1 and common areas of the facility to observe items such as housekeeping, equipment protection, and in-process work activities. No violations or deviations were identified and no items of significance were observed.

7. Exit Meeting (30703)

An exit meeting was conducted August 1, 1989, with the applicant's representatives identified in paragraph 1 of this report. No written material was provided to the applicant by the inspectors during this reporting period. The applicant did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection. During this meeting, the NRC inspectors summarized the scope and findings of the inspection.