

**Florida  
Power**  
CORPORATION  
Crystal River Unit 3  
Docket No. 80-302

March 28, 1995  
3F0395-25

U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555

Subject: Thermo-Lag - Request for Additional Information Regarding Generic Letter 92-08

Reference: A. NRC to FPC letter, 3N1294-20, dated December 28, 1994  
B. FPC to NRC letter, 3F0195-03, dated January 6, 1995  
C. Nuclear Energy Institute (NEI) to William T. Russell, USNRC, letter, dated February 21, 1995

Dear Sir:

The Nuclear Regulatory Commission (NRC), in Reference A, requested information regarding certain physical properties of Thermo-Lag 330 fire barrier materials and the installation of those materials for compliance with 10 CFR 50, Appendix R at Crystal River Unit 3 (CR-3). The basis for your request was the recent indictment of Thermal Science Incorporated (TSI), and information provided by the NRC Inspector General, which called into question the reliability of TSI's quality assurance program for Thermo-Lag materials and subsequently the quality of Thermo-Lag materials.

As reported in Reference B, where FPC continues to use Thermo-Lag materials currently installed at CR-3, we will employ the results of the Nuclear Energy Institute (NEI) fire barrier test program and the "NEI Application Guide for Evaluation of Thermo-Lag 330 Fire Barrier Systems" (herein after referred to as the "Application Guide") to determine the protection afforded by our installations. FPC will also use other industry data compiled by Science Applications International Corporation (SAIC) under contract to the Electric Power Research Institute (EPRI) to evaluate Thermo-Lag fire barrier performance for configurations that exceed the scope of the "Application Guide." This includes fire research conducted on behalf of the NRC by Sandia National Laboratory. Further (also in Reference B), we have committed to chemical testing of CR-3 Thermo-Lag materials to the extent necessary to demonstrate that these materials are equivalent to materials used in the tests reported in the "Application Guide."

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Thermo-Lag materials were purchased and delivered to CR-3 work locations under our Fire Protection Quality Assurance Program. This is a graded quality assurance program based upon NRC guidance in "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls, and Quality Assurance." Purchased material was stored and issued through a controlled warehouse. The remaining important attributes of our Thermo-Lag fire barriers were directly controlled by the FPC Quality Assurance Program. Thermo-Lag fire barriers at CR-3 were installed via our nuclear safety related (Appendix B) modification process. The safety related modification package engineered each barrier installation, and provided work instructions for barrier construction. Installation of barriers was performed by trained and qualified craftsmen using safety related work packages, which included Nuclear Quality Control inspection of important barrier attributes. Subsequently, ten years of experience with surveilling, maintaining, and modifying Thermo-Lag fire barriers at CR-3 have demonstrated the quality and consistency of site specific installations. The important attributes of CR-3 barrier construction were previously reported to the NRC Staff in Reference B.

We believe the integrity of the FPC Quality Assurance Programs, with the addition of the following two factors, are sufficient to provide reasonable assurance that our barriers will perform as expected:

- re-rating of fire barrier endurance based on testing performed by NEI, Tennessee Valley Authority, Texas Utilities, and others, conducted independently of TSI, and
- chemical testing to demonstrate equivalence of our materials to tested materials.

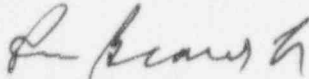
Our specific response to each item requested by Reference A is included in Attachment 1.

Chemical composition testing of CR-3 Thermo-Lag materials will be conducted as part of the NEI Fire Protection Working Group test program outlined in Reference C. FPC will submit eight samples of material as follows. Five samples will be taken from CR-3 warehouse stock material and three samples will be taken from installed plant fire barriers. One sample will be taken from each of the following types of material from warehouse stock: 1-hour pre-shaped conduit section, 3-hour pre-shaped conduit section, 1-hour panel, 3-hour panel, and trowel grade material. Two samples from installed plant barriers will be from 1-hour panels, and one sample will come from a 1-hour pre-shaped conduit section. Based on NRC Staff acknowledgement at the March 14, 1995 meeting on this subject, that there is no evidence of chemical composition variation in the Thermo-Lag materials currently in use, we deem this sample size sufficient.

NEI will submit a written report that confirms that the chemical tests have been completed and the test results. FPC does not plan to submit a separate report of the chemical test results. Further testing may be conducted if the above test results show significant variation in CR-3 material chemical composition when compared to other Industry samples. FPC intends to monitor for the purpose of later endorsing the efforts of NEI, in conjunction with the test lab, to establish appropriate acceptance criteria relative to "significant" composition variations. If further testing is determined to be necessary, it will be conducted after we have revised our post fire safe shutdown analysis, and have identified which of the existing Thermo-Lag fire barriers will be retained for safe shutdown protection. If necessary at that time, a separate sampling program will be established and applied to the barriers that will be retained.

FPC is an active member of the NEI Fire Protection Working Group and other senior NEI advisory committees. We are therefore sensitive to supporting the vital role NEI needs to play on such issues. Nonetheless, we recognize our responsibility as licensee and have a vested interest in resolving this issue effectively. We therefore will continue to work with the NRC, EPRI, and NEI to achieve the most appropriate resolution.

Sincerely,



P. M. Beard, Jr.  
Senior Vice President  
Nuclear Operations

Attachment

PMB/SCP:ff

xc: Regional Administrator, Region II  
NRR Project Manager  
Senior Resident Inspector

## Attachment 1

### Thermo-Lag - Request for Additional Information Regarding Generic Letter 92-08

#### NRC Request

##### 1. Thermo-Lag Materials

- a. Describe the specific tests and analyses that will be performed to verify that the Thermo-Lag fire barrier materials that are currently installed at Crystal River Unit 3, or that will be installed in the future, are representative of the materials that were used to address the technical issues associated with Thermo-Lag barriers and to construct the fire endurance and ampacity derating test specimens. The tests and analyses shall address the material properties and attributes that were determined or controlled by TSI during the manufacturing process and the quality assurance program. The tests and analyses shall also address the material properties and attributes that contribute to conclusions that the Thermo-Lag materials and barriers conform to NRC regulations.

#### FPC Response

##### (1) chemical composition

FPC will extract and submit Thermo-Lag samples for chemical testing by Pyrolysis Gas Chromatography in accordance with the guidance of ASTM D3452 utilizing a gas chromatograph equipped with mass selective detector. FPC will submit eight samples for chemical testing. Five samples will come from warehouse stock material and three will come from installed plant Thermo-Lag configurations.

Tests will be conducted as part of the NEI / Industry chemical composition test program outlined in Reference C. The CR-3 chemical test results will be combined with test results from other nuclear utilities to establish an Industry database. We believe that a coordinated effort such as this is the most efficient way to determine Thermo-Lag product consistency, and to confirm applicability of generic Industry fire endurance, combustibility, flame spread, and heat release test data.

##### (2) material thickness

Material thickness was verified during material receipt inspection by comparison of delivered material to shipping documents. Installation procedures directed the nominal thickness of material to be applied for each barrier and Quality Control (QC) inspection verified that the specified thickness material was applied. As stated in Reference B, FPC has used several means to determine material thickness of installed fire barriers. Based on material receipt and installation documentation, limited destructive examination, and examination of materials in stock, FPC has reasonable assurance of the thickness of Thermo-Lag materials installed as fire barriers at CR-3.

(3) material weight and density

Chemical test results are not expected to show significant variations in material composition. Accordingly, variations in material weight and density can be attributed to the presence of voids or porosity in the cured Thermo-Lag materials. As noted in item (4) below, inspections performed during barrier construction did not disclose these conditions as a problem.

(4) the presence of voids, cracks, and delaminations

QC inspection plans included in each CR-3 Thermo-Lag fire barrier construction work package contained a requirement for verification that there were no holes, cracks, or depressions that would violate material thickness. A review of QC Inspection Reports generated during the period when these barriers were being installed, disclosed no reports of this criteria being violated.

It is probable that random variability in the manufacturing process for Thermo-Lag resulted in the existence of some voids, cracks, delaminations, and porosity in the final product. In the absence of indications to the contrary, it is believed that material variation existed in industry fire test configurations to the same extent that it exists in barriers installed in operating plants. This is supported by the fact that various utilities contributed material from stock to build the fire test assemblies. Therefore, the existence of voids, delaminations, cracks and porosity has already been accounted for in the results of the industry fire test program. Any additional effort to quantify the existence of these defects for barriers in a particular plant would not be beneficial.

(5), (6), and (7) fire endurance capabilities, combustibility, and flame spread rating

The three parameters above are directly related to material composition. These have been established for the materials included in the NEI / Industry fire barrier test program. Based on the results of the chemical composition sampling program noted in item (1) above, judgements will be made of the relationship of these properties for CR-3 materials to those of the NEI tested materials. If the chemical composition sampling program demonstrates that our material differs significantly from the materials tested by NEI during the Industry fire barrier test program, then FPC will participate in further testing to establish these properties for our specific materials.

The combustibility of Thermo-Lag materials is specifically addressed in the EPRI / SAIC Tailored Collaboration project which assesses Thermo-Lag barrier performance and local area fire hazards. Our participation in this project was reported previously in Reference B. When assessing local area fire hazards, Thermo-Lag materials are treated as combustible if subjected to sufficiently severe heat and flame conditions.



(8) ampacity derating

FPC will conduct ampacity testing of Thermo-Lag materials in accordance with the guidance of Institute of Electrical and Electronic Engineers draft Standard P848. If the approved standard has not been issued at the time of test design, the latest draft available at that time will be used. FPC will conduct the test using Thermo-Lag materials from stock supplies, since large (12 foot) sections of material are required making removal from installed plant configurations impractical.

(9) mechanical properties such as tensile strength, compressive strength, shear strength, and flexural strength

It is our understanding that the determination of these properties is related to seismic performance of Thermo-Lag materials. In general the design goal for Seismic Class II (S-II) structures installed above Seismic Class I (S-I) structures, is that the S-II structures will withstand seismic events and will not damage the S-I structures. This design goal, however, was not a design requirement at CR-3. The design of Thermo-Lag fire barriers at CR-3 took no credit for any mechanical properties of Thermo-Lag materials, however the design process accounted for the additional loads on supports due to the installation of Thermo-Lag. The installation instructions required that minimum band spacing of 12" on centers and less than 2" from butt joints be maintained. Field walkdowns have shown compliance with these requirements, and further demonstrated that much closer band and tie wire spacing was actually installed. Considering Florida's minimal seismic activity, the mechanical properties of Thermo-Lag materials are of limited relevance to CR-3 fire barrier installations. Therefore, no testing for mechanical properties of Thermo-Lag is planned by FPC.

#### NRC Request

- b. Describe the methodology that will be used to determine the sample size and demonstrate that the sample size will be large enough to ensure that the information and data obtained will be sufficient to assess the total population of in-plant Thermo-Lag barriers and the materials that will be installed in the future. In determining the sample size, consider the time of installation and manufacture of the various in-plant materials and barrier installations. Give the number and types (e.g., panels, conduit preshapes, trowel-grade material, stress skin) of samples that will be tested or analyzed.

#### FPC Response

FPC will be participating in an industry test program sponsored by NEI, which is intended to establish the similarity between materials that have already been tested and reported in the NEI fire barrier test program, and materials that are installed in operating plants. This test program is fully described in Reference C, and calls for five samples to be submitted by each participating plant. FPC will submit eight samples for testing. Five samples will be taken from CR-3 warehouse stock material and three samples will be taken from installed plant fire barriers. One sample will be taken from each of the following types of material from warehouse stock: 1-hour pre-shaped conduit section, 3-hour pre-shaped conduit section, 1-hour panel, 3-hour panel, and trowel grade material. Two samples from installed plant barriers will be from 1-hour panels, and one sample will come from a 1-hour pre-shaped conduit section. Based on NRC Staff

acknowledgement that there is no evidence of chemical composition variation in the Thermo-Lag materials currently in use, this sample size is deemed sufficient.

Further testing may be conducted if these test results show significant variation in material chemical composition when compared to other Industry samples. FPC will rely on the efforts of NEI, in conjunction with the test lab, to establish appropriate acceptance criteria relative to "significant" composition variations. If further testing is determined to be necessary, it will be conducted after we have revised our post fire safe shutdown analysis, and have identified which of the existing Thermo-Lag fire barriers will be retained for safe shutdown protection. If necessary at that time, a separate sampling program will be established and applied to the barriers that will be retained.

#### **NRC Request**

- c. Submit the schedule for verifying the Thermo-Lag materials.

#### **FPC Response**

The samples for the NEI / Industry chemical test program that are from warehouse stock material have been submitted to the testing laboratory. Samples of material from installed plant barriers will be submitted by March 30, 1995. If additional testing is conducted it will be based on a schedule developed after our final plans for total resolution of the Thermo-Lag fire barrier issue are complete. In Reference B, FPC committed to submit our plans for final resolution by December 31, 1995 for NRC review.

#### **NRC Request**

- d. After the analyses and tests have been completed, submit a written supplemental report that confirms that this effort has been completed and provide the results of the tests and analyses. Describe any changes to previously submitted plans or schedules that result from the tests or analyses.

#### **FPC Response**

NEI will submit a written report that confirms that the chemical tests have been completed and the outcome. Therefore FPC does not plan to submit a separate chemical test report, but intends to review and endorse the NEI results. If any changes to our plans are made based on these test results, FPC will report our revised plans to the NRC.

#### **NRC Request**

#### **2. Important Barrier Parameters**

- a. Describe the examinations and inspections that will be performed to obtain the important barrier parameters given in Section II of the RAI of December 1993 for the Thermo-Lag fire barrier configurations installed at Crystal River Unit 3.

#### **FPC Response**

In Reference B, FPC reported on the inspections of our barrier installations that have been performed. Included was a description of the installed configuration for each parameter. The information provided was obtained from a combination of document reviews, field walkdowns and destructive examinations. Removal of TSI in applications where it is no longer needed will provide an opportunity to "destructively examine" additional installations. FPC will use such opportunities as they arise to capture additional documentation of installed barrier construction parameters.

#### **NRC Request**

- b. Describe the methodology that will be applied to determine the number and type of representative in-plant fire barrier configurations that will be examined in detail and demonstrate that the sample size is adequate to ensure that the information and data that will be obtained are adequate to assess the total population of in-plant Thermo-Lag barriers. A large enough sample of the total population of configurations should be examined to provide reasonable assurance that the materials and important barrier parameters used to construct the in-plant barriers and any future barrier installations or modifications, are representative of the parameters used to construct the fire endurance test specimens.

#### **FPC Response**

No additional inspections of installed fire barriers are planned at this time. FPC is confident that sufficient valid information is already available to establish the important barrier parameters for CR-3 Thermo-Lag installations. Additional information may be obtained incident to removal of abandoned barriers in the future. We will take advantage of any such opportunities to provide further assurance of the details of barrier configurations. Please note that FPC will not necessarily remove all abandoned Thermo-Lag barriers if there is a no safety benefit in doing so.

#### **NRC Request**

- c. Submit the schedule for obtaining and verifying all of the important barrier parameters.

#### **FPC Response**

If additional verifications are performed due to identification of additional important parameters, a schedule will be submitted. However, no further inspections are anticipated before our total resolution plan for CR-3 Thermo-Lag barriers is completed. As stated above, final resolution plans will be completed by December 31, 1995.

#### **NRC Request**

- d. After the information has been obtained and verified, submit a written supplemental report that confirms that this effort has been completed and provides the results of the examinations and inspections. Verify that the parameters of the in-plant configurations are representative of the parameters of the fire endurance test specimens. Describe any changes to previously submitted plans or schedules that result from the examinations.



**FPC Response**

FPC does not plan to perform any additional verifications of barrier parameters at this time. If a need for additional verifications arises, those results will be reported when verifications are completed and the results analyzed.