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December 2, 2009

Mr. Michael T. Lesar
Chief, Rulemaking and Directives Branch (RDB)
Division of Administrative Services
Office of Administration
Mail Stop: TWB-05-B01M
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

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RECEIVED

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RULES AND DIRECTIVES
BRANCH

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION
DOCKET NOS. 50-445 AND 50-446
NUREG-1924, "ELECTRIC RACEWAY FIRE BARRIER SYSTEMS (ERFBS) IN NUCLEAR
POWER PLANTS, DRAFT REPORT FOR COMMENT"

REFERENCE: 1. Federal Register Notice 74 FR 51621 dated October 7, 2009, NUREG-1924, "Electric
Raceway Fire Barrier Systems (ERFBS) in Nuclear Power Plants, Draft Report for
Comment"

Dear Mr. Lesar:

Federal Register Notice 74 FR 51621 dated October 7, 2009, announced the issuance for public comment and availability of Draft NUREG-1924, "Electric Raceway Fire Barrier Systems (ERFBS) in Nuclear Power Plants, Draft Report for Comment."

Luminant Generation Company LLC (Luminant Power) has reviewed the draft document and is providing comments. The attachment provides general comments and specific comments on information related to Comanche Peak Nuclear Power Plant, referred to as Comanche Peak Steam Electric Station (CPSES) in Draft NUREG-1924.

Clarification was provided for Section 4.1, "History of Testing Criteria." Additional information was provided in Section 5.3.1.5, "TVA and TU," to address Thermo-Lag testing performed by TU Electric for CPSES Units 1 and 2.

Section 6 discusses plant specific usage and resolution of ERFBS issues. Additional information was provided for Section 6.12, "Comanche Peak Steam Electric Station (CPSES)," for your consideration. Appendix D discusses supplemental test result summaries. Comments on Section D.1.3, "Texas Utilities (TU) Electric Co. Tests for CPSES", are provided to more accurately address test results. One additional test report that was conducted in February 1999 was added for completeness.

SUNSI Review Complete

E-RIDS = ADM-03

A member of the STARS (Strategic Teaming and Resource Sharing) Alliance

add = G. Taylor
(GJT)

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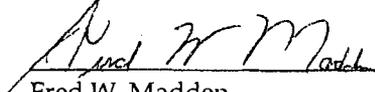
Complete = ADM-013

Luminant Power (TU Electric) recognizes that protection of electrical raceway systems is essential to fire protection safe shutdown capability and Comanche Peak has made significant investment in protecting electrical raceway systems. We believe it is important that the record on the use of electrical raceway fire barrier systems at Comanche Peak be complete and accurate. Luminant Power appreciates your consideration in reviewing and incorporating these comments into NUREG-1924.

Sincerely,

Luminant Generation Company LLC

Rafael Flores

By: 

Fred W. Madden

Director, Oversight & Regulatory Affairs

Attachment- Luminant Power Comments on NUREG-1924

c - E. E. Collins, Region IV
B. K. Singal, NRR
Resident Inspectors, Comanche Peak

ATTACHMENT TO TXX-09142

LUMINANT POWER COMMENTS ON NUREG-1924

Comments on NUREG-1924

ID	Section, Page, etc	Comment
1	Table 1-1, pg. 1-3	Need entry for Promat H and 3M Interam for Nine Mile Point 1 and 2.
2	Table 1-1, pg. 1-3	Add Note 2 to state that reference to 3M Interam includes previous 3M ERFBS materials such as FS-195 and CS-195.
3	Sec. 3, pgs. 3-1, 3-2	Redundant text between last paragraph on pg. 3-1 and 2 nd complete paragraph on pg. 3-2. "The new regulations imposed a minimum set of fire protection program..."
4	Sec. 3, pg. 3-2	Typographical errors in 1 st sentence in 3 rd complete paragraph (addition in lieu of additional) and Footnote 4.
5	Sec. 4.1, pg. 4-1	<p>Please include the following after 1st paragraph:</p> <p>TU Electric conducted a full-scale fire endurance test of the TSI Thermo-Lag 330-1 protective envelop system at Southwest Research Institute in 1981 (Ref. Southwest Research Institute (SWRI) Project No. 03-6491 Final Report dated October 27, 1981, "Fire Qualification Test of a Protective Envelop System"). The purpose of this test was to obtain a 1-hour fire rating for Thermo-Lag in accordance with American Nuclear Insurers (ANI) Bulletin dated July 1979 (Ref. ANI Bulletin No. 5, "ANI / MAERP Standard Fire Endurance Test Method to Qualify a Protective Envelop for Class 1E Electrical Circuits") and ASTM E119-80 Time / Temperature requirements. The results of the test indicated that the protective Thermo-Lag envelop system successfully withstood the fire exposure and hose stream tests without allowing the passage of flames as well as protecting the circuit integrity of the cables within the electrical raceway system. An ASTM E84 test determined that Thermo-Lag had a flame spread rating of 5, fuel contribution rating of 0 and smoke development rating of 15. This was consistent with licensing commitments which require a rating of less than 25 for each of these variables. The SWRI report was submitted to the NRC for evaluation of Thermo-Lag 330-1 as an acceptable fire barrier material for use at CPSES (Ref. TXX-3437, November 15, 1981, "Comanche Peak Steam Electric Station Fire Barrier Material Test Report"). In a letter dated December 1, 1981, the NRC replied that they "have evaluated the fire test report and concluded that it demonstrated that the TSI Thermo-Lag material / system exhibits characteristics equivalent or better than other approved materials, and therefore can provide an acceptable fire barrier for cable trays and cables." The NRC concluded that "based on our evaluation, we conclude that the use of the TSI material / system will meet the requirements of Appendix R to 10 CFR Part 50 and is therefore acceptable." (Ref. letter to R.J. Gary (Texas Utilities) from R.L. Tedesco (NRC), December 1, 1981, "Comanche Peak Tray Fire Barrier Evaluation")</p> <p>The above information was most recently provided to the NRC via TXX-97047, February 28, 1997.</p>

ID	Section, Page, etc	Comment
6	Sec. 4.1, pg. 4-1	<p>Add the following after the text from Comment 5: As with the TSI / Thermo-Lag ERFBS, the NRC staff approved the use of the HEMYC wrap system for Waterford 3 based on a series of fire tests originally performed for B&B Insulation, Inc. in 1982. Specifically, NUREG-0787, Supplement 5 (June 1983) states, "In SSER No. 3, the staff reported that one of the redundant trains needed for safe shutdown would be kept free of fire damage by providing separation, fire protection (fire detection, suppression, fire barriers), repairs for cold shutdown equipment, and/or an alternate shutdown capability. By letter dated February 14, 1983 (Ref. letter to T. M. Novak (NRC) from L.V. Maurin (LP&L), February 14, 1983) the applicant submitted results of tests conducted by an independent testing laboratory on an insulating blanket and wrap that will be used to protect shutdown-related cable trays and conduits. This material, in conjunction with area-wide smoke detection and fire suppression systems, is in compliance with Section III.G.2 of Appendix R to 10CFR50. The blanket and wrap were tested in configurations representative of what is to be found in the plant, with unprotected tray supports, using cables representative of those used in the plant. As a result of the tests, the material has been demonstrated to protect cable from visible damage and to maintain circuit integrity during an ASTM E119 1-hour fire exposure. The material is not adversely affected by a water hose stream and is capable of limiting temperature rise on the unexposed side of trays and conduits to not more than 250°F above ambient, which is well below the temperature at which similar IEEE-qualified cable began to fail in tests conducted independently for NRC at Underwriter's Laboratories (report to be published). The staff concludes that this protection, coupled with the other automatic and manual fire protection available, will provide reasonable assurance that one train of safe shutdown cable remains free of fire damage and, therefore, is acceptable."</p>
7	Sec. 4.1, pg. 4-1	<p>Based on the historical record outlined by Comments 5 and 6, revise statement in 1st paragraph regarding "was not found acceptable by NRC." Similarly, revise last sentence in 5th paragraph to read "and is no longer considered to be an acceptable method to NRC staff for qualifying ERFBS."</p>
8	Sec. 4.1, pg. 4-2	<p>1st complete paragraph, after 1st sentence (ending with "acceptance criteria"), add the following: Therefore, TU Electric proposed an alternate, site-specific fire test methodology and acceptance criteria that did not rely on the ANI approach. In October 1992, NRC concurred with the alternative site-specific fire test methods that TU Electric would utilize for conduct of future fire tests. (Ref. S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992)</p>
9	Sec. 4.1, pg. 4-2	<p>Add sentence to end of 1st complete paragraph to state: "Since NRC had previously concurred with TU Electric's site-specific fire test methodology, the approach promulgated by Supplement 1 to GL 86-10 did not apply to Comanche Peak."</p>
10	Sec. 4.3.1, pg. 4-4	<p>Revise wording in 3rd paragraph to state "NRC now considers..."</p>
11	Sec. 5-1, pg. 5-3	<p>Revise last sentence in 4th paragraph to read, "or a moisture content of less than 100 when using a moisture meter with a scale of 0-100."</p>
12	Sec. 5-1, pg. 5-3	<p>Add sentence at end of last paragraph to state: "Thermal short commodities, such as support members, may be covered (or protected) for various distances depending on the fire tested configurations."</p>
13	Sec. 5.1.1, pg. 5-5	<p>Correct last sentence in 2nd to last paragraph, IN 91-79 did not describe any failed fire tests by TU Electric.</p>

ID	Section, Page, etc	Comment
14	Sec. 5.1.3.1, pg. 5-13	Last sentence in 2 nd paragraph, only one (1) 30-inch wide cable tray was tested by TU Electric on August 21, 1992. The current text implies more than one test was performed.
15	Sec. 5.1.3.4, pg. 5-17	4 th paragraph, NUMARC / NEI fire testing was conducted in 3 phases, not 2.
16	Sec. 5.1.3.4, pg. 5-18	Typo in 3 rd bullet item (redundant use of "3-hour").
17	Sec. 5.1.3.4, pg. 5-18	After discussion of Phase 2, include the following: Phase 3 assessed the performance of baseline and upgraded Thermo-Lag ERFBS on cable and raceway "box" design configurations (e.g., junction boxes, cable tray boxes, etc.) using both 1-hour and 3-hour prefabricated panels.
18	Sec. 5.1.3.5, pg. 5-18	Add the following to end of 2 nd paragraph: Thermo-Lag testing performed by TU Electric in late 1992 and 1993 was conducted primarily to qualify ERFBS configurations for CPSES Unit 2 which was undergoing the plant licensing process at that time. Testing performed to qualify Unit 1 ERFBS configurations was performed later in 1993 and in 1998. The results of the TU Electric test program were consistent with the TVA results, in that small diameter conduits required an additional layer of material, and joints on cable tray and other "box" design enclosures required external stress skin reinforcement.
19	Sec. 5.2, pg. 5-24	Last sentence in 3 rd paragraph should read, "CS-195 should <i>not</i> be used inside containment unprotected."
20	Sec. 5.2, pg. 5-25	Include Nine Mile Point with plants that utilize CS-195 in 1 st sentence of last paragraph.
21	Sec. 5.2.1, pg. 5-26	Typo in 1 st sentence of 1 st paragraph.
22	Sec. 5.5, pg. 5-57	In last sentence of the paragraph immediately below Figure 5-9, the thickness of the Hemyc mat should be 1.5-in.
23	Sec. 5.5, pg. 5-57	Typos at end of 1 st sentence of 2 nd paragraph below Figure 5-9.
24	Sec. 5.5.1, pg. 5-60	Provide complete reference to GL 86-10, Supplement 1 in 2 nd sentence of 1 st paragraph.
25	Sec. 5.5.1, pg. 5-61	Last sentence in 2 nd to last paragraph should state "operating" in lieu of operation.
26	Sec. 5.5.1, pg. 5-61	In last paragraph, typo in 2 nd sentence (one in lieu of on) and last sentence (believes in lieu of believe).
27	Sec. 5.5.2, pg. 5-62	Typos in 1 st sentence of 2 nd paragraph (should be licensee's, and its acceptability).
28	Sec. 5.5.2, pg. 5-62	Typo in 2 nd sentence of 3 rd paragraph (or in lieu of "of").
29	Sec. 5.5.3.1, pg. 5-66	Typo in 2 nd sentence of 2 nd paragraph (testing in lieu of tested).
30	Sec. 5.5.4, pg. 5-74	2 nd two sentence in 1 st paragraph below Table 5-32 need rewording.
31	Sec. 6.4, pg. 6-3	For BFN, text should be updated to reflect U1 as operational in lieu of in recovery phase.

ID	Section, Page, etc	Comment
32	Sec. 6.12, pg. 6-6	<p>Replace the existing text with the following: CPSES uses Thermo-Lag 330-1 ERFBS to protect redundant trains located within a single fire area to satisfy fire protection program licensing commitments. CPSES has approximately 5500 linear feet of 1-hour ERFBS installed for Unit 1 and approximately 4700 linear feet of 1-hour ERFBS for Unit 2. The licensee has directly qualified most ERFBS configurations by conducting a comprehensive series of fire endurance tests that were performed to a site-specific test methodology and acceptance criteria deemed adequate by the NRC staff. In addition, all ERFBS configurations, including those not directly tested, have been evaluated in accordance with GL 86-10 to ensure they are capable of providing the necessary fire endurance capability. The licensee also performed site-specific testing to determine appropriate electrical cable ampacity derating factors.</p> <p>The licensee received NRC acceptance of closure of all Thermo-Lag ERFBS GL 92-08 technical issues (i.e., fire endurance capability, cable-ampacity derating factors, and seismic II over I considerations) installed in the plant for Unit 2 via NUREG-0797, Supplements 26 and 27 dated February and April of 1993, respectively.</p> <p>Following 1993, the licensee performed additional fire endurance testing and implemented design upgrade modifications to address qualification of Thermo-Lag ERFBS configurations for Unit 1. The licensee received NRC acceptance of closure of all Thermo-Lag ERFBS GL 92-08 technical issues for Unit 1 via NRC correspondence dated May 14, 1999 (TAC No. M85536). Since the design methods employed for Unit 1 Thermo-Lag ERFBS configurations are consistent with those for Unit 2 configurations, closure of cable ampacity derating and seismic II over I issues for Unit 2 applies for Unit 1 as well.</p> <p>IN 95-49, "Seismic Adequacy of Thermo-Lag Panels" was issued subsequent to closure of seismic II over I issues for CPSES. Since the observations of the IN were similar to those identified by the licensee in 1992, the licensee concluded that based on material receipt inspection criteria invoked by the quality assurance program requirements governing Thermo-Lag ERFBS, appropriate upper bound prefabricated Thermo-Lag material weight parameters, (including appropriate allowances for additional Thermo-Lag trowel grade material and exterior stress skin, and other material mechanical parameters) were utilized in the seismic qualification calculations. Therefore, no response to the IN was required to address the identified seismic concerns; the previously accepted analysis remains acceptable.</p>

ID	Section, Page, etc	Comment
32 (cont.)	Sec. 6.12, pg. 6-6	<p>CPSES also uses approximately 800 linear feet of Hemyc wrap as a radiant energy shield (RES) inside both Unit 1 and Unit 2 containment structures (1600 linear feet total). There are no applications at CPSES where Hemyc is used to provide a 1- or 3-hour ERFBS for separation of redundant post-fire safe shutdown circuits. In a letter dated December 20, 2007, the licensee informed NRC that after evaluating information regarding NRC's testing of Hemyc; it concluded that use of Hemyc as a RES at CPSES continues to meet its licensing basis. Regional staff verified that the licensee had appropriately dispositioned the issue. (IR 05000445/2008006 and 05000446/2008006, July 3, 2008).</p> <p>Electrical cable ampacity derating is controlled for raceways protected with Hemyc wrap via the CPSES Design Basis Document (DBD) governing cable philosophy and sizing criteria which requires the use of appropriate ampacity derating factors. Hemyc wrap configurations installed at CPSES do not pose a seismic II over I concern based on the low self-weight of the material, its tight conformity to raceways using "direct application" installation methods, and the high relative tensile strength of the stainless steel band fasteners. Finally, the weight of the Hemyc blankets are considered in the self-weight of the supporting raceway as required by applicable civil / structural design basis documents.</p> <p>TU Electric conducted a series of ampacity derating tests for Thermo-lag fire barrier configurations at Omega Point Laboratories in San Antonio, Texas from March 3, through March 13, 1993. The NRC staff observed test preparation and testing from March 2 to March 7, 1993. Six raceway and cable configurations were tested:</p> <ul style="list-style-type: none"> a) ¾" conduit containing a single 3/C #10 AWG cable b) 2" conduit containing a single 3/C #6 AWG cable c) 5" conduit containing 4 1/C #750 MCM cables d) 24" cable tray containing 126 3/C #6 AWG cables e) Air Drop containing a single 3/C #6 AWG cable f) Air Drop containing 3 #750 MCM cables <p>The TU Electric ampacity-derating test was based on the methodology detailed in the proposed standard IEEE P848. The test report was provided to the NRC in TXX-93214.</p> <p>Based on the Safety Evaluation dated Jun 14, 1995 the staff concluded that there are no significant safety hazards at CPSES resulting from the ampacity derating concerns associated with the use of Thermo-Lag fire barriers to enclosed cables.</p>
33	Sec. 6.24, pg. 6-12	Typo in last sentence of 1 st paragraph (IN 97-48) and last paragraph is redundant text.
33a	App. B, pg. B-1	The first paragraph of appendix B has a reference to ICEA/NEMA P-54. This is different than the reference within IEEE 848-1996 that is NEMA WC51-1991/ICEA P-54-440, Ampacities of Cables in Open-Top Trays.

ID	Section, Page, etc	Comment
33b	App. B, pg. B-3	In the 3 rd paragraph, the NUREG states, "the final conductor temperature and ambient temperature may not match 90° C (194° F), respectively". The statement should be revised to: "the final conductor temperature and ambient temperature may not match 90° C (194° F) and 40° C (104° F), respectively".
34	App. D.1.3, pg. D-12	For Hose Stream, Insert Passed
35	App. D.1.3, pg. D-12	Revise Footnote 1 to Table D-14, to read as follows: The max. ΔT values shown in the table are all from thermocouples on the outside of the steel conduits, between the steel surface and the Thermo-Lag fire barrier material. The test laboratory personnel responsible for conduct of the fire test attributed the excessive conduit surface temperatures to electro-chemical reactions caused by saturation of the fiberglass thermocouple insulation braiding by condensate accumulated on the conduit steel. Early in the test the condensate saturated the thermocouple lead wires and caused erroneous readings.
36	App. D.1.3, pg. D-12	Revise Footnote 2 to Table D-14 to read as follows: The test laboratory and the licensee based the 60 minute rating of the tested Thermo-Lag ERFBS configurations on the site-specific acceptance criteria accepted by the NRC (Ref. letter from S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992) for the following parameters: 1) single point and average cable ΔT s remained below allowable limits; 2) no fire barrier burnthrough was evident following the fire endurance and hose stream tests; 3) visual cable inspection revealed no visible damage; 4) no loss of circuit integrity occurred during the fire endurance and hose stream tests; 5) results of the post-fire cable insulation resistance tests were well within allowable limits. The licensee credited the results of this fire test as part of the Thermo-Lag ERFBS qualification basis at CPSES.
37	App. D.1.3, pg. D-13	For Hose Stream, Insert Failed
38	App. D.1.3, pg. D-13	Revise Footnote 1 to Table D-15 to read the same as comment 35 above.
39	App. D.1.3, pg. D-13	Revise Footnote 2 to Table D-15 to read as follows: The assembly met the site-specific acceptance criteria accepted by the NRC (Ref. letter from S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992) for the following parameters: 1) no loss of circuit integrity occurred during the fire endurance and hose stream tests; 2) results of the post-fire cable insulation resistance tests were well within allowable limits. However the ΔT values for cables inside the conduits exceeded allowable limits; and visible cable damage and fire barrier burnthrough occurred for the 1-1/2" and 2" conduits. The licensee did not credit the results of this fire test as part of the Thermo-Lag ERFBS qualification basis at CPSES.
40	App. D.1.3, pg. D-14	For Hose Stream, Insert Passed
41	App. D.1.3, pg. D-14	Revise Footnote 1 to Table D-16 to read the same as comment 35 above.

ID	Section, Page, etc	Comment
42	App. D.1.3, pg. D-14	Revise Footnote 2 to Table D-16 to read as follows: The test laboratory and the licensee based the 60 minute rating of the tested Thermo-Lag ERFBS configurations on the site-specific acceptance criteria accepted by the NRC (Ref. letter from S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992) for the following parameters: 1) single point and average cable Δ Ts remained below allowable limits; 2) no fire barrier burnthrough was evident following the fire endurance and hose stream tests; 3) visual cable inspection revealed no visible damage; 4) no loss of circuit integrity occurred during the fire endurance and hose stream tests; 5) results of the post-fire cable insulation resistance tests were well within allowable limits. The licensee credited the results of this fire test as part of the Thermo-Lag ERFBS qualification basis at CPSES.
43	App. D.1.3, pg. D-15	For Hose Stream, Insert Passed
44	App. D.1.3, pg. D-15	Revise Footnote 1 to Table D-17 to read the same as comment 35 above.
45	App. D.1.3, pg. D-15	Revise Footnote 2 to Table D-16 to read as follows: The test laboratory and the licensee based the 60 minute rating of the tested Thermo-Lag ERFBS configurations on the site-specific acceptance criteria accepted by the NRC (Ref. letter from S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992) for the following parameters: 1) single point and average cable Δ Ts remained below allowable limits; 2) no fire barrier burnthrough was evident following the fire endurance and hose stream tests; 3) visual cable inspection revealed no visible damage; 4) no loss of circuit integrity occurred during the fire endurance and hose stream tests; 5) results of the post-fire cable insulation resistance tests were well within allowable limits. The licensee credited the results of this fire test as part of the Thermo-Lag ERFBS qualification basis at CPSES.
46	App. D.1.3, pg. D-16	For Hose Stream, Insert Passed
47	App. D.1.3, pg. D-16	The 3" steel conduit air drop Δ T entry in Table D-18 should be 209°F in lieu of 219°F.
48	App. D.1.3, pg. D-16	Add superscript reference to Footnote 1 on each of the 60-minute entries in Table D-18.
49	App. D.1.3, pg. D-16	Add Footnote 1 to Table D-18 to state as follows: The test laboratory and the licensee based the 60 minute rating of the tested Thermo-Lag ERFBS configurations on the site-specific acceptance criteria accepted by the NRC (Ref. letter from S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992) for the following parameters: 1) single point and average cable tray, conduit and cable Δ Ts remained below allowable limits; 2) no fire barrier burnthrough was evident following the fire endurance and hose stream tests; 3) except for 3 cables in the 5" air drop bundle, visual cable inspection revealed no visible damage; 4) no loss of circuit integrity occurred during the fire endurance and hose stream tests; 5) results of the post-fire cable insulation resistance tests were well within allowable limits. The licensee credited the results of this fire test as part of the Thermo-Lag ERFBS qualification basis at CPSES.
50	App. D.1.3, pg. D-17	For Hose Stream, Insert Passed
51	App. D.1.3, pg. D-17	In Table D-19, replace the question mark in the rating entry for the 2" steel conduit air drop with 60.

ID	Section, Page, etc	Comment
52	App. D.1.3, pg. D-17	<p>Revise Footnote 1 in Table D-19 to state as follows: The single point ΔT parameter was exceeded on the power cable in the 2" air drop bundle at the 59-minute mark. However, the test laboratory and the licensee based the 60 minute rating of the tested Thermo-Lag ERFBS configurations on the site-specific acceptance criteria accepted by the NRC (Ref. letter from S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992) for the following parameters: 1) the single point ΔT parameter was exceeded a one thermocouple location on the 2" air drop bundle, however all remaining single point and average cable tray, conduit and cable ΔTs remained below allowable limits; 2) no fire barrier burnthrough was evident following the fire endurance and hose stream tests; 3) except at a single small location on one cable in both the 1-1/2" and 2" air drop bundles, visual cable inspection revealed no visible damage; 4) results of the post-fire cable insulation resistance tests were well within allowable limits. The licensee credited the results of this fire test as part of the Thermo-Lag ERFBS qualification basis at CPSES.</p>
53	App. D.1.3, pg. D-17	For Hose Stream, Insert Failed
54	App. D.1.3, pg. D-18	Add superscript reference to Footnote 1 on the 60-minute entry for the box design air drop in Table D-20.
55	App. D.1.3, pg. D-18	<p>Add Footnote 1 to Table D-20 to state as follows: A through opening in the air drop box design portion of the ERFBS occurred during the hose stream test. However, the test laboratory and the licensee based the 60 minute rating of the tested Thermo-Lag ERFBS configurations on the site-specific acceptance criteria accepted by the NRC (Ref. letter from S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992) for the following parameters: 1) single point and average cable tray, cable, and air drop enclosure interior (bare #8 AWG conductor) ΔTs remained below allowable limits; 2) visual cable inspection revealed no visible damage; 3) results of the post-fire cable insulation resistance tests were well within allowable limits. The licensee credited the results of this fire test as part of the Thermo-Lag ERFBS qualification basis at CPSES.</p>
56	App. D.1.3, pg. D-18	For Hose Stream, Insert Right and Center Trays - Passed, Left Tray - Failed
57	App. D.1.3, pg. D-18	Add superscript reference to Footnote 2 on the 60-minute entry for the Right cable tray in Table D-21.
58	App. D.1.3, pg. D-18	<p>Add Footnote 2 to Table D-21 to state as follows: The test laboratory and the licensee based the 60 minute rating of the tested Thermo-Lag ERFBS configuration on the site-specific acceptance criteria accepted by the NRC (Ref. letter from S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992) for the following parameters: 1) single point and average cable tray and cable ΔTs remained below allowable limits; 2) no fire barrier burnthrough was evident following the fire endurance and hose stream tests; 3) visual cable inspection revealed no thermal damage; 4) results of the post-fire cable insulation resistance tests were well within allowable limits. The licensee credited the results of this fire test for the Right cable tray as part of the Thermo-Lag ERFBS qualification basis at CPSES.</p>
59	NOT USED	
60	App. D.1.3, pg. D-19	For Hose Stream, Insert Passed
61	App. D.1.3, pg. D-19	Add superscript reference to Footnote 2 on the 60-minute entry in Table D-22.
62	App. D.1.3, pg. D-19	Delete 3 rd sentence in Footnote 1 to Table D-22 (for consistency with previous tables)

ID	Section, Page, etc	Comment
63	App. D.1.3, pg. D-19	Add Footnote 2 to Table D-22 to state as follows: The test laboratory and the licensee based the 60 minute rating of the tested Thermo-Lag ERFBS configuration on the site-specific acceptance criteria accepted by the NRC (Ref. letter from S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992) for the following parameters: 1) single point and average cable tray and cable ΔT s remained below allowable limits; 2) no fire barrier burnthrough was evident following the fire endurance and hose stream tests; 3) visual cable inspection revealed no thermal damage; 4) no loss of circuit integrity occurred during the fire endurance and hose stream tests; 5) results of the post-fire cable insulation resistance tests were well within allowable limits. The licensee credited the results of this fire test as part of the Thermo-Lag ERFBS qualification basis at CPSES.
64	App. D.1.3, pg. D-20	For Hose Stream, Insert Failed
65	App. D.1.3, pg. D-20	Add superscript reference to Footnote 2 on the 60-minute entry in Table D-23.
66	App. D.1.3, pg. D-20	Delete 3 rd sentence in Footnote 1 to Table D-23 (for consistency with previous tables)
67	App. D.1.3, pg. D-20	Add Footnote 2 to Table D-23 to state as follows: Although no burnthrough of the ERFBS occurred, a barrier opening occurred during the hose stream test where the bottom panel on the Tee section interfaced with the fire stop. However, the test laboratory and the licensee based the 60 minute rating of the tested Thermo-Lag ERFBS configuration on the site-specific acceptance criteria accepted by the NRC (Ref. letter from S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992) for the following parameters: 1) single point and average cable tray and cable ΔT s remained below allowable limits; 2) visual cable inspection revealed no thermal damage; 3) no loss of circuit integrity occurred during the fire endurance and hose stream tests; 4) results of the post-fire cable insulation resistance tests were well within allowable limits. The licensee credited the results of this fire test as part of the Thermo-Lag ERFBS qualification basis at CPSES. The ERFBS design for bottom panel and cable tray fire stop interfaces was modified and successfully tested in Scheme 14-1.
68	App. D.1.3, pg. D-20	For Hose Stream, Insert Passed
69	App. D.1.3, pg. D-20	Add superscript reference to Footnote 2 on the 60-minute entry in Table D-24.
70	App. D.1.3, pg. D-20	Delete 3 rd sentence in Footnote 1 to Table D-24 (for consistency with previous tables)
71	App. D.1.3, pg. D-20	Add Footnote 2 to Table D-24 to state as follows: The test laboratory and the licensee based the 60 minute rating of the tested Thermo-Lag ERFBS configuration on the site-specific acceptance criteria accepted by the NRC (Ref. letter from S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992) for the following parameters: 1) single point and average cable tray and cable ΔT s remained below allowable limits; 2) no fire barrier burnthrough was evident following the fire endurance and hose stream tests; 3) visual cable inspection revealed no thermal damage; 4) no loss of circuit integrity occurred during the fire endurance and hose stream tests; 5) results of the post-fire cable insulation resistance tests were well within allowable limits. The licensee credited the results of this fire test as part of the Thermo-Lag ERFBS qualification basis at CPSES.
72	App. D.1.3, pg. D-21	For Hose Stream, Insert Failed
73	App. D.1.3, pg. D-21	Add superscript reference to Footnote 2 on the 60-minute entries in Table D-25.

ID	Section, Page, etc	Comment
74	App. D.1.3, pg. D-21	<p>Add Footnote 2 to Table D-25 to state as follows: The cable tray and conduit ERFBS assemblies suffered minor areas of burnthrough that occurred prior to the hose stream test. Additionally, the single point and average cable tray and conduit surface ΔTs exceeded allowable limits. However, single point and average cable ΔTs remained below allowable limits. Moreover, the tested ERFBS assemblies did meet the site-specific acceptance criteria accepted by the NRC (Ref. letter from S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992) for the following parameters: 1) visual cable inspection revealed no thermal damage; 2) results of the post-fire cable insulation resistance tests were well within allowable limits. The licensee does not credit the results of this fire test as part of the Thermo-Lag ERFBS qualification basis at CPSES.</p>

ID	Section, Page, etc	Comment
75	App. D.1.3, pg. D-21	<p>Following Table D-25, insert the following information for Test Scheme 13-3 which was conducted in late 1998:</p> <p><i>TU Electric Report No. 12340-102571, Scheme 13-3 (February 1999)</i></p> <p><u>ERFBS:</u></p> <p>This 1 hr. test evaluated two full-scale 2" steel conduit assemblies, two full-scale 12" wide steel cable tray assemblies, and a 12" wide steel cable tray segment. Each conduit assembly penetrated the furnace roof, descended into the furnace to 90° conduit fittings, ran horizontally three feet below the furnace roof, and exited the furnace through its front wall about six feet (measured horizontally) from their entrance location. Similarly, each full-scale cable tray assembly penetrated the furnace roof, descended into the furnace to 90° radial bends fittings, ran horizontally three feet below the furnace roof, and exited the furnace through its front wall about six feet (measured horizontally) from their entrance location. The 12" cable tray segment simply extended vertically downward into the furnace for a three foot distance. The fire barriers protecting the conduits and cable trays were constructed using Thermo-Lag 330-1 flat and v-rib panels and preshaped conduit half round sections that were ½" nominal thickness with 311 topcoat, 330-69 stress skin sheets, and 330-1 trowel grade subliming compound. The joints on the conduit fitting enclosure for each conduit were upgraded with standard stress skin and trowel grade reinforcement. The overall external surface of Conduit A received an additional ¼" thickness of trowel grade material, while Conduit B did not. Similarly, the bottom and side rail surfaces of Cable Tray C received an additional ¼" thick trowel grade build-up, while Cable Tray D did not. Finally, the bottom of the ERFBS installed on Tray E was sealed with a 12" deep silicone foam fire stop.</p> <p><u>Test Procedure:</u> Texas Utilities Electric TEST PLAN, Rev. 1 (October 26, 1998)</p> <p><u>Test Slab:</u> 13' x 8' 10 GA (Steel), with 2 layers of 2" ceramic fiber blanket insulation</p> <p><u>Ambient Temperature:</u> 74°F <u>Desired Rating:</u> 1 hr.</p> <p><u>Thermocouples:</u> The conduits each had one TC every 6" along the outside surface clamped under a screw head, and one TC every 6" on the single 5/C 12 AWG cable routed inside the conduits. The cable trays each had one TC every 6" on both side rails clamped under a screw head. The cable trays also had one TC every 6" on one power, control, and instrument cables.</p>

ID	Section, Page, etc	Comment																														
75 cont.	App. D.1.3, pg D-21	<p>The TCs on cables were secured to the top of the cables with a double wrap of glass fiber reinforced electrical tape. Additionally, the trays each had one TC installed every 6" on a single #8 AWG bare copper conductor routed along the longitudinal centerline of the trays on top of the enclosed cables. The fire stop assembly had three TCs on its unexposed: one located 1" from a side rail, one located 1" from a penetrating cable, one located in the fire stop center.</p> <p><u>Hose Stream:</u> Conduit A – Passed, Conduit B – Failed, Tray C – Passed, Tray D – Passed, Tray E (fire stop) – Passed</p> <p><u>Furnace:</u> 11' x 6' x 80"</p> <p><u>Furnace Control:</u> Ten (10) thermocouples on probes located throughout the furnace</p> <p><u>Cable Type:</u> Conduits A & B each contained a single instrumentation cable. Trays C & D each contained 19 instrumentation cables, and Tray E contained 40 instrumentation cables that penetrated through the fire stop.</p> <p style="text-align: center;">Table D-25A TU Electric Thermo-Lag Test 13-3</p> <table border="1" data-bbox="688 789 1787 1037"> <thead> <tr> <th>Raceway Type</th> <th>Barrier Protection</th> <th>Cable Fill</th> <th>Max. Temp Rise (°F)</th> <th>Rating²</th> </tr> </thead> <tbody> <tr> <td>2" Conduit A</td> <td>≈5/8" nom. TL-330-1</td> <td>8.6%</td> <td>323°F</td> <td>60 min.</td> </tr> <tr> <td>2" Conduit B</td> <td>½" nom. TL-330-1</td> <td>8.6%</td> <td>1344°F¹</td> <td>Failed</td> </tr> <tr> <td>12" Cable Tray C</td> <td>≈5/8" nom. TL-330-1</td> <td>5.5%</td> <td>258°F¹</td> <td>59 min.</td> </tr> <tr> <td>12" Cable Tray D</td> <td>½" nom. TL-330-1</td> <td>4.6%</td> <td>378°F¹</td> <td>Failed</td> </tr> <tr> <td>12" Cable Tray E (Fire Stop)</td> <td>½" nom. TL-330-1 (12" silicone foam)</td> <td>11.4%</td> <td>256°F</td> <td>60 min.</td> </tr> </tbody> </table> <p>¹These temperature rises are above the 325°F single point maximum temperature rise criterion, therefore Conduit B and Cable Trays C & D failed to achieve the desired 60 minute qualification.</p> <p>²For Cable Tray-C, the side rail and bare #8 bare conductor ΔTs exceeded allowable limits at 59 minutes. However, the following acceptance parameters were met: 1) no fire barrier burnthrough after fire and hose stream test; 2) no visible cable damage; 3) the post-fire cable insulation resistance tests were well within allowable limits. The licensee credited the results of this fire test for Conduit A, Cable Tray C, and Cable Tray E (fire stop) as part of the Thermo-Lag ERFBS qualification basis at CPSES.</p>	Raceway Type	Barrier Protection	Cable Fill	Max. Temp Rise (°F)	Rating ²	2" Conduit A	≈5/8" nom. TL-330-1	8.6%	323°F	60 min.	2" Conduit B	½" nom. TL-330-1	8.6%	1344°F ¹	Failed	12" Cable Tray C	≈5/8" nom. TL-330-1	5.5%	258°F ¹	59 min.	12" Cable Tray D	½" nom. TL-330-1	4.6%	378°F ¹	Failed	12" Cable Tray E (Fire Stop)	½" nom. TL-330-1 (12" silicone foam)	11.4%	256°F	60 min.
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76	App. D.1.3, pg. D-22	For Hose Stream, Insert Passed																														
77	App. D.1.3, pg. D-22	For Table D-26, change entry for Rating column to 60 min. and add superscript reference to Footnote 1.																														

ID	Section, Page, etc	Comment
78	App. D.1.3, pg. D-22	<p>Revise Footnote 1 to Table D-26 to state as follows: A single thermocouple (TC 91) located on the front cable tray side rail nearest the fire stop assembly exceed the allowable 325°F single point ΔT criteria by 6°F during the last one minute of the fire endurance portion of the test. Specifically, at the 59 minute mark, the single point ΔT recorded by TC 91 was 325°F, and at the 60 minute mark the ΔT 331°F. Therefore, the test laboratory and the licensee based the 60 minute rating of the tested Thermo-Lag ERFBS configuration on the site-specific acceptance criteria accepted by the NRC (Ref. letter from S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992) for the following parameters: 1) no fire barrier burnthrough was evident following the fire endurance and hose stream tests; 2) visual cable inspection revealed no thermal damage; 3) no loss of circuit integrity occurred during the fire endurance and hose stream tests; 4) results of the post-fire cable insulation resistance tests were well within allowable limits. The licensee credited the results of this fire test as part of the Thermo-Lag ERFBS qualification basis at CPSES.</p>
79	App. D.1.3, pg. D-22	For Hose Stream, Insert Passed
80	App. D.1.3, pg. D-23	Add superscript reference to Footnote 2 on the 60-minute entries in Table D-27.
81	App. D.1.3, pg. D-23	<p>Add Footnote 2 to Table D-27 to state as follows: The test laboratory and the licensee based the 60 minute rating of the tested Thermo-Lag ERFBS configuration on the site-specific acceptance criteria accepted by the NRC (Ref. letter from S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992) for the following parameters: 1) single point and average cable tray and cable ΔTs remained below allowable limits; 2) no fire barrier burnthrough was evident following the fire endurance and hose stream tests; 3) visual cable inspection revealed no thermal damage; 4) no loss of circuit integrity occurred during the fire endurance and hose stream tests; 5) results of the post-fire cable insulation resistance tests were well within allowable limits. The licensee credited the results of this fire test as part of the Thermo-Lag ERFBS qualification basis at CPSES.</p>
82	App. D.1.3, pg. D-23	For Hose Stream, Insert Passed
83	App. D.1.3, pg. D-23	<p>Revise Footnote 1 to Table D-28 to state as follows: The ΔT values listed above were recorded on the bare #8AWG stranded wire that was positioned inside the Thermo-Lag wrap protecting each W-008 750 kCM cables.</p>
84	App. D.1.3, pg. D-23	For Table D-28, change entries in Rating column to 60 min. and add superscript reference to Footnote 3.

ID	Section, Page, etc	Comment
85	App. D.1.3, pg. D-23	<p>Add Footnote 3 to Table D-28 to state the following:</p> <p>Although the ΔT criterion was exceeded on the bare #8 AWG conductor that was positioned inside the ERFBS protecting each W-008 cable, the test laboratory and the licensee based the 60 minute rating of the tested Thermo-Lag ERFBS configuration on the site-specific acceptance criteria accepted by the NRC (Ref. letter from S.C. Black (NRC) to W.J. Cahill (TUE), October 29, 1992) for the following parameters: 1) single point and average cable ΔTs remained below allowable limits; 2) no fire barrier burnthrough was evident following the fire endurance and hose stream tests; 3) visual cable inspection revealed no penetrating thermal cable damage; 4) results of the post-fire cable insulation resistance tests were well within allowable limits. However, to ensure complete protection of large power cables that are wrapped in exposed cable trays, the licensee upgraded the installed configurations by adding a third layer of Thermo-Lag 330-660 Flexi-Blanket. The licensee credited the results of this fire test as part of the Thermo-Lag ERFBS qualification basis at CPSES.</p>