



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

May 31, 1988

Docket Nos. 50-445
and 50-446

APPLICANT: Texas Utilities Electric Company (TU Electric)
FACILITY: Comanche Peak Steam Electric Station (CPSES), Units 1 and 2
SUBJECT: SUMMARY OF AUDIT ON MAY 23-26, 1988 - HVAC AND CONCRETE
ANCHORAGE DESIGN VALIDATION AND TAP ACTIVITIES

On May 23-26, 1988, the NRC staff and its consultants conducted an audit of the TU Electric Corrective Action Program (CAP) design validation for heating, ventilation, and air-conditioning (HVAC) and concrete anchorages at the CPSES site in Glen Rose, Texas. The purposes of the audit were to (1) review the underlying reasons for the establishment of the HVAC design validation effort including the type of technical issues identified by various organizations and the process for their resolution, (2) to better understand the scope of the TU Electric QA Technical Audit Program (TAP) in general and specifically in the area of HVAC structural design, and (3) to review the adequacy of the concrete anchorage design criteria used by the CAP contractors (i.e., Ebasco, Impell, and Stone & Webster Engineering Corporation) in satisfying the concrete anchorage design criteria established in the controlling CPSES design basis document DBD-CS-015, "The Qualification of Embedments in Concrete," (Revision 2).

The following is a summary of above audit areas. A list of persons involved in the audit is provided in Enclosure 1 to this summary.

1. HVAC Background

The applicant presented a detailed account of the events leading to the establishment of the HVAC design validation effort under the TU Electric CAP. Bahnson Service Company was the original organization responsible for the design, construction, and inspection of the HVAC systems at CPSES. Corporate Consulting and Development Company Limited (CCL) was Bahnson's sub-contractor for the seismic qualification of the HVAC duct and supports.

The background began with the special inspection conducted by the NRC's Construction Appraisal Team (CAT) in early 1983 which identified problem areas in the welding on HVAC duct supports and continued through to the dismissal of Bahnson in 1987. A copy of the chronology provided to the staff at the audit is included in this summary (Enclosure 2).

2. TU Electric QA Technical Audit Program

The applicant described its QA Technical Audit Program to the staff. The discussion included the purpose of the TAP, its organizational structure, and the scope of its audits. A copy of the slides presented to the staff on the overall TAP description is included in Enclosure 3 to this summary.

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In addition, the staff reviewed the specific audits conducted by TAP for each design area related to HVAC, cable tray hangers, and conduit supports. These audits are summarized in the matrix provided in Enclosure 4 to this summary. The staff reviewed the TAP audit reports (ATP-87-02, ATP-87-31, and ATP-87-52) related specifically the HVAC structural design. Our review of these audit reports will be incorporated into our on-going review of the HVAC design validation activities.

3. HVAC Technical Issues

The staff discussed with the applicant, the sources of the HVAC issues and the process used to identify and correct deficiencies. The HVAC concerns appear to stem primarily from HVAC construction and inspection rather than design although the design/construction interface was also found to be a weak area. An internal audit was conducted by Ebasco of the CCL seismic qualification and analysis of the HVAC duct supports in March-April 1986 [Memorandum from E. Odar (Ebasco) to R. C. Iotti (Ebasco) dated May 27, 1986 (File Ref. 2-CP/C-409)]. Ebasco found the "design calculations were generally complete and conservative and in accordance with general industry practice and state of the art." Long trapezes were identified as a potential concern as well as longitudinal supports which were assumed in design to carry axial loads. However, overall Ebasco found that CCL was very knowledgeable of the CYGNA issues raised in the cable tray hanger design review as they pertain to the design of HVAC duct supports and of the S0910 drawing used for design.

The HVAC construction, inspection, and interface concerns appear to have been raised through various reviews including (1) the CPRT Program Plan's Quality of Construction (QOC) review performed under ISAP VII.c 2) internal audits of Bahnson by the former TUGCO organization, and (3) the NRC's inspections at CPSES. The HVAC problem areas were found to be documented in TU Electric Corrective Action Reports (and Significant Deficiency Analysis Reports) and transmitted to the responsible organizations for proper disposition.

The staff reviewed the process specifically for resolving the QOC findings identified in ISAP VII.c Appendix 31, "HVAC Duct Supports," which resulted in an unclassified trend by the CPRT for the entire construction work category. The six QOC recommendations were found to be documented in CAR 111 (Revision 2) dated April 1, 1987 and CAR 87-014 (Revision 1) dated April 8, 1987. CAR 111 which included five QOC recommendations (S-7) was transmitted to the CAP workscope for HVAC (Ebasco) and CAR 87-014 which included the QOC recommendation (S-10) for a test program for Richmond inserts with less than full thread engagement was transmitted to the CAP workscope for civil/structural (Stone & Webster Engineering Corporation). The Richmond insert test program has been completed (SWEC Test Report Nos. 6 and 7) and the final test reports will be issued in the near future. The staff requested a copy of the SWEC test reports (Nos. 6 and 7) when the final reports are completed.

4. Concrete Anchorages

The applicant presented to the staff, its program for qualifying attachments to concrete. The types of attachments include Hilti bolts, Richmond inserts, embedded plates, grouted/cast-in-place bolts, and through bolts. The governing design documents are the SS-30 specification and the design basis document DBD-CS-015, "The Qualification of Embedments in Concrete."

The latest revision to SS-30 is Revision 3. Several CAP workscopes including piping, cable tray hangers, conduit supports, and HVAC duct supports have been qualified to SS-30 Revision 2 to date. These workscopes will be qualified to SS-30 (Revision 3) as a part of the Post-Construction Hardware Validation Program (PCHVP).

The applicant discussed PCHVP results to date which potentially impact anchor spacing and concrete free edge distance criteria revised in SS-30 (Revision 3). Based on a limited survey, the results appear to indicate that the interaction ratios are low and that revised spacing and free edge distance criteria will not have a significant impact on the current designs and modifications. However, the staff requested to be kept apprised of the impact of these SS-30 (Revision 3) changes on the current designs. The slides presented to the staff are provided in Enclosure 5 to this summary.

As a part of this audit, the staff reviewed the design criteria for concrete anchorages used by the various CAP contractors (i.e. Ebasco, Impell, and SWEC) for cable tray hanger, conduits support, piping, and HVAC design. The staff reviewed the design validation guidelines for conformance to the design basis document DBD-CS-015. Except for the concern identified above regarding the final reconciliation of anchorage spacing and concrete free edge distance, the staff found in the implementation of design validation, that the CAP contractors are using design guidelines in accordance with (or more conservative than) the design criteria specified in DBD-CS-015.

There were no open or unresolved items identified. A total of 80 hours was involved in this audit.

David Terao

David Terao, Project Manager
Comanche Peak Project Division
Office of Special Projects

Enclosures:

1. List of Persons Involved in Audit
2. Chronology of HVAC Problems
3. TAP Presentation
4. TAP Audit Matrices
5. Concrete Anchorage Presentation

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(original signed by)

David Terao, Project Manager
Comanche Peak Project Division
Office of Special Projects

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