Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381

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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of the Application of	)	Docket Nos. 50-390
Tennessee Valley Authority	)	50-391

WATTS BAR NUCLEAR PLANT (WBN) - DECEMBER 23, 1994, REQUEST FOR ADDITIONAL INFORMATION REGARDING GENERIC LETTER (GL) 92-08, "THERMO-LAG 330-1 FIRE BARRIERS" (TAC M63648, M83948, AND M83949)

The purpose of this letter is to provide TVA's reply to the subject request for additional information (RAI) about the measures TVA is taking to ensure that Thermo-Lag fire barrier material used at WBN conforms to NRC regulations. Additionally, this letter provides an updated response to TVA's April 16, 1993, response to GL 92-08 for WBN.

TVA has performed extensive testing (fire endurance, seismic, and ampacity derating tests) of Thermo-Lag 330-1 fire barrier material. The tests show that Thermo-Lag 330-1 can be relied upon to protect electrical raceways and associated cabling in the event of a postulated fire. The testing qualified Thermo-Lag 330-1 for use as a rated one-hour electrical raceway fire barrier system. Qualification was based on maintaining the temperature rise inside the fire barrier below the acceptance criteria provided in Supplement 1 to GL 86-10 (250 degrees F average temperature rise, 325 degrees F maximum temperature rise).

TVA's Thermo-Lag 330-1 Phase I and II fire test results were submitted on July 9, 1993, and December 23, 1994, respectively. Phase I ampacity derating test results were submitted on July 9, 1993. Phase II ampacity derating tests have successfully been completed and are scheduled to be submitted in the near future. Seismic test results were submitted on November 11, 1994. The test procedures used for these tests were discussed with NRC Staff personnel prior to conducting the tests. Also, NRC Staff personnel observed the testing as it was being performed.

TVA's testing program demonstrated that Thermo-Lag can be relied upon to perform satisfactorily. To ensure that Thermo-Lag used at WBN is qualified, TVA is implementing measures to ensure that the material installed in the plant is representative of the tested materials, and that important test configuration installation parameters bound the in-plant configurations.

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Additionally, TVA is verifying that the Thermo-Lag material used during installation is consistent with the material used during testing. TVA's response to the information requested in the subject RAI about these measures is provided in Enclosure 1. Based on the successful test results and the measures TVA is implementing to ensure that Thermo-Lag is qualified and installed properly, TVA requests approval of our plans to use Thermo-Lag at WBN.

In TVA's April 16, 1993, response to GL 92-08 for WBN, TVA indicated that existing Thermo-Lag 330-1 installed at WBN would be evaluated for acceptability. Based on the testing results, TVA has evaluated the previously installed Thermo-Lag 330-1 and determined that there was insufficient evidence to justify its use. Accordingly, TVA has removed the "old" Thermo-Lag 330-1 at WBN. Therefore, the in-situ destructive testing of Thermo-Lag 330-1 installations discussed in the subject RAI will not be required. TVA's updated response to GL 92-08 is provided in Enclosure 2.

TVA is now planning limited use of Thermo-Lag 770-1 material for three-hour rated electrical raceway fire barrier systems at WBN. TVA considers that this approach is the best option available since recent testing shows that the material can perform satisfactorily, and its use will allow TVA to cancel several specific requests for deviating from TVA's commitment to meet 10 CFR 50 Appendix R Section III.G.2. Therefore, the program described in the enclosures for ensuring that Thermo-Lag meets regulatory requirements will be applied to both Thermo-Lag 330-1 and 770-1. The qualification tests results for Thermo-Lag 770-1 (fire endurance and ampacity testing) will be provided as they become available.

Commitments contained in this submittal are contained in Enclosure 3. If you should have any questions, contact Mr. P. L. Pace at (615)-365-1824.

Sincerely,

Paul Baron

Raul R. Baron
Nuclear Assurance and
Licensing Manager (Acting)

Enclosures
cc: See page 3

Subscribed and sworn to before
me on this 22nd day of March 1995

E. Jeannette Long
Notary Public

My Commission Expires July 1, 1997

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Enclosures
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ENCLOSURE 1

WATTS BAR NUCLEAR PLANT (WBN) RESPONSE TO
REQUEST FOR ADDITIONAL INFORMATION REGARDING
GENERIC LETTER 92-08
"THERMO-LAG 330-1 FIRE BARRIERS"

THERMO-LAG MATERIALS

NRC REQUEST - 1a

"Describe the specific tests and analyses that will be performed to verify that the Thermo-Lag fire barrier materials that are currently installed at Watts Bar Unit 1, 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. These include:

1. chemical composition
2. material thickness
3. material weight and density
4. the presence of voids, cracks, and delaminations
5. fire endurance capabilities
6. combustibility
7. flame spread rating
8. ampacity derating
9. mechanical properties such as tensile strength, compressive strength, shear strength, and flexural strength."

TVA RESPONSE

The following tests and analyses will be performed to provide assurance that Thermo-Lag materials and barriers conform to NRC regulations. Unless otherwise noted, the tests and analyses will be performed on both Thermo-Lag 330-1 and 770-1 used at WBN.

1. Chemical Composition

   A. Test Methods

      Infrared (IR) Spectroscopy and Thermogravimetric Analysis (TGA) will be performed to verify that the Thermo-Lag fire barrier materials installed at Watts Bar Unit 1 are representative of the materials used in the fire endurance, ampacity derating, and seismic tests. IR spectroscopy will be conducted in accordance with procedures derived from ASTM E 1252-88, "Standard Practice for General Techniques for Qualitative Infrared Analysis." TGA will be conducted in accordance with procedures derived from ASTM

E 1131-93, "Standard Test Method for Compositional Analysis by Thermogravimetry."

(1) Summary of IR Test Method

IR spectroscopy is used to identify organic and inorganic materials. When subjected to a transmitted or reflected spectra, distinct wavelengths are absorbed by specific compounds. Each compound is characterized by its unique absorption spectra, generally plotted as percent transmittance or reflectance as a function of wavelength (or frequency). Infrared analysis is carried out by comparison of IR absorption spectra of unknown materials with those of known reference materials.

(2) Summary of Thermogravimetry Test Method

TGA is an empirical technique in which a substance is heated at a controlled rate in a specific environment. The mass of the material is recorded as a function of time or temperature. Mass loss over a specific temperature range and in a specific atmosphere provides a compositional analysis of that substance.

B. Baseline Testing and Acceptance Criteria

TVA will perform baseline testing (i.e., IR and TGA analyses) on samples taken from the production lots which were used for fire endurance, ampacity, and seismic testing conducted by TVA to evaluate the acceptability of Thermo-Lag. The results of these IR and TGA analyses will be used to establish acceptance criteria for installed materials.

C. Sampling Frequency

TVA will perform IR and TGA analysis on a sample from each production lot of Thermo-Lag used as a fire barrier at WBN.

D. Lot Homogeneity

TVA will perform lot homogeneity testing on two or more lots of Thermo-Lag installed at WBN. The testing will establish a measure of the variation in chemical composition, and thus product homogeneity, that exists within a typical lot of Thermo-Lag material provided by TSI. The sample size will be selected in accordance with the general inspection levels provided by Military Standard MIL-STD-105E, "Sampling Procedures and Tables for Inspection by Attributes."

E. Sampling Methods

Test specimens required for analysis will be obtained from an interior location of the solid sample. Where practical, the sample will be taken from a general area or several areas rather than removing a small, localized piece of material.

Trowel-grade material will be thoroughly mixed prior to removing a sample for testing. Samples of trowel-grade materials will be cured to the solid form prior to testing.

Material Thickness

The thickness of the Thermo-Lag is verified to meet acceptance criteria during TVA's Quality Control inspections (either at the source or at a TVA facility) using procedures that implement specified values. TVA General Engineering Specification G-98, "Installation, Modification, and Maintenance of Electrical Raceway Fire Barrier Systems," specifies the material thickness. G-98 defines Thermo-Lag 330-1 thicknesses as: Nominal 3/8-inch and Nominal 5/8-inch. The tolerances for these nominal sizes of materials are plus or minus 1/8-inch. These tolerances were the same as those used during TVA's fire endurance, ampacity, and seismic testing. Similar controls for verifying the thickness of Thermo-Lag 770-1 will be implemented.

Material Weight and Density

Density acceptance criteria will be established based on the results of weighing and measuring samples from the material lots used during TVA fire endurance, ampacity derating, and seismic testing. A sample from each lot of material being installed at WBN will be measured to ensure that Thermo-Lag conforms to the density acceptance criteria.

Presence of Voids, Cracks, and Delaminations

Material is verified to meet acceptance criteria for voids, cracks, and delaminations during TVA Quality Control inspections (either at the source or at a TVA facility). TVA General Engineering Specification G-98, "Installation Modification, and Maintenance of Electrical Raceway Fire Barrier Systems," defines acceptance criteria for voids, cracks, and delaminations in Thermo-Lag 330-1:

- Surface voids - Surface voids are unacceptable.
- Cracks - Surface cracks that exceed 2 inches in length and 1/16 inch depth are unacceptable.
- De-lamination - No observable separation of material is allowed.

TVA will not inspect for internal voids. During qualification testing, TVA used standard production Thermo-Lag 330-1 materials manufactured and inspected to the TVA specifications and tolerances described above. While preparing the material for testing, internal voids were discovered during cutting operations for installation. The material was used (with the voids) during testing. No problems resulting from the internal voids were discovered in any of the full scale fire tests. This is because Thermo-Lag 330-1 swells during the sublimation process and closes the internal voids. Therefore, the internal voids that are an inherent part in the manufacturing process of the Thermo-lag 330-1 prefabricated boards and conduit sections are considered to be acceptable.

Fire Endurance Capabilities

TVA performed three phases of fire testing to demonstrate the fire endurance capabilities of Thermo-Lag materials. The first phase of testing consisted of six, full scale, one-hour fire tests for Thermo-Lag 330-1. These tests were submitted to the NRC on July 9, 1993. The second phase of fire testing consisting of seven, full scale, one-hour fire tests for Thermo-Lag 330-1. These tests were submitted to the NRC on December 23, 1994. These 13 fire tests document the fire endurance capabilities of Thermo-Lag 330-1 when installed in accordance with TVA procedures. A third phase of testing is being performed to qualify Thermo-Lag 770-1 as a three-hour fire barrier. The test results will be submitted as they become available.

The fire endurance capabilities of Thermo-Lag fire barrier are dependant on the materials used and the manner in which the Thermo-Lag is installed. TVA's material verification measures summarized in this enclosure (e.g., chemical testing, weight and density measurements) ensure that consistent material is used. TVA's installation procedures, summarized in this enclosure, ensure that Thermo-Lag used in the plant is installed in a manner similar to the Thermo-Lag used during testing. These measures are adequate to ensure that the fire endurance capabilities of the Thermo-Lag fire barrier materials installed at WBN are consistent with the materials used in the fire endurance tests.

Combustibility

No combustibility tests or analyses are planned. Thermo-Lag 330-1 is considered to be a "Limited Combustible." This is based upon the test results described in: NRC Information Notice 92-82; Nuclear Utility Management and Resource Council (NUMARC), "Thermo-Lag 330-1 Combustibility Evaluation Methodology Plant Screening Guide;" American Society for Testing Materials (ASTM) E136, D1929, E1321, and E1354 test results; and Underwriters Laboratory Inc. (UL)-723 test report, File R6076 Project 81NK3238 dated June 16, 1981.

Thermo-Lag is not used as a non-combustible radiant energy heat shield, nor to create combustible-free zones at WBN. The material verification measures described above are considered adequate to ensure that Thermo-Lag 330-1 combustibility variables are controlled.

Flame Spread Rating

No flame spread rating tests or analyses are planned. Thermo-Lag 330-1 was tested by UL in 1981 (UL test 723 - File R6076 Project 81NK3238 dated June 16, 1981). UL indicates a Flame Spread value of 5, Fuel Contribution value of 0 and Smoke Developed value of 15. Additional tests were conducted by NUMARC ("Thermo-Lag 330-1 Combustibility Evaluation Methodology Plant Screening Guide" and ASTM D1929, E1321, and E1354 test results). Based on observations of Thermo-Lag 330-1 performance during TVA's fire endurance tests by qualified engineering personnel, the values obtained by UL and NUMARC are considered to be applicable to WBN. TVA will review the results of the prior tests to establish values for flame spread ratings at WBN and document them in DS-M17.2.2.

Ampacity Derating

TVA performed three phases of ampacity derating tests. The first phase test results (Thermo-Lag 330-1) were submitted to NRC on July 9, 1993. The second (Thermo-Lag 330-1) and third phase (Thermo-Lag 770-1) ampacity test reports will be submitted when they become available.

Ampacity derating associated with a Thermo-Lag fire barrier is dependant on the materials being used and the manner in which the Thermo-Lag is installed. The material verification measures described herein (e.g., chemical testing, weight and density measurements) ensure that consistent material is used. The installation procedures summarized herein ensure that Thermo-Lag used in the plant will be installed in a manner similar to the Thermo-Lag used during testing. These measures are adequate to ensure that the ampacity derating factors used for the Thermo-Lag fire barrier materials installed at WBN are consistent with the derating factors developed during the ampacity derating tests.

Mechanical Properties Such as Tensile Strength, Compressive Strength, Shear Strength, and Flexural Strength

TVA has performed extensive mechanical property (static) testing of the materials used in construction of Thermo-Lag 330-1 fire barriers at WBN. TVA's seismic test reports (static and dynamic) were submitted to the NRC on November 11, 1994.

To provide additional assurance of reliable mechanical properties for seismic qualification, a sample from each lot of material being installed will be tested to ensure that Thermo-Lag used at WBN conforms to board (flat panel) shear strength acceptance criteria. Board shear strength acceptance criteria will be determined in accordance with ASTM D 4255 using a sample from the material lots that were used for TVA testing.

Other mechanical properties of the Thermo-Lag 330-1, such as tensile strength, compressive strength, and flexural strength, do not need to be further tested. In the TVA designs, the stainless and carbon steel mesh (stress skin) bonded to the Thermo-Lag 330-1 board is the principal material used to ensure that Thermo-Lag 330-1 remains in place under postulated design basis seismic events. Tensile strength, compressive strength, and flexural strength of Thermo-Lag 330-1 depend primarily on the physical properties of the steel mesh. Since steel properties are relatively consistent and not controlled by TSI, no confirmatory test program is needed to establish the consistency of those properties.

Thermo-Lag 770-1 material lots will be tested for punching shear strength using procedures appropriate for the circumstances. WBN Thermo-Lag 770-1 ERFBS' will be seismically qualified for position retention based on the punching shear strength of the material and tensile strength of the specified external tie wires.

NRC REQUEST - 1b

"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."

TVA RESPONSE

Sample sizes used for verifying that Thermo-Lag conforms to regulatory requirements are described above. Pending the results of the homogeneity verification testing described above, TVA considers it sufficient to take a sample from each lot of Thermo-Lag used at WBN since the material within a lot is believed to be consistent.

NRC REQUEST - 1c

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

TVA RESPONSE

Thermo-Lag material is verified to conform to regulatory requirements during procurement and installation. Procurement of Thermo-Lag is currently on-going. The installation schedule is part of the site construction schedule which is being made available for NRC review on a periodic basis.

NRC REQUEST - 1d

"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."

TVA RESPONSE

TVA will submit a supplemental report providing the requested information within 60 days after completing installation of Thermo-Lag in WBN Unit 1.

IMPORTANT BARRIER PARAMETERS

NRC REQUEST - 2a

"Describe the examinations and inspections that will be performed to obtain the important barrier parameters listed below for the Thermo-Lag fire barrier configurations installed at Watts Bar:

1. Raceway orientation (horizontal, vertical, radial bends)
2. Conduit
3. Junction boxes and lateral bends
4. Ladder-back cable tray with single layer cable fill
5. Cable tray with T-Section
6. Raceway material (aluminum, steel)
7. Support protection, thermal shorts (penetrating elements)
8. Air drops
9. Baseline fire barrier panel thickness
10. Preformed conduit panels
11. Panel rib orientation (parallel or perpendicular to the raceway)
12. Unsupported spans
13. Stress skin orientation (inside or outside)
14. Stress skin over joints or no stress skin over joints
15. Stress skin ties or no stress skin ties
16. Dry-fit, post-buttered joints or prebuttered joints
17. Joint gap width
18. Butt joints or grooved and scored joints
19. Steel bands or tie wires
20. Band/wire spacing
21. Band/wire distance to joints
22. No internal bands in trays
23. No additional trowel material over sections and joints or additional trowel material applied
24. No edge guards or edge guards
25. Cable size and type (power, control, or instrumentation).
26. Cable jacket type (thermoplastic, thermoset) and materials.
27. Cable conductor insulation type (thermoplastic, thermoset plastic) and materials.
28. Cable fill and distribution of cables within the protected conduit or cable tray.
29. Proximity of cables to the unexposed (inside) surfaces of the fire barrier.
30. Presence of materials between the cables and the unexposed side of the fire barrier material (for example, Sealtemp cloth, which is used in the NUMARC test specimens).
31. Cable operating temperature.
32. Temperatures at which the cables can no longer perform their intended function when energized at rated voltage and current."

TVA RESPONSE[1]

The importance of variations in fire barrier parameters has been determined from TVA'S fire endurance, seismic, and ampacity test programs. The important design parameters are controlled by the following TVA design standards:

1) DS-M17.2.2, "Electrical Raceway Fire Barrier Systems."

2) DS-C1.6.16, "Structural Evaluation of Electrical Raceway Fire Barrier Systems."

3) DS-E12.6.3, "Auxiliary and Control Power Cable Sizing Up to 15,000 Volts."

These TVA design standards and applicable WBN design criteria provide the technical basis for the installation drawings and installation procedures. WBN Thermo-Lag 330-1 Electrical Raceway Systems (ERFBS) are being installed in accordance with the following documents:

1) General Engineering Specification G-98, "Installation, Modification, and Maintenance of Electrical Raceway Fire Barrier Systems."

2) 47W243 Drawing Series of Typical Thermo-Lag 330-1 ERFBS Enclosures.

3) Design Change Notice (DCN) M-11727.

4) WBN Modification/Addition Instruction (MAI) 3.10, "Application of Thermo-Lag Fire Barriers on Electrical Raceways."

TVA General Engineering Specification G-98 contains important Thermo-Lag 330-1 installation and inspection parameters based on lessons learned from TVA's fire endurance, seismic, and ampacity test programs, and feedback from installations completed to date. TVA General Engineering Specification G-98, the 47W243 series drawings, and DCN M-11727 provide the design output for Thermo-Lag 330-1 ERFBS installations at WBN-1. Watts Bar Site Specific Implementing Instruction MAI 3.10 provides the method for control, application, and verification of Thermo-Lag 330-1 ERFBS' in accordance with design documents.

The following responses correspond to the specific parameters listed in NRC Request 2a. In each case a brief description is given of the basis for associated inspections and examinations being performed for the WBN installations, as justified by TVA's testing program and design standards for Thermo-Lag 330-1. Note that all of the WBN-1 Thermo-Lag 330-1 ERFBS installations will be new. Previously existing Thermo-Lag 330-1 ERFBS installations have been removed.

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1 The fire endurance test reports discussed in this section of the response that document the results of TVA testing of Thermo-Lag 330-1 were submitted on July 9, 1993, and December 23, 1994.

Requirements for the limited scope of Thermo-Lag 770-1 ERFBS used for 3-hour fire barriers will be added to the design standards, installation drawings, and implementing procedures upon completion of the associated TVA tests.

1. Raceway Orientation (horizontal, vertical, radial bends)

   TVA varied raceway orientation as a part of the fire endurance testing. Typically, fire test assemblies had the raceway running both horizontally and vertically in the same test. Items used to change direction such as radial bends and condulets (lateral bends) were included in the testing. TVA also tested assemblies running vertical to ensure designs were not position dependent. Additionally, TVA considered potential raceway orientations and locations when defining the required response spectra for seismic testing.

   Important barrier parameters for different raceway orientations are documented in TVA Design Standard DS-M17.2.2. TVA Design Standard DS-C1.6.16 provides associated methods for seismic qualification. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents (e.g., General Engineering Specification G-98, WBN 47W243 series drawings, and MAI 3.10).

2. Conduit

   TVA varied the sizes of conduits to determine the number of layers and thickness of Thermo-Lag 330-1 required for each size during fire endurance testing. Important barrier parameters for conduits are documented in DS-M17.2.2. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

3. Junction Boxes and Lateral Bends

   TVA performed fire endurance testing on the smallest and largest anticipated junction boxes and lateral bends expected to be encountered at WBN. Important barrier parameters are documented in DS-M17.2.2. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

4. Ladder-back Cable Tray With Single Layer Cable Fill

   TVA performed a fire endurance test on a ladder back cable tray with a single layer of cable fill to compare the results with other amounts of cable fill. Important barrier parameters for this attribute are documented in DS-M17.2.2. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

5. Cable Tray With T-Section

   TVA performed a fire endurance test on the largest expected cable tray T-Section. Important barrier parameters are documented in DS-M17.2.2. TVA Design Standard DS-C1.6.16 provides allowable stresses and associated analysis methods for seismic qualification. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

6. Raceway Material (Aluminum, Steel)

TVA tests used steel and aluminum conduits. The cable trays used in the fire endurance and seismic testing were steel, which is typical of the cable trays to be protected at WBN. Important barrier parameters are documented in DS-M17.2.2. TVA Design Standard DS-C1.6.16 provides associated methods for seismic qualification. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

7. Support Protection, Thermal Shorts (Penetrating Elements)

Both phases of the TVA fire endurance test program included tests using steel supports to determine support protection and thermal short parameters. The supports in the testing were steel, which is typical of the supports being protected at WBN. Important barrier parameters are documented in DS-M17.2.2. Primary raceway supports are evaluated and protected, if required, such that the supports retain sufficient strength to ensure raceway functionality during the postulated fire event. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

8. Air Drops

TVA tested essential air drop cables to determine their protection parameters. The air drops in the testing were typical of the ones to be protected at WBN. Important barrier parameters are documented in DS-M17.2.2. TVA Design Standard DS-C1.6.16 provides associated methods for seismic qualification. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

9. Baseline Fire Barrier Panel Thickness

Baseline fire barrier panel thickness tolerances were determined prior to the construction of the test assemblies. TVA has defined the thickness as: Nominal 3/8-inch and Nominal 5/8-inch. The tolerances for these nominal sizes of materials are plus or minus 1/8-inch. This requirement corresponds to the Thermo-Lag 330-1 material used in the TVA testing program. This barrier parameter is verified by TVA during Quality Control inspections at the manufacturer or at a TVA facility, in accordance with G-98 requirements.

10. Preformed Conduit Panels

Baseline preformed conduit fire barrier panel thickness tolerances were determined prior to the construction of the test assemblies. TVA has defined the thickness as: Nominal 3/8-inch and Nominal 5/8-inch. The tolerances for these nominal sizes of materials are plus or minus 1/8-inch. This requirement corresponds to the Thermo-Lag 330-1 material used in the TVA fire testing. This barrier parameter is verified by TVA during Quality Control inspections at the manufacturer or at a TVA facility, in accordance with G-98 requirements.

11. Panel Rib Orientation

Panel rib orientation is not considered to be a critical attribute since seismic and fire endurance qualification did not rely on the presence of panel ribs. However, panel rib orientation is specified in the WBN installation instructions and 47W243 series drawings.

12. Unsupported Spans

TVA evaluates and seismically qualifies each Thermo-Lag 330-1 installation on unsupported spans in accordance with DS-C1.6.16. Typical qualified unsupported span configurations are shown in WBN 47W243 series drawings. Installation, examination, and inspection are in accordance with G-98 and MAI 3.10.

13. Stress Skin Orientation (Inside or Outside)

Standard production Thermo-Lag 330-1 boards and preformed conduit sections are manufactured with internal stress skin. In addition to the internal stress skin, a number of TVA designs use external stress skin. For these designs external stress skin is an important parameter for fire endurance and seismic qualification. The designs specifying stress skin orientation are documented in DS-M17.2.2 and WBN 47W243 series drawings. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

14. Stress Skin Over Joints or No Stress Skin Over Joints

TVA tested a number of external applications of stress skin. The designs specifying stress skin orientation are documented in DS-M17.2.2 and WBN 47W243 series drawings. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

15. Stress Skin Ties or No Stress Skin Ties

TVA tested a number of designs using stress skin ties (stitching). The designs specifying stress skin tie placement are documented in DS-M17.2.2. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

16. Dry-fit, Post-buttered Joints or Prebuttered Joints

TVA one-hour ERFBS designs use prebuttered joints. This barrier parameter is documented in DS-M17.2.2. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

17. Joint Gap Width

Joint gap width is specified in DS-M17.2.2. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

18. Butt Joints or Grooved and Scored Joints

TVA fire endurance testing program tested a number of designs using both butt joints and grooved and scored (score and fold) joints. The designs specifying the type of joint are documented in DS-M17.2.2. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

19. Steel Bands or Wire Ties

The designs specifying use of steel bands or wire ties are documented in DS-M17.2.2 and WBN 47W243 series drawings. TVA Design Standard DS-C1.6.16 provides associated methods for seismic qualification. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

20. Band/Wire Spacing

Tie wire spacing requirements were determined by TVA fire endurance testing and seismic qualification evaluations. The designs specifying wire spacing are documented in DS-M17.2.2 and WBN 47W243 series drawings. TVA Design Standard DS-C1.6.16 provides methods for seismic qualification. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

21. Band/Wire Distance to Joints

Tie wire distance from joint requirements were determined in the TVA testing. The designs specifying wire distance to joints are documented in DS-M17.2.2. TVA Design Standard DS-C1.6.16 provides associated methods for seismic qualification. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

22. No Internal Bands in Trays

Internal bands are not used inside cable trays (i.e., their use is not prescribed in TVA design and installation documents). Wire ties are installed inside the fire barrier where applicable in accordance with DS-M17.2.2. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

23. No Additional Trowel Material Over Sections and Joints or Additional Trowel Material Applied

TVA designs require additional trowel grade be used in the finishing process over sections and joints. The designs specifying use of trowel grade material are documented in DS-M17.2.2. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

24. No Edge Guards or Edge Guards

Stainless steel edge guards are not used in the WBN designs (i.e., their use is not prescribed in TVA design and installation documents).

25. Cable Size and Type (Power, Control, or Instrumentation)

Cable size and type are not considered to be critical attributes for determining the ability of a protected cable to withstand a fire because the ERFBS designs used at WBN meet the 250°F average/325°F maximum temperature rise acceptance criteria provided in Supplement 1 to Generic Letter 86-10. Therefore, no examinations or inspections are needed to identify cable size and type to ensure that the cable is able to withstand the effects of a fire.

Cable size and type are considerations when determining the effects of ampacity qualification. Ampacity derating factors are assigned depending on the type of Thermo-Lag enclosure used. TVA design control measures ensure that the appropriate ampacity derating factor is used where a Thermo-Lag 330-1 enclosure is specified.

26. Cable Jacket Type (Thermoplastic, Thermoset) and Materials

Cable jacket type is not considered to be a critical attribute because the TVA designs used at WBN meet the 250°F average/325°F maximum temperature rise acceptance criteria provided in Supplement 1 to Generic Letter 86-10. Therefore, no examinations or inspections are needed to identify cable jacket type.

27. Cable Conductor Insulation Type (Thermoplastic, Thermoset Plastic) and Materials

Cable insulation type is not considered to be a critical attribute because the TVA designs used at WBN meet the 250°F average/325°F maximum temperature rise acceptance criteria provided in Supplement 1 to Generic Letter 86-10. Therefore, no examinations or inspections are needed to identify cable insulation type.

28. Cable Fill and Distribution of Cables Within the Protected Conduit or Cable Tray

In conduits and air drops, cable fill and distribution are not considered to be critical attributes because the TVA designs used at WBN meet the 250°F average/325°F maximum temperature rise acceptance criteria provided in Supplement 1 to Generic Letter 86-10. TVA fire endurance testing to establish the acceptable designs were performed with no cables installed. Installed cable will increase the interior thermal mass and result in improved performance (i.e., inside temperatures will be lower than those which occurred during the tests). Therefore, no examinations or inspections are needed to identify cable fill and distribution in conduits and air drops.

To meet the 250°F average/325°F maximum temperature rise acceptance criteria provided in Supplement 1 to Generic Letter 86-10, TVA determined that a minimum cable mass of 1.33 pounds-per-linear foot must be present in a single 18-inch cable tray when it is protected by Thermo-Lag 330-1. Where insufficient mass exists, additional cable is installed to meet the mass requirements specified in TVA designs. Minimum mass requirements are specified in DS-M17.2.2.

Seismic qualification is based on a pre-determined cable weight. Cable fill and cable weight are tracked and maintained in the WBN CCRS data base and are considered when evaluating the seismic adequacy by DS-C1.6.16 methods. Installation, examination, and inspection are in accordance with corresponding installation and inspection documents.

29. Proximity of Cables to the Unexposed (Inside) Surfaces of the Fire Barrier

Cable proximity to the surface of the fire barrier is not considered to be a critical attribute at WBN. Cables in cable trays and conduits do not come into contact with the fire barrier. Free air drop designs used at WBN meet the 250°F average/325°F maximum temperature rise acceptance criteria provided in Supplement 1 to Generic Letter 86-10 at the unexposed surface of the fire barrier. Therefore, no examinations or inspections are needed to identify cable proximity to the fire barrier.

30. Presence of Materials Between the Cables and the Unexposed Side of the Fire Barrier Material (For Example, Sealtemp Cloth, Which is Used in the NUMARC Test Specimens)

Material presence is not considered to be a critical attribute because the TVA designs used at WBN meet the 250°F average/325°F maximum temperature rise acceptance criteria provided in Supplement 1 to Generic Letter 86-10 without specifying additional material. Therefore, no examinations or inspections are needed to ensure the presence of additional materials. It should be noted that many cables at WBN have been coated with the fire retardant "Vimasco." This coating was applied before the Appendix R requirements were promulgated, and no credit is taken for its presence.

31. Cable Operating Temperature

Cable operating temperature is not considered to be a critical attribute because the TVA designs used at WBN meet the 250°F average/325°F maximum temperature rise acceptance criteria provided in Supplement 1 to Generic Letter 86-10. Therefore, no examinations or inspections are needed to identify the cable operating temperature (power, control, or instrumentation).

32. Temperatures at Which the Cables Can No Longer Perform Their Intended Function When Energized at Rated Voltage and Current

These temperatures are not considered to be critical attributes because the TVA designs used at WBN meet the 250°F average/325°F maximum temperature rise acceptance criteria provided in Supplement 1 to Generic Letter 86-10. Therefore, no examinations or inspections are needed to identify the temperatures at which the cables (power, control, or instrumentation) can no longer perform their intended function when energized at rated voltage and current.

NRC REQUEST - 2b

"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."

TVA RESPONSE

This information request is not applicable to WBN. Material and important barrier parameters are being verified during construction of the barrier.

NRC REQUEST - 2c

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

TVA RESPONSE

This information request is not applicable to WBN. Material and important barrier parameters are being verified during construction of the barrier.

NRC REQUEST - 2d

"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."

TVA RESPONSE

This information request is not applicable to WBN. Material and important barrier parameters are being verified during construction of the barrier.

ENCLOSURE 2

WATTS BAR NUCLEAR PLANT (WBN) UPDATED RESPONSE TO
GENERIC LETTER (GL) 92-08
"THERMO-LAG 330-1 FIRE BARRIERS"

The following provides an update to the information contained in TVA's April 16, 1993, response to GL 92-08.

NRC ITEM

1. "State whether Thermo-Lag 330-1 barriers are relied upon (a) to meet 10 CFR 50.48, to achieve physical independence of electrical systems, (b) to meet a condition of a plant's operating license, or (c) to satisfy a licensing commitment. If applicable, state that Thermo-Lag 330-1 is not used at the facility. This generic letter applies to all 1-hour and all 3-hour Thermo-Lag materials and barrier systems assembled by any assembly method such as by assembling preformed panels and conduit shapes, as well as spray, trowel and brush-on applications."

TVA RESPONSE

1. Thermo-Lag 330-1 fire barrier systems are only being used at WBN for fire protection of safe shutdown capability to meet TVA's licensing commitment to comply with 10 CFR 50 Appendix R, Section III.G.2 as described in the WBN Fire Protection Report (Item c above). Thermo-Lag 330-1 is being used in one-hour electrical raceway fire barrier systems (ERFBS') at WBN. TVA will also be using Thermo-Lag 770-1 material for three-hour ERFBS'. No response is required for items a and b.

NRC ITEM

2. "If Thermo-Lag 330-1 barriers are used at the facility,

   (a) State whether or not the licensee has qualified the Thermo-Lag 330-1 fire barriers by conducting fire endurance tests in accordance with the NRC's requirements and guidance or licensing commitments.

   (b) State (1) whether or not the fire barrier configurations installed in the plant represent the materials, workmanship, methods of assembly, dimensions, and configurations of the qualification test assembly configuration; and (2) whether or not the licensee has evaluated any deviations from the tested configurations.

   (c) State (1) whether or not the as-built Thermo-Lag 330-1 barrier configurations are consistent with the barrier configurations used during the ampacity derating tests relied upon by the licensee for the ampacity derating factors used for all raceways protected by Thermo-Lag 330-1 (for fire protection of safe shutdown capability or to achieve physical independence of electrical systems) and (2) whether or not the ampacity derating test results relied upon by the licensee are correct and applicable to the plant design."

TVA RESPONSE

(a) Thermo-Lag 330-1 fire barrier systems being installed at WBN have been qualified based upon the results of fire endurance testing conducted in accordance with TVA commitments as described in the Thermo-Lag 330-1 fire endurance test results submitted to NRC on July 9, 1993, and December 23, 1994.

Thermo-Lag 770-1 installations are being qualified using test methods and procedures similar to those used to qualify Thermo-Lag 330-1.

(b) (1) - The Thermo-Lag fire barrier systems being installed at WBN represent the materials, workmanship, methods of assembly, dimensions, and configurations of the test assemblies qualified for use at WBN. The small amount of Thermo-Lag 330-1 that was installed prior to the performance of the fire endurance tests discussed above has been removed.

(2) - Deviations from the configurations qualified by test are being identified during the construction of WBN raceway fire barriers. Each deviation is evaluated by engineering to ensure that the installations are bounded by the acceptable test assembly configurations. The engineering evaluations to show that acceptable Thermo-Lag configurations are being installed are available onsite for review.

(c) (1) - The Thermo-Lag 330-1 raceway fire barriers being installed at WBN are consistent with or bounded by the barrier configurations used during ampacity derating tests. Ampacity derating factors used for safe-shutdown raceways protected by Thermo-Lag 330-1 fire barrier systems are consistent with those developed during testing.

Ampacity derating factors for Thermo-Lag 770-1 are being developed based on TVA tests. The test results are scheduled to be submitted as they become available. The Thermo-Lag 770-1 raceway fire barriers to be installed at WBN will be consistent with or bounded by the barrier configurations used during ampacity derating tests. Ampacity derating factors used for safe-shutdown raceways protected by Thermo-Lag 770-1 fire barrier systems will be consistent with those developed during testing.

(2) - Thermo-Lag 330-1 ampacity derating test results used are correct and applicable to the designs being installed at WBN. The ampacity derating test results for Thermo-Lag 330-1 raceway fire barriers being used at WBN have been submitted for NRC's review. The ampacity derating test for Thermo-Lag 330-1 was performed in two phases. The first phase test results were submitted to the NRC on July 9, 1993. The second phase test results will be submitted as they become available.

Thermo-Lag 770-1 ampacity derating test results used will be correct and applicable to the designs installed at WBN.

NRC ITEM

3. "With respect to any answer to items 2(a), 2(b), or 2(c) above in the negative, (a) describe all corrective actions needed and include a schedule by which such actions shall be completed and (b) describe all compensatory measures taken in accordance with the technical specifications or administrative controls. When corrective actions have been completed, confirm in writing their completion."

TVA RESPONSE

3. No response required. The Thermo-Lag being installed at WBN conforms to TVA requirements.

NRC ITEM

4. "List all Thermo-Lag 330-1 barriers for which answers to Item 2 cannot be provided in the response due within 120 days from the date of this generic letter, and include a schedule by which such answers shall be provided."

TVA RESPONSE

4. No response required.

ENCLOSURE 3

WATTS BAR NUCLEAR PLANT (WBN) RESPONSE TO
REQUEST FOR ADDITIONAL INFORMATION REGARDING
GENERIC LETTER 92-08
"THERMO-LAG 330-1 FIRE BARRIERS"

LIST OF COMMITMENTS

1. Procedures will be developed to implement the Thermo-Lag 330-1 material verification measures described in Enclosure 1 to this letter. The procedures will be completed by April 28, 1995, and made available for NRC review.

2. TVA will submit a supplemental report providing the information requested in Item 1d within 60 days after completing installation of Thermo-Lag in WBN Unit 1.

3. The test results to qualify Thermo-Lag 770-1 as a three-hour fire barrier will be submitted as they become available.

4. Requirements and tests for the limited scope of Thermo-Lag 770-1 ERFBS to be used for three-hour fire barriers will be added to the design standards, installation drawings, and implementing procedures upon completion of the associated TVA tests. These requirements will ensure that the material control measures, qualification requirements, and applicable important barrier parameters discussed in Enclosures 1 and 2 are met.