

APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Inspection Report: 50-445/93-42  
50-446/93-42

Licenses: NPF-87  
NPF-89

Licensee: TU Electric  
Skyway Tower  
400 North Olive Street, L.B. 81  
Dallas, Texas

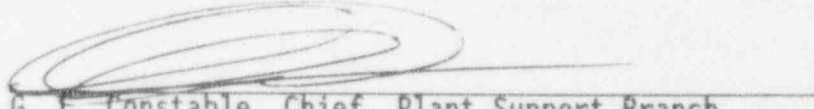
Facility Name: Comanche Peak Steam Electric Station (CPSES), Units 1 and 2

Inspection At: CPSES, Glen Rose, Texas

Inspection Conducted: November 2-5, 23-24, 1993 and January 26-28, 1994

Inspector: M. E. Murphy, Reactor Inspector, Plant Support Branch  
Division of Reactor Safety

Approved:

  
G. E. Constable, Chief, Plant Support Branch  
Division of Reactor Safety

2/14/94  
Date

Inspection Summary

Areas Inspected (Unit 1): Routine, announced inspection of Thermo-Lag upgrade work on Unit 1.

Areas Inspected (Unit 2): No inspection of Unit 2 was performed.

Results (Unit 1):

- The licensee had established and implemented a well integrated team approach to the Unit 1 Thermo-Lag upgrade program with thorough and comprehensive craft personnel training (Sections 1.2 and 1.3).
- The pre-work walkdowns and planning appeared to be very effective, providing identification of potential access and interference problems for early disposition and resolution (Section 1.4).
- Documentation, disposition, and resolution of identified problems were appropriate and appeared complete (Section 1.4).

- The licensee appeared to be complying with the approved installation specifications developed from both the original installation techniques and the upgrade techniques identified during the licensee sponsored fire tests for both Units 1 and 2 (Section 1.4).

Results (Unit 2): Not applicable.

Summary of Inspection Findings:

- None

Attachment:

- Attachment - Persons Contacted and Exit Meeting

## DETAILS

### **1 THERMO-LAG 330-1 FIRE BARRIER UPGRADE ON UNIT 1 (64100)**

This inspection was conducted to compare the licensee's installation techniques with the tested configurations for the Unit 1 upgrade of the Thermo-Lag 330-1 fire barriers. The licensee uses Thermo-Lag as a one hour barrier for cable raceways. The upgrade involved approximately 5500 linear feet of raceway barriers in Unit 1. The total effort was expected to exceed 30,000 hour of work. The inspection included verification of the installation specifications and assessment of the training, planning, and quality control employed during the Unit 1 upgrade.

#### 1.1 Background

The licensee took the lead in resolving industry Thermo-Lag issues in order to support a NRC decision to issue an operating license for Comanche Peak Unit 2. As a result of licensee sponsored fire tests at an independent testing facility, the licensee was able to complete upgrades on installed configurations and initial configuration installations in Unit 2, prior to the issuance of the operating license. This allowed the commencement of operations of Unit 2 without any required fire watches to monitor Thermo-Lag installations in Unit 2.

Since Unit 1 was in operation before the discovery of the Thermo-Lag problems, the licensee had complied with the requirements of NRC Bulletin 92-01, Supplement 1, "Failure Of Thermo-Lag 330 Fire Barrier System To Perform Its Specified Fire Endurance Function," and had in place the required fire watches as a compensatory measure. The licensee, in continuation of the program to resolve any questionable configurations installed in Unit 1, conducted fire tests of five test schemes in August 1993. The results of two of these tests were documented in NRC Inspection Report 50-445/93-34; 50-446/93-34. Subsequently, the licensee met with NRC representatives on September 20, 1993, to discuss the results of all the Unit 1 upgrade tests. At this meeting, the licensee also reviewed the application of the Unit 1 and 2 tested configurations to the Unit 1 upgrades. The licensee acknowledged that the planned work schedule would result in "at risk" installations, since the NRC had not completed a review of the test results. Installation of the Unit 1 upgrades commenced during the week of September 4, 1993.

#### 1.2 Organization and Planning

Project management, overview and approval, as well as quality control inspection and surveillance, were provided by the licensee. Planning, work document development, training, field engineering and installation work was contracted to Brown and Root Industrial Services (BRIS). Since Brown and Root did the original Thermo-Lag installation on Unit 1, this provided good depth of experience for the upgrade work.

The licensee had established an overall plan to accomplish the Unit 1 upgrade work in three phases: pre-outage, outage, and post outage. The grouping of areas to be included in each phase was based on minimizing conflicts with operations and maintenance during outage preparations, the actual outage and radiological considerations. Pre-planning consisted of walkdowns of each area to identify the commodities to be upgraded, potential interferences, existing commodity conditions and other support requirements such as scaffolding. These walkdowns were apparently effective, providing good lead time for engineering evaluations and dispositions for identified problems. Emergent work was minimized and, for the most part, limited to conditions identified during opening and breakdown of existing installations where required. The engineering backlog was very low throughout the inspection period, with no apparent impact on scheduled field work.

### 1.3 Training

The inspector reviewed training material for the Unit 1 Thermo-Lag upgrade. This material was contained in BRIS lesson plan 3009, "Thermo-Lag," Revision 11, dated November 3, 1993. The lesson plan was found to be very extensive, detailed, and effectively covered all the basic upgrade techniques, including treatment of attachments, interferences, air drops, conduit radial bends and other unique configurations. Feedback was provided to training on installation problems in the field as a means of measuring the effectiveness of the training provided. An interview with the training coordinator for BRIS confirmed, through discussion of examples of the feedback received, that provisions for field problem disposition feedback were in place and effective. At the beginning of this inspection, in November 1993, the licensee had 14 active installers, trained and qualified for the upgrade work, with a planned increase of an additional 33 people to be trained and involved in field work by December 6, 1993. At the conclusion of this inspection in January 1994, the goal had been met. Interviews with selected personnel and field observations indicated that the training was thorough and comprehensive and the transition to full staffing was accomplished without any apparent problems.

During a field observation early in the inspection, the inspector noted in a work package review, reference to specification CPES-M-2032, "Procurement and Installation of Fire Barrier and Fireproofing Materials." This document was issued for Unit 2 Thermo-Lag work. The Training Lesson Plan 3009 references only Specification 2323-MS-38H, "Cable and Raceway Fire Barrier Materials and Structural Steel Fireproofing," issued for Units 1 and 2 Thermo-Lag work. This apparent inconsistency was discussed with the licensee. The inspector was informed that the intent was to incorporate CPES-M-2032 into 2323-MS-38H and have only one Thermo-Lag installation specification document. However, some work packages were issued referencing the Unit 2 specification because the revised 2323-MS-38H was not issued. The inspector reviewed selected areas of both specifications and confirmed that use of CPES-M-2032 was not inconsistent since several of the Unit 1 configuration upgrades were based on the Unit 2 qualification tests and upgrade techniques.

#### 1.4 Work Observations

At the start of this inspection, the licensee had completed the pre-outage work and was approximately 30% complete with the scheduled outage work. The inspector toured one of the completed pre-outage rooms, Room 63, to observe the upgrade installation which involved Cable Tray T13GSCE14. What could be seen of the completed work presented the same appearance as the tested configuration; that is, stress skin application, stitching, and banding appeared to meet the upgrade criteria of Specification 2323-MS-38H, "Cable And Raceway Fire Barrier Materials And Structural Steel Fireproofing." Because of the limited number of qualified installers, the only outage work in progress was limited to Room 113, where a conduit upgrade was being installed. This work also involved junction boxes, attachments and interferences. The work package, WO 1-93-054509, required the use of a modified upgrade, and the actual installation was being accomplished in accordance with the acceptance criteria. The work was under essentially constant licensee quality control surveillance.

The inspector also toured several rooms scheduled for upgrade work during the post outage period to observe conditions under which the planned work would be accomplished. These rooms were 115A, 180, 174, and 179. One area of concern to the licensee was the technique for accomplishing the upgrade of a bare cable tray containing fire barrier wrapped cables in the overhead of Room 180. This upgrade required the addition of a third layer of wrap, and there were several places where access was very difficult and potential interferences could cause space problems.

At the conclusion of this inspection, the licensee had completed all planned outage work and was approximately 10% complete with the scheduled post outage work. An acceptable technique had been developed by the licensee for the upgrade of the bare cable tray in Room 180 and the work was underway. The technique involved disconnecting cables to apply the fire barrier wrapping, then the cables were regerminated. The licensee was continuing the close surveillance of the upgrade work by quality control personnel. Review of in-process work packages by the inspector confirmed this continued attention to installation detail and conformance to the installation specification.

The inspector noted that the pre-work walkdowns and in-process surveillance coverage had resulted in what appeared to be a large number of deficiencies with the installed fire barriers. Based on obvious external damage, such as gouges, and water damage etc., it was the inspector's opinion that many of these deficiencies should have been identified during the normal surveillance inspection of fire barrier conditions required by the licensee's fire protection program. The inspector reviewed completed data packages from the last completed inspection under FIR-311, "Fire Rated Assembly Visual Inspection," Revision 1, dated April 12, 1993. Comparing the results of this surveillance activity with the results of the pre-work walkdowns and in-process problem identification showed that the FIR-311 inspections had identified similar deficiencies. The acceptance criteria provided in FIR-311 covered a broad spectrum of unsatisfactory conditions, such as flaking,

peeling, shrinking, gouging, charring, cracks, water damage and deformation. It was noted by the inspector that many of the items identified during the walkdowns and in-process inspections were the result of disassembly and would not have been apparent from only a visual inspection.

A good example of the type of deficiencies being found was documented on a One Form, the process used by the licensee to report problems and develop resolutions written for problems identified in Room 115A. This One Form identified several deficiencies in Room 115A, one of which was "dry joints" on conduit overlays that were installed at pedestal hangars. A "dry joint" would indicate the lack of buttering during the initial installation process, a practice that was considered an essential part of providing a sound fire barrier. The condition was identified as a result of rework under DM 92-077, and was considered a concern because the original installation overlays, when removed, did not appear to require much effort to break free and did not appear to have the normal residual material of a buttered surface.

The licensee's investigation and disposition of the condition stated that, "Upon critical examination of the conduit mating surfaces, however, there were clear indications on the surface of the exposed conduit sections and on the one intact overlay to verify that the joints had been buttered per specification 2323-MS-38H prior to assembly." The ease of removal was probably due to "...the formation of a skim coat on the surface of the trowel grade material prior to the joints' initial assembly." However, "Engineering investigation reveals that the joints did require tools and leverage to separate them. Therefore, adhesion between mating surfaces did occur, even though it was not as much as other joints."

During the inspection conducted November 2-5 and 23-24, 1993, the inspector interviewed several people involved in the engineering, quality control inspection, and installation of the Thermo-Lag upgrades for Unit 1. These interviews confirmed the licensee's conclusions for this specific problem and determined that there were no widespread occurrences of "dry joint" identification. The pre-upgrade walkdowns and subsequent rework have identified a variety of non-conforming conditions that are the result of original installation, aging, and inadvertent damage from work in the areas. A review of the One Forms issued for the identified problems with the Unit 1 Thermo-Lag upgrade work did not reveal any widespread "dry joint" problem. One or two instances of "dry joint" were identified in other areas; however, after reviewing the disposition and observing the field conditions, it was the inspectors opinion that they could be considered isolated cases of installation error due to access or personnel technique. The licensee was apparently documenting and dispositioning all problems identified with the original Thermo-Lag installation in an appropriate and complete manner.

The inspector noted an apparent discrepancy between the deficiencies documented in the One Forms and problems requiring resolution listed in the licensee's weekly status report for the Unit 1 Thermo-Lag upgrade work. There were problems listed in the weekly status report that did not appear on a One Form, such as the cracking of the final overlay of the trowel grade Thermo-Lag

material. The licensee's position was that many of these items did not meet the criteria for nonconformances, or they were already included in a previous report of a problem of a similar nature.

After reviewing the available information and interviews with both the installation crafts and quality control personnel, the inspector agreed with the licensee's assessment. For the specific problem with the trowel grade material, the licensee had determined that the condition did not meet the criteria for a nonconforming condition and that it was technically acceptable. The condition evidently resulted from the use of one specific batch of the trowel grade material. This batch of material was returned to the vendor for analysis, and it was determined that it met the vendors specifications. The vendor recommended that a slight change in the mix ratio, but within the bounds of the specification range, could prevent the problem. The recommendation was implemented and the problem had not recurred.

### 1.5 Conclusions

The licensee had established and implemented a well-integrated team approach to the Unit 1 Thermo-Lag upgrade program. Craft training was thorough and comprehensive. The pre-work walkdowns and planning appeared to be very effective, providing identification of potential access and interference problems for early disposition and resolution. Documentation, disposition, and resolution of identified problems were appropriate and appeared complete. The licensee appears to be complying with the approved installation specifications developed from both the original installation techniques and the upgrade techniques identified during the licensee sponsored fire tests for both Units 1 and 2.

## ATTACHMENT

### 1 PERSONS CONTACTED

#### TU ELECTRIC

C. Beckett, Engineering  
O. Bhatt, Regulatory Affairs  
B. Bhujang, Plant Engineering Manager  
B. Brown, Operations Fire Protection Coordinator  
D. Buschbaum, Regulatory Compliance  
W. Guldmond, Systems Engineering Manager  
T. Hope, Regulatory Compliance Manager  
J. Kelley, Vice President, Engineering/Support  
B. Lancaster, Plant Support Manager  
F. Madden, Mechanical Engineering Manager  
D. McAfee, Quality Assurance Manager  
J. Muffett, Station Engineering Manager  
G. Stein, Mechanical Maintenance  
C. Terry, Vice President, Nuclear Operations  
R. Wakeman, Fire Protection Supervisor

The personnel listed above attended the exit meeting. In addition to the personnel listed above, the inspector contacted other personnel during this inspection period.

### 2 EXIT MEETING

An exit meeting was conducted of January 28, 1994. During this meeting, the inspector reviewed the scope and findings of the report. The licensee did not express a position on the inspection findings documented in this report. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspector.