January 6, 1993

Docket Nos. 50-445
and 50-446

LICENSEE: Texas Utilities Electric Company (TU Electric)

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

SUBJECT: SUMMARY OF MEETING ON CPSES FIRE PROTECTION ISSUES

A meeting was held on December 17, 1992 to review the findings from the fire protection inspection (conducted at CPSES the week of November 16, 1992) and to discuss related fire protection issues (e.g., Thermo-lag ampacity, combustibility, etc.). Six unresolved items and six inspector follow-up items were discussed with TU Electric personnel at the inspection exit meeting on November 20, 1992. All of these items were discussed again at the meeting for the NRR staff to assess potential impacts for the Unit 2 licensing process.

The primary issue discussed was potential fire-induced short circuiting of motor-operated valve circuitry initiated by a control room fire. (This issue was the subject of NRC Information Notice 92-18, "Potential for Loss of Remote Shutdown Capability During a Control Room Fire", dated February 28, 1992). Although TU Electric considers this scenario to have an extremely low probability, they committed at the meeting to implement design changes in the control circuits of the affected motor-operated valves (as required) prior to startup from the first refueling outage for Unit 2 and the third refueling outage for Unit 1. This commitment was documented in a letter from TU Electric dated December 23, 1992.

Thermo-lag testing and raceway support qualification issues were discussed in general. TU Electric committed to update their engineering report on Thermo-lag by December 24, 1992. (Note: This update was received by letter of December 23, 1992 from TU Electric). The staff is continuing their review of the TU Electric test results and engineering documents and will address Thermo-lag issues in a future safety evaluation.

Original Signed By

Brian E. Holian, Senior Project Manager
Project Directorate IV-2
Division of Reactor Projects III/IV/V
Office of Nuclear Reactor Regulation

Enclosures:
1. Attendance List
2. Meeting Handouts

cc w/enclosures:
See next page

DISTRIBUTION:

Docket File	TBergman
NRC PDR	OGC
Local PDR	EJordan
PDIV-2 RF	ACRS (10)
PDIV-2 PF	LYandell, RGN-IV
JPartlow	NRC Participants
JRoe	EPeyton
MVirgilio	TMurley/FMiraglia
SShankman	RArchitzel

OFFICE	PDIV-2/LA	PDIV-2/PM	SPLB	PDIV-2/D	
NAME	EPeyton	BHolian;nb	RArchitzel	SBlack	
DATE	1/4/93	1/4/93	1/4/93	1/04/93	/ /

Document Name: MTG.Sum; c:\wp\cp1&2

cc w/enclosures:
Senior Resident Inspector
U.S. Nuclear Regulatory Commission
P. O. Box 1029
Granbury, Texas 76048

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76011

Mrs. Juanita Ellis, President
Citizens Association for Sound Energy
1426 South Polk
Dallas, Texas 75224

Owen L. Thero, President
Quality Technology Company
Lakeview Mobile Home Park, Lot 35
4793 East Loop 820 South
Fort Worth, Texas 76119

Mr. Roger D. Walker, Manager
Regulatory Affairs for Nuclear
Engineering Organization
Texas Utilities Electric Company
400 North Olive Street, L.B. 81
Dallas, Texas 752^1

Texas Utilities Electric Company
c/o Bethesda Licensing
3 Metro Center, Suite 610
Bethesda, Maryland 20814

William A. Burchette, Esq.
Counsel for Tex-La Electric
Cooperative of Texas
Jorden, Schulte, & Burchette
1025 Thomas Jefferson Street, N.W.
Washington, D.C. 20007

GDS Associates, Inc.
Suite 720
1850 Parkway Place
Marietta, Georgia 30067-8237

Jack R. Newman, Esq.
Newman & Holtzinger
1615 L Street, N.W.
Suite 1000
Washington, D. C. 20036

Chief, Texas Bureau of Radiation Control
Texas Department of Health
1100 West 49th Street
Austin, Texas 78756

Honorable Dale McPherson
County Judge
P. O. Box 851
Glen Rose, Texas 76043

Mr. William J. Cahill, Jr.
Group Vice President
TU Electric
400 North Olive Street, L.B. 81
Dallas, Texas 75201

Enclosure 1

MEETING ATTENDEES

NAMES	ORGANIZATION
Brian Holian	NRC
Steven West	NRC
Ralph Architzel	NRC
Conrad McCracken	NRC
Patrick Madden	NRC
Ronaldo V. Jenkins	NRC
Paul Gill	NRC
Suzanne Black	NRC
Donna Skay	NRC
Roger Walker	TU Electric
Charles L. Terry	TU Electric
Richard L. Dible	TU Electric
K.N. Khanna	TU Electric

Enclosure 2

TU ELECTRIC
FIRE PROTECTION INSPECTION
STATUS MEETING
DECEMBER 17, 1992

NRC MEETING

FIRE PROTECTION INSPECTION

- UNRESOLVED ITEMS
- INSPECTOR FOLLOWUP ITEMS

THERMO-LAG

- TESTING
  - UNIT 2 TESTS
  - UNIT 1 TESTS
  - USE OF UNIT 1 TESTS IN UNIT 2
  - AMPACITY
  - COMBUSTIBILITY
- RACEWAY SUPPORT QUALIFICATION
  - WEIGHT
  - II OVER I

NRC FIRE PROTECTION INSPECTION (446/92-49)
NOVEMBER 16-20, 1992

STATUS OF UNRESOLVED ITEMS

ITEMS	STATUS
• SPRINKLER HEAD TEMPERATURE RATINGS 212°F VS 165°F	• DISCUSSED WITH STAFF DURING 12/15/92 TELECONFERENCE. POSITION PAPER DESCRIBING BASIS FOR 212°F TEMPERATURE RATINGS HAS BEEN DEVELOPED.
• SUPPRESSION SYSTEM "WATER CURTAIN" FOR SEPARATION OF REDUNDANT SAFETY CHILLER COMPONENTS	• DISCUSSED WITH STAFF DURING 12/15/92 TELECONFERENCE. ADDITIONAL INFORMATION TO BE PROVIDED TO STAFF. FOLLOWUP INSPECTION SHOULD RESOLVE CONCERNS.
• TURBINE TRIP DELAY DUE TO AUTO TRIP FAILURE	• MANUAL ACTION FOR TURBINE TRIP FROM CONTROL ROOM TO BE INCORPORATED INTO ABN 803 PROCEDURES BY 1/11/93

UNRESOLVED ISSUED (CONT.)

• EMERGENCY LIGHTING BATTERY PACK DEGRADATION IN HIGH TEMP PLANT AREAS (RCB, MS PIPING AREAS)	• REPLACE BATTERY PACKS IN CONTAINMENT EVERY REFUELING OUTAGE AND OTHER BATTERY PACKS EVERY 3 YEARS • VENDOR SAMPLE 10% OF BATTERY PACKS • FUNCTIONAL CHECK EVERY 6 MONTHS • PRESENTLY EVALUATING EFFECTS OF TEMPERATURE ON BATTERY LIFE
• TEST/MAINTENANCE PROGRAM FOR THOSE SAFE SHUTDOWN CIRCUIT BREAKERS, RELAYS, MCCB'S NOT COVERED BY TECH SPECS	• P.M.'S PARTS IN PLACE FOR ALL 6.9KV AND 480V BREAKERS. PACKAGE WILL BE AVAILABLE FOR FOLLOWUP INSPECTION (1/11/93)
• ASSOCIATED CIRCUIT CABLE FAILURES FROM HIGH IMPEDANCE FAULTS	• CALCULATION 2-EE-53 HAS BEEN REVISED TO INCLUDE MORE CONSERVATIVE CIRCUIT SAMPLE SIZE. CIRCUIT BREAKER MODS TO BE COMPLETELY INSTALLED PRIOR TO FOLLOWUP INSPECTION (1/11/93)
• TU ELECTRIC POSITION ON IN 92-18, CONTROL ROOM FIRE INDUCING MOV CIRCUIT HOT SHORTS	• SEE SLIDES

CONCERNS RAISED VIA NRC INFORMATION NOTICE 92-18

- THERMAL OVERLOAD RELAY PROTECTION IS BYPASSED IN MOTOR OPERATED VALVE CONTROL CIRCUITS AT SOME PLANTS.

- HOT SHORTS IN THESE CIRCUITS COULD CAUSE MOTOR FAILURE DISABLING SUBSEQUENT REMOTE OPERATION OF THE MOV.

- HOT SHORTS IN THESE CIRCUITS COULD CAUSE MECHANICAL DAMAGE TO THE VALVE COMPONENTS RENDERING SUBSEQUENT MANUAL REPOSITIONING IMPOSSIBLE.

INFORMATION NOTICE 92-18
MOV HOT SHORT

- NOT A SIGNIFICANT SAFETY CONCERN BASED ON EXTREMELY LOW PROBABILITY OF A FIRE OF THE MAGNITUDE NECESSARY TO CAUSE SEVERE CABLE DAMAGE THAT WOULD EXPOSE SPECIFIC CONDUCTORS TO HOT SHORT CONDITIONS.

MODIFICATION OUTLINE:

- HARDWARE MODIFICATIONS
- SOFTWARE MODIFICATIONS

IN 92-18 MODIFICATIONS

HARDWARE MODIFICATIONS (FIGURES 1 AND 2)

- DETERMINE WHICH SAFE SHUTDOWN MOV'S REQUIRE MODIFICATION FROM REVIEW OF FIRE SAFE SHUTDOWN ANALYSIS (FSSA).

- LOCATE TORQUE/LIMIT SWITCH CONTACTS BETWEEN THE CONTROL ROOM/CABLE SPREAD ROOM/HOT SHUTDOWN PANEL (IF APPLICABLE) AND THE ASSOCIATED MOTOR CONTROL CENTER. TYPICALLY SPARE CONDUCTORS OF AN EXISTING CABLE ARE AVAILABLE.

- DETERMINE CABLES WHICH REQUIRE PROTECTION IN SPECIFIC FIRE AREAS BY COMPARING NEW CIRCUIT CONFIGURATION TO EXISTING CIRCUIT CONFIGURATION BY FIRE AREA.

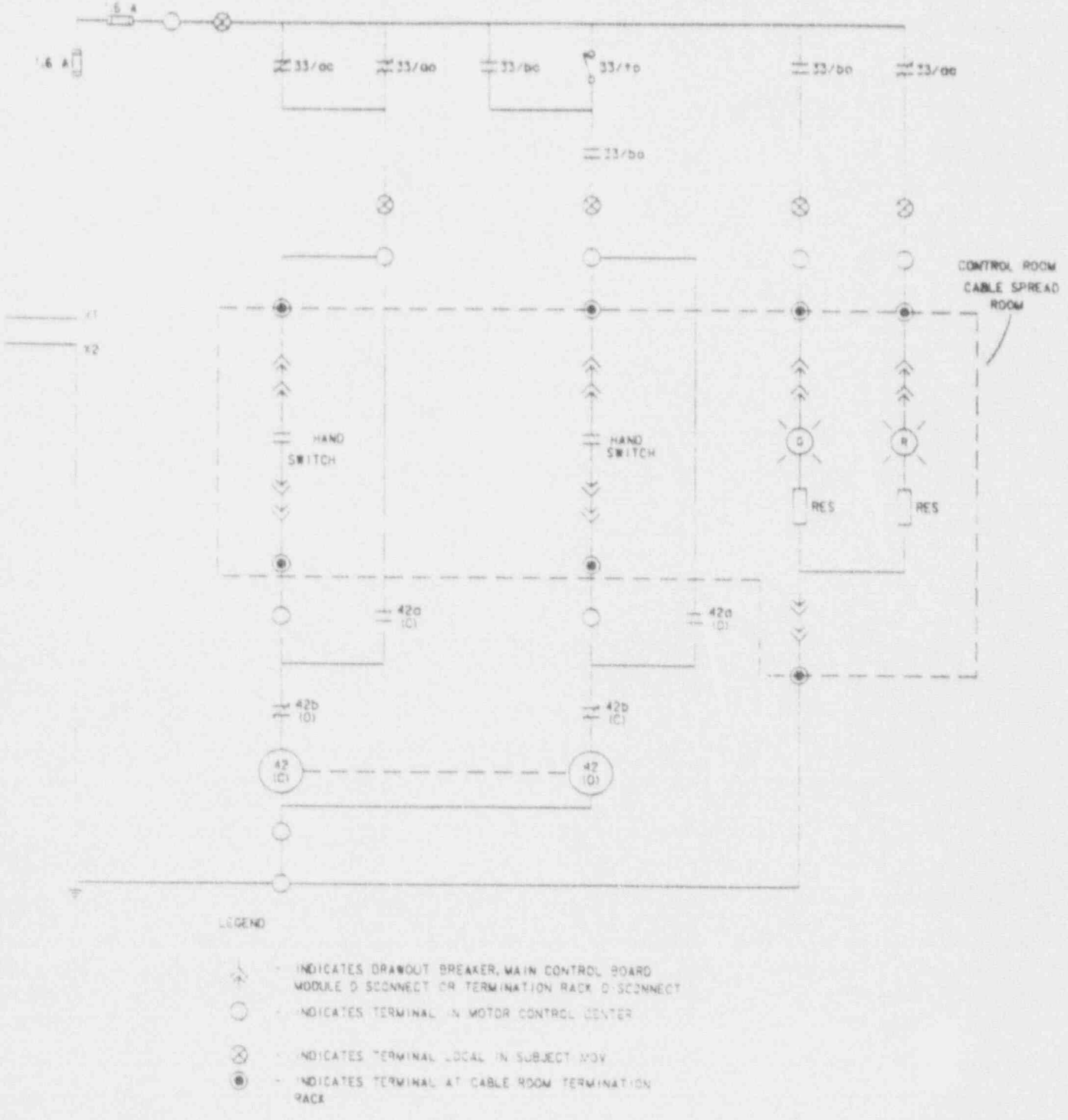
- ADD THERMOLAG/RADIANT ENERGY SHIELD AS REQUIRED TO SATISFY FSSA REQUIREMENTS.

IN 92-18 MODIFICATIONS

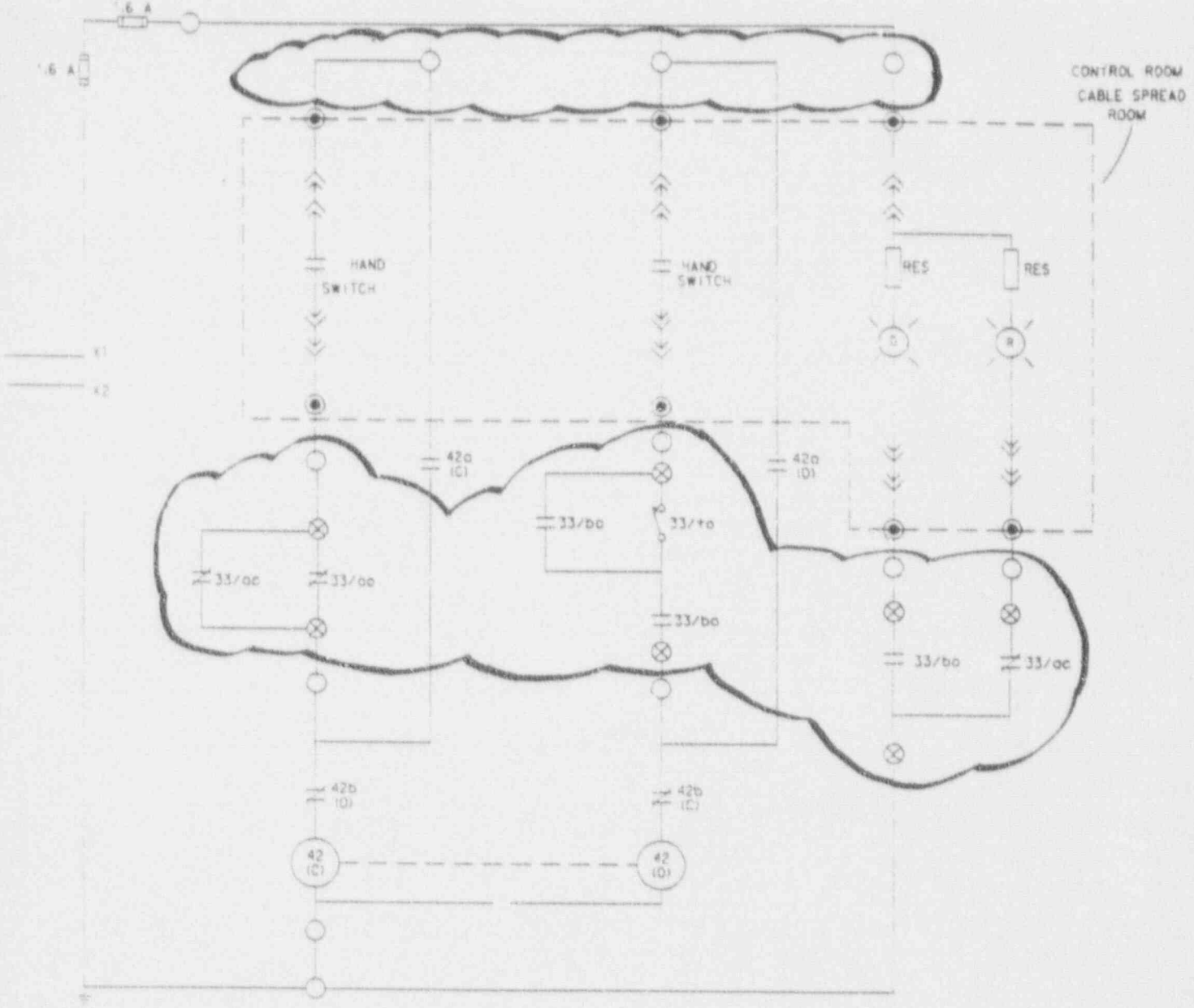
SOFTWARE MODIFICATIONS

- UPDATE FSSA CALCULATION
- UPDATE SEPARATION CALCULATION
- MODIFY ABNORMAL OPERATING PROCEDURES (ABN)
- PREPARE 50.59 SAFETY EVALUATION REPORT
- UPDATE FIRE PROTECTION REPORT
- UPDATE FSAR.

EXISTING MOV CONTROL CIRCUIT (TYPICAL)



MOV CIRCUIT MODIFICATION (TYPICAL)



LEGEND

- INDICATES DRAWOUT BREAKER, MAIN CONTROL BOARD MODULE DISCONNECT OR TERMINATION RACK DISCONNECT
- INDICATES TERMINAL IN MOTOR CONTROL CENTER
- INDICATES TERMINAL LOCAL TO SUBJECT MOV
- INDICATES TERMINAL AT CABLE ROOM TERMINATION RACK

NRC FIRE PROTECTION INSPECTION (446/92-46)
NOVEMBER 16-20, 1992

STATUS OF FOLLOWUP ITEMS

ISSUE	STATUS
• VERIFICATION OF SPRINKLER SYSTEM AND FIRE DETECTION SYTSEM COVERAGE	• POST CONSTRUCTION WALKDOWNS TO BE COMPLETED WITH ANY DISCREPANCIES DISPOSITIONED PRIOR TO FOLLOWUP INSPECTION (1/11/93)
• DISCREPANCIES IN ABN PROCEDURE FOR CONTROL ROOM FIRE SCENARIO	• PROCEDURE TO BE REVISED TO RESOLVE DISCREPANCIES PRIOR TO FOLLOWUP INSPECTION (1/11/93)
• EMERGENCY COMMUNICATIONS ADEQUACY	• ADEQUACY OF COMMUNICATIONS CAPABILITY BETWEEN HSP AND AREAS REQUIRING ACTIONS DURING SHUTDOWN TO BE VERIFIED PRIOR TO FOLLOWUP INSPECTION (1/11/93)
• EMERGENCY LIGHTING BLACKOUT TESTING	• ADEQUACY OF ILLUMINATION LEVELS TO BE VERIFIED VIA BLACKOUT SIMULATION TESTING PRIOR TO FOLLOWUP INSPECTION (1/11/93)
• FIRE BRIGADE RESPONSE PROCEDURES FOR THERMO-LAG CONCERNS	• CAUTIONS TO BE INCORPORATED INTO PRE-PLANS AND ADMIN CONTROLS FOR HOSE NOZZLES IN PLACE PRIOR TO FOLLOWUP INSPECTION (1/11/93)

FOLLOWUP ITEMS (CONT.)

- INSTALLATION OF PENETRATION SEALS
- ALL PENETRATION SEALS TO BE INSTALLED PRIOR TO FOLLOWUP INSPECTION (1/11/93)
- PERIODIC ASSESSMENT OF RCP LUBE OIL COLLECTION TANK LEVELS
- REQUIREMENT FOR LEVEL CHECKS TO BE INCORPORATED INTO PREVENTIVE MAINTENANCE PROGRAM FOR EACH RFO BY 12/31/92

TEST PLAN - Rev. 0

AMPACITY DERATING TESTS OF ARTICLES PROTECTED WITH THE THERMO-LAG® FIRE BARRIER SYSTEM

1.0 SCOPE

This test plan describes the methods and guidelines to be utilized for the preparation of test specimens, installation of the THERMO-LAG® (hereafter referred to as "Thermo-Lag") Fire Barrier Systems, performance of ampacity derating tests and all applicable documentation of these tasks and the test results.

2.0 OBJECTIVE

The objective of these tests is to determine the ampacity derating factors for a protective generic fire barrier system for redundant essential cables at TU Electric's Comanche Peak Steam Electric Station. Results of this test program will provide documented evidence of the necessary current derating factors for a wide variety of raceway configurations. These tests shall satisfy the requirements for ampacity derating by testing the cable raceway fire barriers as detailed in the IEEE P848/D11 "Procedure for the Determination of the Ampacity Derating of Fire Protective Cables," Draft 11, dated April 6, 1992, Underwriters Laboratories Subject 1712 "Outline of Investigation for Tests for Ampacity of Insulated Electrical Conductors Installed in Fire Protective Systems," Issue Number 1, July 1984, and, in the absence of other standards for these specific types of tests, standard practice shall be invoked. Variations in this test procedure from the standards referenced will be documented in the final test report.

3.0 REFERENCES

3.1 Documents

3.1.1 IEEE P848/D11, "Procedure for the Determination of the Ampacity Derating of Fire Protective Cables," Draft 11, April 6, 1992.

3.1.2 Underwriters Laboratories Subject 1712 Outline of Investigation for Tests for Ampacity of Insulated Electrical Conductors Installed in Fire Protective Systems, Issue No. 1, July 1984.

3.1.3 Thermal Science, Inc.'s Technical Note 20684, Revision V "THERMO-LAG 330 Fire Barrier System, Installation Procedures Manual, Power Generating Plant Application," including TSI letters of clarification thereto.

3.1.4 Specification CPES-M-2032, Rev. 0, "Procurement and Installation of Fire Barrier and Fireproofing Materials."

3.1.5 M2-1701, "Thermo-Lag Typical Details"

a. Sheet 01, Rev. CP-1
b. Sheet 02, Rev. CP-1
c. Sheet 03, Rev. CP-1
d. Sheet 03A, Rev. CP-1
e. Sheet 03B, Rev. CP-1
f. Sheet 04, Rev. CP-1
g. Sheet 04A, Rev. CP-1
h. Sheet 05, Rev. CP-1
i. Sheet 05A, Rev. CP-1
j. Sheet 06, Rev. CP-1
k. Sheet 07, Rev. CP-1
l. Sheet 08, Rev. CP-1
m. Sheet 09, Rev. CP-1
n. Sheet 10, Rev. CP-1
o. Sheet 11, Rev. CP-1
p. Sheet 12, Rev. CP-1
q. Sheet 13, Rev. CP-1
r. Sheet 14, Rev. CP-1
s. Sheet 15, Rev. CP-1

3.1.6 Construction/Quality Procedure CQP-CV-107, Rev. 0, "Application of Fire Barrier and Fireproofing Materials."

3.1.7 Specification CPES-E-2004, Rev. 1, "Electrical Installation."

3.1.8 Construction/Quality Procedure CQP-EL-222, Rev. 1, "Installation and Fabrication of Conduit Raceway Systems."

4.0 RESPONSIBILITIES

4.1 Texas Utilities Electric (TU Electric) and Associated Contractor Organizations

4.1.1 Establish the criteria, guidelines, drawings (draft quality), recommendations, etc., to govern the installation of the test

items. Supply the test item pieces, including all hardware, electrical cables, conduit, tray systems, etc.

4.1.2 Establish the criteria, guidelines, drawings (final, report-quality if needed), recommendations, etc., to govern the installation of the Thermo-Lag Fire Barrier System Materials to the test articles.

4.1.3 Provide the specific Thermo-Lag installation procedures and work package documentation.

4.1.4 Provide materials representative of existing or future site installations.

4.1.5 Provide the Thermo-Lag Fire Barrier System materials and installation tools and equipment.

4.1.6 Provide scheduling of personnel, equipment and material necessary to perform the installation and QC documentation of the fire barrier system materials utilizing the appropriate installation procedures.

4.1.7 Coordinate all phases of the ampacity test preparation with the testing organization including approval of variations from the standard test methods.

4.1.8 Apply the fire barrier system to the test articles.

4.1.9 Supply QC and construction personnel to witness and document assembly and test article raceway configurations.

4.1.10 Perform as a liaison with the testing organization and provide the testing organization with all applicable TU Electric Documents as identified in Section 4.1.

4.1.11 Provide all applicable quality control documentation for the fire barrier system materials, cables, and installation of the fire barrier system and penetration seal materials to each test article.

4.2 **Omega Point Laboratories, Inc. (Laboratory)**

4.2.1 Prepare the test assemblies and provide all required test instrumentation in accordance with Appendix B Quality Assurance and Quality Control Programs and other applicable procedures.

4.2.2 Provide thermocouple calibration and instrumentation, storage temperature recorder, surface temperature probe and relative humidity instrumentation.

4.2.3 Assemble, install and document the installation of all trays, conduits, cables, etc. to be supplied by TU Electric. Provide computer-generated drawings of tray, conduit and cabling systems which clearly indicate dimensions, thermocouple locations, etc.

4.2.4 Observe and document the installation of the Thermo-Lag Fire Barrier System Materials to the test articles, and attendant instrumentation on each test article.

4.2.5 Conduct the ampacity baseline and derating tests.

4.2.6 Document the test parameters and provide a formal detailed written report of the test program and test results.

4.2.8 Provide VHS video and 35mm photographic coverage of the test project.

4.3 Laboratory Quality Assurance/Quality Control

4.3.1 Verify and document the quality control documentation of the fire barrier system materials used in the test program.

4.3.2 Perform and document inspections of the fire barrier system materials at various points during the installation process.

4.3.3 Verify and document that TU Electric's installation procedures are utilized in the installation of the fire barrier system materials.

4.3.4 Inspect and document the construction and instrumentation of the test articles.

4.3.5 Provide written calibration documentation of all thermocouples, measurement devices and data acquisition systems used in this test program.

5.0 SPECIAL PRECAUTIONS

5.1 Precautions For Installation Of The Fire Barrier System Materials

5.1.1 Observe specific precautions recommended by Thermal Science, Inc. and other's material safety data sheets.

6.0 PREREQUISITES

6.1 General Test Configuration Requirements

The conduits, cables and cable loading used in this test program shall be representative of those configurations used, and shall be specified and designed by TU Electric.

6.2 Traceability Requirements

To insure that the materials used in this test are representative of those in actual use at Comanche Peak Steam Electric Station (CPSES), all aspects of traceability as required by the Laboratory QA Program shall be applied.

The cables used in this test program shall be traceable to the respective cable manufacturer and shall be supplied by TU Electric or the Laboratory with documentation of traceability.

All thermocouples used in this test program shall be traceable to the respective thermocouple manufacturer, with calibration certification.

6.3 Dimensioned Drawings

All test articles shall conform to the rough draft dimensioned drawings provided by TU Electric during assembly of the test articles. Final, dimensioned drawings will be prepared by the Laboratory.

6.4 Test Configuration

6.4.1 Cable Tray Test Article

A single tray article will be tested: that described in the IEEE P848/D11 draft test method.

a. A 24" wide x 4" deep straight section of ladder back cable tray, 12 feet long (Scheme AT-1).

6.4.2 Conduit Test Articles

Five (5) configurations (i.e. "Schemes") of galvanized rigid steel conduit supplied by TU Electric will be tested. All will be 12 feet long and will contain electrical cables as described.

a. A 3/4" diameter conduit, with a single W-026 cable, clad in a 1/2 inch thick layer of Thermo-Lag with a 1/4" overlay (Scheme AC-1).

b. A 2" diameter conduit, with two W-020 cables, clad in a 1/2 inch thick layer of Thermo-Lag with a 1/4" overlay (Scheme AC-2).

c. A 1" diameter conduit, with a single W-026 cable, clad in a 1/2 inch thick layer of Thermo-Lag (Scheme AC-3).

d. A 1-1/2" diameter conduit, with a single W-020 cable, clad in a 1/2 inch thick layer of Thermo-Lag (Scheme AC-4).

e. A 5" diameter conduit, with 10 lengths of W-026 cable, clad in a 1/2 inch thick layer of Thermo-Lag (Scheme AC-5).

6.4.3 Air Drop Test Articles

Eight (8) configurations (i.e. "Schemes") of cable bundle air drops supplied by TU Electric will be tested. Each will consist of a 12 foot long cable bundle as described below.

a. A single W-020 cable clad in three layers of 660-Flex Blanket (Scheme AA-1-1).

b. A single W-020 cable clad in four layers of 660-Flex Blanket (Scheme AA-1-2).

c. A 2" diameter bundle (3 pcs) of W-020 cables clad in three layers of 660-Flex Blanket (Scheme AA-2-1).

d. A 2" diameter bundle (3 pcs) of W-020 cables clad in four layers of 660-Flex Blanket (Scheme AA-2-2).

e. A 2-1/2" diameter bundle (4 pcs) of W-020 cables clad in two layers of 660-Flex Blanket (Scheme AA-3-1).

f. A 2-1/2" diameter bundle (4 pcs) of W-020 cables clad in three layers of 660-Flex Blanket (Scheme AA-3-2).

g. A 6" diameter bundle (31 pcs) of W-020 cables clad in two layers of 660-Flex Blanket (Scheme AA-4-1).

h. A 6" diameter bundle (31 pcs) of W-020 cables clad in three layers of 660-Flex Blanket (Scheme AA-4-2).

6.6 Cable Installation

An itemized listing of cable types and quantities including density fill to be installed in the test articles will be prepared by the Laboratory and included in the final report. Cable location within the test articles shall be documented and included with data to be evaluated by the testing laboratory. All conductors inside each test article will be connected into a single, series electrical circuit.

6.7 Thermocouple Installation

All thermocouples used in this test program shall be provided and installed by the Laboratory, with QC surveillance by Laboratory personnel. The thermocouple wires shall be calibrated (by Lot No.) prior to installation and/or use, and applicable quality control documentation for record purposes generated. All thermocouples will consist of 24 GA, type K, Chromel-Alumel (Special Limits of Error: ±1.1°C) electrically welded thermojunctions. Calibration will consist of manufacturer-supplied (and audited) certifications of calibrations at five temperatures of thermocouples taken from both ends of each purchased lot number.

All thermocouples shall be located on and within each test article in accordance with the IEEE P848/D11 requirements.

6.8 Installation of the Fire Barrier system to the Test Articles

Thermo-Lag Fire Barrier System materials shall be installed by TU Electric in accordance with applicable specifications, design drawings and procedures (Ref. 3.1.5, 3.1.6 and 3.1.7) such that the test articles are representative of CPSES plant installations except those test articles intended to qualify upgraded THERMO-LAG installation configurations. Details of the Thermo-Lag configurations including fasteners, orientation of structural ribs, etc., shall be documented in the final test report.

6.9 Pretest Inspection

6.9.1 Prior to the commencement of the fire endurance test, a thorough check of each test assembly and associated

equipment (including data recording equipment) shall be performed and documented by the testing laboratory.

6.9.2 TU Electric shall inspect the Thermo-Lag Fire Barrier System for surface defects, etc. prior to test.

6.9.3 Written approval of the construction, assembly, installation and instrumentation will be supplied by TU Electric and the Laboratory prior to performance of each test (a sign-off sheet for this purpose will be supplied by the Laboratory).

6.9.4 Ampacity derating testing of assemblies will not commence until Thermo-Lag Fire Barrier Materials attain a moisture meter reading that does not exceed 20% moisture content when using a meter with a scale of 0-100 (with 100 being 20% actual moisture content) such as a Delmhorst Model DP or equivalent.

7.0 PROCEDURE

7.1 Ampacity Baseline Tests

7.1.1. The unprotected test articles shall be energized with 60 cycle AC voltage as specified in IEEE P848/D11 and the baseline current ampacity determined as that which results in a thermal equilibration at 90°C at the hottest location at the center of the test article.

7.1.2 The conditions specified in IEEE P848/D11 for ambient temperature and current/temperature equilibrium will be adhered to.

7.2 Ampacity Derating Tests

7.2.1 The protected test articles shall be energized with 60 cycle AC voltage as specified in IEEE P848/D11 and the baseline current ampacity determined as that which results in a thermal equilibration at 90°C at the hottest location at the center of the test article.

7.2.2 The conditions specified in IEEE P848/D11 for ambient temperature and current/temperature equilibrium will be adhered to.

8.0 DATA SYSTEMS

8.1 During the ampacity test period, all thermocouples will be scanned at one minute intervals or less.

8.2 The data acquisition computer will determine the hottest single point at the center of each assembly and, using Proportional, Integral and Derivative (PID) process control computer routines, will output a voltage signal which will update the position of a motor-driven variable transformer to drive the system to equilibrium at 90°C.

8.3 The data acquisition computer will concurrently measure the current flow through the assembly, by interfacing with a calibrated current loop circuit. When equilibrium has been reached (in accordance with the P848/D11 Draft standard), the system will be de-energized and the test will be complete.

9.0 TEST REPORT

9.1 The Laboratory will submit a report on the results of the test and thermocouple data.

9.2 The Laboratory will assemble the final test report, containing the collected data and required quality control documentation.

9.3 The test report shall be prepared in sufficient detail to summarize the total testing activity. The report shall include as a minimum:

a) Date of the test
b) Location of the test
c) Description of the test equipment and test articles
d) Calibration documentation of all thermocouples
e) Qualification and certification for test personnel
f) Test procedures used
g) Ampacity values determined and accompanying equilibration temperatures.
h) Provide quality control records for:
    - Test article construction
    - Qualification and certification for installation and inspection personnel
    - Identification and installation of fire barrier material
    - Thermocouple locations
    - Cables, size, type, and location
    - Actual tray and conduit fill densities

i) Computer printout and graphic results of the ampacity test
j) All raw data
k) 35mm and VHS video photographic coverage of the test project
l) Provide a chronological log (Event Log) of all activities from receipt of materials through final test report