

December 19, 1994

Donald F. Schnell
Senior Vice President
Nuclear

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, D.C. 20555

ULNRC-3116

Gentlemen:

DOCKET NUMBER 50-483
CALLAWAY PLANT
THERMO-LAG 330-1 FIRE BARRIERS

- Reference: 1. Request for Additional Information
Regarding Generic Letter 92-08,
"Thermo-Lag 330-1 Fire Barriers,"
Pursuant to 10 CFR 50.54(f), dated
December 21, 1993
2. ULNRC-2955, dated February 10, 1994
3. Follow-Up to the Request for
Additional Information Regarding
Generic Letter 92-08 Issued Pursuant to
10CFR50.54(f), dated September 19, 1994

Reference 3 requests Licensees to provide follow-up information to that provided in their initial response to Reference 1. The information requested was for the following sections: Section II, "Important Barrier Parameters," Section III,, "Thermo-Lag Fire Barriers Outside the Scope of the Nuclear Energy Institute (NEI) (formerly NUMARC) Program," Section IV, "Ampacity Derating," and Section VI, "Schedules". For completeness we have duplicated our response from the original submittal, Reference 2, and have addressed all of the sections (Attachment 2). Revision bars are used to indicate the areas that differ from the first response. This letter supercedes Reference 2.

Based on the test program completed to date by the Nuclear Energy Institute, we have determined that additional programs are needed for the evaluation of Thermo-Lag installations. These programs are described in Attachment 1.

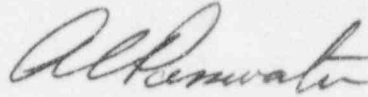
Union Electric hereby submits its 90 day response to the follow-up request for additional

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information regarding Generic Letter 92-08, "Thermo-Lag
330-1 Fire Barriers," pursuant to 10 CFR 50.54(f).

Should you have any questions or need additional
information concerning this matter, please contact us.

Very truly yours,



for Donald F. Schnell

JMC/dls

Attachments

STATE OF MISSOURI)
) S S
CITY OF ST. LOUIS)

Alan C. Passwater, of lawful age, being first duly sworn upon oath says that he is Manager, Licensing and Fuels (Nuclear) for Union Electric Company; that he has read the foregoing document and knows the content thereof; that he has executed the same for and on behalf of said company with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By Alan C. Passwater
Alan C. Passwater
Manager, Licensing and Fuels
Nuclear

SUBSCRIBED and sworn to before me this 19th day
of December, 1994.

Barbara J. Pfaff
BARBARA J. PFAFF
NOTARY PUBLIC--STATE OF MISSOURI
MY COMMISSION EXPIRES APRIL 22, 1997
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INTRODUCTION TO THE EVALUATION OF THERMO-LAG INSTALLATIONS

Union Electric's response to the original 50.54(f) letter was based on the assumption that the majority of installations would be covered by the draft NEI Application Guide and that these installations would be inspected to verify compliance with the guide; or if required, upgraded to meet the three hour requirement. At that time, only a limited number of applications, which are listed in Table 1 of Attachment 2, were felt to be outside those to be covered by the NEI Application Guide. Union Electric had initiated actions which supplement the NEI effort to resolve these installations. However, upon completion of the NEI Application Guide generic activities, it was determined that the majority of applications at Callaway were not covered by the Application Guide, since testing of baseline post-buttered configurations was not completed.

In an independent effort, the Callaway Plant is utilizing the Fire Induced Vulnerability Evaluation (FIVE) methodologies to review the fire protection system as part of the Individual Plant Examination of External Events (IPEEE) review. Upon reviewing the scope of work required to complete the FIVE analysis, it was determined that the technology could be used to provide a rigorous deterministic method for evaluating each Thermo-Lag installation to determine if the actual plant configuration was adequate for the hazard.

Union Electric has recently joined the Electric Power Research Institute (EPRI) Tailored Collaboration (TC) effort as part of its resolution of Thermo-Lag issues. This decision was based on the following factors:

1. The TC provides an engineering tool that allows us to evaluate Thermo-Lag thickness not specifically tested by NEI and for post-buttered joints.
2. Much of the modeling required to analytically determine the hazard in each fire area containing Thermo-Lag could be accomplished by coordinating the effort to resolve Thermo-Lag issues with the FIVE efforts.
3. Based on the hazard and interpolated behavior of Thermo-Lag represented by EPRI tools, the effectiveness of the installed barrier could be evaluated.
4. If the above evaluation in conjunction with the installed fire suppression capability of the plant, the expected response of the fire brigade, and the actual requirements for the plant system/function being protected determined that adequate protection was provided, then a 10CFR 50.59 evaluation will be completed documenting the analysis. If the analysis demonstrates that adequate protection is not provided, then plant modifications would be initiated to provide that protection.

The intent of the Tailored Collaboration effort is to provide utilities with the tools necessary to evaluate the installed Thermo-Lag configurations using state-of-the-art analytical methods. Union Electric will use these tools to determine effective plant modifications where adequacy of the installations can not be demonstrated. There are several steps in this evaluation effort:

1. Combustible loadings are calculated based on a review of in-situ combustibles in the fire area. This is accomplished by using the IPEEE and FIVE methodologies to determine the heat sources. It includes a review of the drawings and a walkdown of the fire area. Combustibles in a given fire area are assumed to ignite and burn until consumed.
2. Fire modeling techniques are used to show that the barrier is acceptable for the hazard. Use of fire modeling techniques is the next logical step, following use of the NEI Application Guide, for the raceways which have not been shown to meet conditions of the Plant's Operating License or satisfy licensing commitments (Appendix R). In these cases where strict compliance to Section III.G of Appendix R is not attainable, Callaway will perform 50.59 evaluations which will contain a technical basis that demonstrates the in-plant condition provides an adequate level of fire safety. Rather than relying heavily on engineering judgment, a rigorous deterministic evaluation will be performed which will provide quantifiable results.
3. In cases where fire modeling techniques are unable to qualify a barrier, Section V of Attachment 2 describes specific alternatives available for achieving compliance with NRC fire protection requirements in plant areas that contain Thermo-Lag fire barriers.

When actual combustible loadings are determined and compared to 1 and 3-hour fire barriers, preliminary reviews indicate that the fire areas inside the Callaway facility have levels of safety far beyond those needed to assure protection of safe shutdown functions. As such, in many fire areas a reduction in fire barrier rating, as determined during recent industry testing, may have no impact on the defense in depth objectives of Appendix R.

RESPONSE TO THE FOLLOW-UP TO THE REQUEST
FOR ADDITIONAL INFORMATION REGARDING GENERIC LETTER 92-08

I. Thermo-Lag Fire Barrier Configurations and Amounts

In Reference 1, Action Item I.B.1 requested Licensees to describe the Thermo-Lag 330-1 barriers installed in the plant to:

- a. meet 10 CFR 50.48 or Appendix R to 10 CFR Part 50,
- b. support an exemption from Appendix R,
- c. achieve physical independence of electrical systems,
- d. meet a condition of the plant operating license,
- e. satisfy licensing commitments.

RESPONSE:

| Attachment 3 to this response lists the Thermo-Lag 330-1 barriers installed in the plant to meet conditions of the plant's operating license and to satisfy licensing commitments including 10 CFR 50, Appendix A, General Design Criteria 3 to ensure safe shutdown capability in the event of a fire.

| Attachment 4 to this response lists the Thermo-Lag 330-1 barriers installed in the plant to achieve physical independence of electrical systems.

Action Item I.B.1 also requested Licensees to include the following information: the intended purpose and fire rating of the barrier (for example, 3-hour fire barrier, 1-hour fire barrier, radiant energy heat shield), and the type and dimension of the barrier (for example, 8-ft by 10-ft wall, 4-ft by 3-ft by 2-ft equipment enclosure, 36-inch-wide cable tray, or 3-inch-diameter conduit).

RESPONSE:

| Attachments 3 and 4 also list the intended purpose, fire rating, type, and dimension of each barrier.

Action Item I.B.2 requested Licensees to submit, for the total population of Thermo-Lag fire barriers described under Item I.B.1, an approximation of:

- a. For cable tray barriers: the total linear feet and square feet of 1-hour barriers and the total linear feet and square feet of 3-hour barriers.
- b. For conduit barriers: the total linear feet of 1-hour barriers and the total linear feet of 3-hour barriers.

- c. For all other fire barriers: the total square feet of 1-hour barriers and the total square feet of 3-hour barriers.
- d. For all other barriers and radiant energy heat shields: the total linear feet or square feet of 1-hour barriers and the total linear or square feet of 3-hour barriers, as appropriate for the barrier configuration or type.

RESPONSE:

Callaway has approximately 31 linear feet (161 square feet) of 3-hour cable tray barriers, this includes cable tray fire stops, and there are no 1-hour cable tray barriers. In response to Item I.B.2.b, Callaway has approximately 132 linear feet of 1-hour conduit barriers and approximately 614 linear feet of 3-hour conduit barriers. In response to Item I.B.2.c, Callaway originally had approximately 517 square feet of other 3-hour barriers which has been reduced to 139 square feet by plant modifications. This includes junction boxes, valve enclosures and hatch covers. In response to Item I.B.2.d, Callaway has approximately 743 linear feet of 1-hour conduit radiant energy heat shields, approximately 105 square feet of 1-hour junction box radiant energy heat shields, approximately 20 square feet of 1-hour junction box fire barriers, and approximately 52 linear feet of 3-hour conduit radiant energy heat shields.

II. Important Barrier Parameters

Action Item II.B.1 requested that Licensees state whether or not they had obtained and verified each of the listed parameters for each Thermo-Lag barrier installed in the plant. If not, Licensees were to discuss the parameters they had not obtained or verified.

RESPONSE:

Discussion with Science Applications International Corporation (SAIC), the lead consultant for the EPRI TC effort, revealed that there are only 3 parameters which are important with respect to the qualification of the Thermo-Lag fire barriers. These are:

- Raceway size
- Baseline fire barrier thickness
- Band/wire spacing

The data required to demonstrate baseline fire barrier thickness and band/wire spacing will be obtained to support the TC analysis. The parameters listed below will be documented as

needed on a barrier by barrier basis as part of the Thermo-Lag evaluation process:

1. Support protection, thermal shorts (penetrating elements).
2. Preformed conduit panels.
3. Butt joints, or grooved and scored joints.
4. Steel bands or tie wires.
5. Band/wire distance to joints.
6. No additional trowel material over sections and joints or additional trowel material applied.
7. Interfaces between Thermo-Lag materials and other fire barrier materials or building features.
8. Internal supports.
9. Chemical properties of Thermo-Lag materials.

With respect to the parameters of importance concerning cables protected by fire barriers, Callaway has obtained and verified the eight (8) items listed in Action Item II.A. These are listed below for clarity. It should be noted that there are no materials between the cables and the unexposed side of the fire barrier material (for example, Sealtemp cloth).

1. Cable size and type (power, control, or instrumentation).
2. Cable jacket type (thermoplastic, thermoset) and materials.
3. Cable conductor insulation type (thermoplastic, thermoset plastic) and materials.
4. Cable fill and distribution of cables within the protected conduit or cable tray.
5. Proximity of cables to the unexposed (inside) surfaces of the fire barrier.
6. Presence of materials between the cables and the unexposed side of the fire barrier material (for example, Sealtemp cloth, which is used in the NEI test specimens).
7. Cable operating temperature.
8. Temperatures at which the cables can no longer perform their intended function when energized at rated voltage and current.

As requested in Action Item II.B.1, detailed information will be retained on site for NRC audit of the known parameters.

Action Item II.B.2 requested that Licensees state, for any parameter that is not known or has not been verified, how they will evaluate the in-plant barrier for acceptability.

RESPONSE:

During the Callaway Thermo-Lag evaluation process, Callaway will model each of the areas containing Thermo-Lag as described above. Where needed, to support the fire modeling evolution, Callaway will inspect each section of raceway protected by Thermo-Lag on a barrier by barrier basis. The results of these

inspections will be compared to the fire model to assure that the model bounds the actual installation. Callaway will update databases which depict the key attributes of the Thermo-Lag barriers, in conjunction with drawings which show the configuration and location of the Thermo-Lag on plant equipment. We expect that one of the following five methods will be taken to evaluate parameters, and therefore the barrier, that are not known or have not been verified:

1. Perform additional calculations, testing (destructive or non-destructive), or analyses to justify the parameter and therefore the barrier as adequate for the hazard;
2. Upgrade the barrier to new test/installation/modeling criteria;
3. Replace the barrier with another approved fire barrier material;
4. Eliminate the need for the barrier by re-routing electrical circuits; or
5. Evaluate the need for the barrier in view of safe shutdown alternatives.

Action Item II.B.3 requested that Licensees describe the type and extent of the unknown parameters at their plant in the context of NEI's application guideline.

RESPONSE:

Parameters listed under Action Item II.B.1 will be determined as required during the Thermo-Lag evaluation effort.

III. Thermo-Lag Fire Barriers Outside the Scope of the NEI Program

Action Items III.B.1 and III.B.2 requested that Licensees perform the following:

1. Describe the barriers discussed under Item I.B.1 that will not be bounded by the NEI test program; and
2. Describe the plant-specific corrective action program or plan that is expected to be used to evaluate the fire barrier configurations particular to the plant. This description should include a discussion of the evaluations and tests being considered to resolve the fire barrier issues identified in GL 92-08 and to demonstrate the adequacy of existing in-plant barriers.

RESPONSE:

Listed below in Table 1, are the barriers discussed under Item I.B.1 that will not be bounded by the NEI test data. The Callaway corrective action program or plant modification is listed for each barrier, which will address the corresponding fire barrier configuration.

TABLE-1

BARRIER	CORRECTION ACTION
ALHV0032 Valve Enclosure	Callaway Plant modification 89-1047 has been implemented to remove the 3-hour Thermo-Lag valve enclosure and replace it with 20 foot separation, no intervening combustibles, automatic detection, and automatic suppression in accordance with 10 CFR Part 50, Appendix R. The modification is complete.
RHR and Containment Spray Hatch Covers	Callaway Plant modification 93-1010 has been implemented to replace the 3-hour Thermo-Lag hatch covers with 1/4" checker-plate steel. A calculation to show that the 1/4" checker-plate provides an adequate fire barrier is currently scheduled for completion by 12/31/94. An evaluation to address 50.59 issues and Callaway fire protection license conditions is scheduled to be completed by 2/28/95.
Buttress Hatch Covers	The buttress hatch covers consist of 3-hour Thermo-Lag on 1/4" steel plate. This configuration will be evaluated to leave the installation "as-is" and show that the hatch covers prevent the propagation of fire and hot gases with or without the Thermo-Lag covering. Completion of the calculation is currently scheduled for 12/31/94. An evaluation to address 50.59 issues and Callaway fire protection license conditions is scheduled to be completed by 2/28/95.
Cable Tray Fire Stops	The Thermo-Lag material on the cable tray fire stops will be evaluated to leave the installation "as-is" and show that the fire stops prevent the propagation of a fire along the cable trays with or without the Thermo-Lag portion of the fire design. The fire stops are located above a 20' combustible free zone and the cables are equivalent to IEEE-383 qualified cables. Completion is currently scheduled for 12/31/94. An evaluation to address 50.59 issues and Callaway fire protection license conditions is scheduled to be completed by 2/28/95.
Multiple Conduits Enclosed in Thermo-Lag and Radiation Detector Cable Enclosed in Thermo-Lag	Callaway is currently working under the EPRI TC effort to determine if the fire modeling will bound these configurations. If these configurations can not be bounded by the fire modeling methodology, one of the five options in Item II.B.2 will be performed as required to bring the barriers into compliance with NRC requirements. The schedule for this evaluation will be determined at that time.
Multiple Junction Boxes Enclosed in Thermo-Lag	Callaway is currently working under the EPRI TC effort to determine if the fire modeling will bound these configurations. If these configurations can not be bounded by the fire modeling methodology, one of the five options in Item II.B.2 will be performed as required to bring the barriers into compliance with NRC requirements. The schedule for this evaluation will be determined at that time.

Action Item III.B.3 requested that Licensees describe the following if it is anticipated that a plant-specific fire endurance test program will be conducted:

- a. Anticipated test specimens; and
- b. Test methodology and acceptance criteria including cable functionality.

RESPONSE:

Callaway is currently not anticipating any plant-specific fire endurance test program.

IV. Ampacity Derating

Action Item IV.B.1 requested that Licensees describe, for the barriers under Item I.B.1, those that will fall within the scope of the NEI program for ampacity derating, those that will not be bounded by the NEI program, and those for which ampacity derating does not apply.

RESPONSE:

Callaway conduit and cable tray Thermo-Lag fire barriers are believed to fall within the scope of the NEI program for ampacity derating. Ampacity derating with respect to Thermo-Lag does not apply to the Callaway fire stops, junction boxes, hatch covers and valve enclosure.

Action Item IV.B.2 requested that Licensees describe, for the barriers that fall within the scope of the NEI program, what additional testing or evaluation will need to be performed to derive valid ampacity derating factors.

RESPONSE:

For the Callaway conduit and cable tray Thermo-Lag fire barriers, which are believed to fall within the scope of the NEI program for ampacity derating, any additional testing or evaluation will depend on the information provided by NEI to derive valid ampacity derating factors. As noted in Reference 3, there are unresolved technical issues regarding ampacity derating. Callaway concurs with the staff's view that these issues can be resolved independently of the fire endurance issues. As such, Callaway will resolve the ampacity derating issues independently of the fire endurance issues.

Action Item IV.B.3 requested that Licensees describe, for the barrier configurations that will not be bounded by the NEI test program, the plan for evaluating whether or not the ampacity

derating tests relied upon the ampacity derating factors used for those electrical components protected by Thermo-Lag 330-1 (for protecting the safe-shutdown capability from fire or to achieve physical independence of electrical systems) are correct and applicable to the plant design. Licensees are to describe all corrective actions needed and submit the schedule for completing such actions.

RESPONSE:

This item does not apply to Callaway, as Thermo-Lag barriers for which ampacity derating applies are expected to be bounded by the NEI test program.

Action Item IV.B.4 requested that Licensees describe, in the event that the NEI fire barrier tests indicate the need to upgrade existing in-plant barriers or to replace existing Thermo-Lag barriers with another fire barrier system, the alternative actions that will be taken (and the schedule for performing those actions) to confirm that the ampacity derating factors were derived by valid tests and are applicable to the modified plant design.

RESPONSE:

In the event that the NEI fire barrier tests indicate the need to upgrade existing in-plant barriers or to replace existing Thermo-lag barriers with another fire barrier system, NEI is expected to provide valid ampacity derating tests or a valid method to calculate the ampacity derating for the modified design. Callaway will review the tests or methods provided to ensure their validity for the modified plant design. This review will be completed within 90 days of receiving NRC acceptance of the information provided by NEI.

V. Alternatives

Action Item V.B requested that Licensees describe the specific alternatives available for achieving compliance with NRC fire protection requirements in plant areas that contain Thermo-Lag fire barriers. Examples of possible alternatives to Thermo-Lag based upgrades include the following:

1. Upgrading existing in-plant barriers using other materials.
2. Replacing Thermo-Lag barriers with other fire barrier materials or systems.
3. Rerouting cables or relocating other protected components.
4. Qualifying 3-hour barriers as 1-hour barriers and installing detection and suppression systems to satisfy NRC fire protection requirements.

RESPONSE:

Each of the possible alternatives listed above, and the measures listed in Action Item II.B.2, will be considered in addressing compliance with NRC fire protection requirements in plant areas that contain Thermo-Lag fire barriers.

VI. Schedules

Action Item VI.B requested that Licensees submit an integrated schedule that addresses the overall corrective action schedule for the plant. At a minimum, the schedule should address the following aspects for the plant:

1. Implementation and completion of corrective actions and fire barrier upgrades, for fire barrier configurations within the scope of the NEI program, and
2. Implementation and completion of plant-specific analyses, testing, or alternative actions for fire barriers outside the scope of the NEI program.

RESPONSE:

Attachment 5 provides an integrated completion schedule that addresses the overall corrective action for fire endurance issues at Callaway that are within the scope of the NEI program. For the completion schedule of plant-specific analysis, testing, or alternative actions of fire barriers outside the scope of the NEI program, please refer to Table 1 under the response to Action Items III.B.1 and III.B.2.

VII. Sources and Correctness of Information

Action Item VII requested that Licensees describe the sources of the information provided in response to this request for information and how the accuracy and validity of the information was verified.

RESPONSE:

The sources of the information provided in response to this request for information included plant drawings, quality control documentation, NEI-provided documentation, electrical circuit databases, plant walk downs, and installation procedures. The accuracy and validity of the information was verified by independent physical plant inspections.

ATTACHMENT 3

12/15/94

Thermo-Lag 330-1 Barriers Installed to Meet Conditions of the
Plant's Operating License and to Satisfy Licensing Commitments (Appendix R)

BARRIER I.D.	INTENDED PURPOSE	FIRE RATING	TYPE	DIMENSION	NOTES
211J1E2A	Fire Barrier	3-Hour	Conduit	1.5"	None
211J1L01	Fire Barrier	3-Hour	Cable Tray	24" Wide	None
211J1L1B	Fire Barrier	3-Hour	Conduit	1"	None
211J3C1A	Fire Barrier	3-Hour	Conduit	1.5"	None
211U1037	Fire Barrier	3-Hour	Conduit	3"	Wrapped with 211U1040 & 211U1041
211U1038	Fire Barrier	3-Hour	Conduit	1.5"	Wrapped with 211U1039
211U1039	Fire Barrier	3-Hour	Conduit	1.5"	Wrapped with 211U1038
211U1040	Fire Barrier	3-Hour	Conduit	1.5"	Wrapped with 211J3C1A & 211U1041
211J1041	Fire Barrier	3-Hour	Conduit	1.5"	Wrapped with 211U1040 & 211J3C1A
211U1042	Fire Barrier	3-Hour	Conduit	1.5"	Wrapped with 211U1043, 45, & 44
211U1043	Fire Barrier	3-Hour	Conduit	1.5"	Wrapped with 211U1042, 45, & 44
211U1044	Fire Barrier	3-Hour	Conduit	1.5"	Wrapped with 211U1042, 43, & 45
211U1045	Fire Barrier	3-Hour	Conduit	1.5"	Wrapped with 211U1042, 43, & 44
211U1K01	Fire Barrier	3-Hour	Cable Tray	24" Wide	None
211U1K5C	Fire Barrier	3-Hour	Conduit	4"	None
211UJ029	Fire Barrier	3-Hour	Jct. Box	24" X 12" X 8"	None
212J1019	Fire Barrier	3-Hour	Conduit	1.5"	None
212J1035	Fire Barrier	3-Hour	Conduit	3"	None
212J1036	Fire Barrier	3-Hour	Conduit	3"	None
212J1037	Fire Barrier	3-Hour	Conduit	3"	None
212J1040	Fire Barrier	3-Hour	Conduit	4"	None
212J1042	Fire Barrier	3-Hour	Conduit	4"	None
212J1043	Fire Barrier	3-Hour	Conduit	4"	None
212J1046	Fire Barrier	3-Hour	Conduit	3"	None
212J1047	Fire Barrier	3-Hour	Conduit	3"	None
212J1049	Fire Barrier	3-Hour	Conduit	4"	None
212J1050	Fire Barrier	3-Hour	Conduit	4"	None
212J1052	Fire Barrier	3-Hour	Conduit	1.5"	None
212J1B1F	Fire Barrier	3-Hour	Conduit	4"	None
212J1B1G	Fire Barrier	3-Hour	Conduit	4"	None
212J1B1H	Fire Barrier	3-Hour	Conduit	4"	None
212JJ051	Fire Barrier	3-Hour	Jct. Box	30" X 24" X 8"	None
212JJ052	Fire Barrier	3-Hour	Jct. Box	6" X 6" X 24"	None
212JJ053	Fire Barrier	3-Hour	Jct. Box	6" X 6" X 30"	None
212JJ054	Fire Barrier	3-Hour	Jct. Box	6" X 6" X 24"	None
212JJ056	Fire Barrier	3-Hour	Jct. Box	18" X 18" X 8"	None
212UJ013	Fire Barrier	1-Hour	Jct. Box	6" X 24" X 6"	None
213J1024	Fire Barrier	3-Hour	Conduit	1.5"	None
213J1027	Fire Barrier	1-Hour	Conduit	3"	None
213J1029	Fire Barrier	3-Hour	Conduit	3"	None
213J1031	Fire Barrier	3-Hour	Conduit	3"	None
213J1034	Fire Barrier	3-Hour	Conduit	1.5"	None
213J1B1F	Fire Barrier	3-Hour	Conduit	3"	None
213JJ052	Fire Barrier	3-Hour	Jct. Box	30" X 15" X 8"	None
213JJ053	Fire Barrier	1-Hour	Jct. Box	6" X 6" X 30"	None
214J1013	Fire Barrier	3-Hour	Conduit	0.75"	None
214J1014	Fire Barrier	3-Hour	Conduit	3"	None
214J1036	Fire Barrier	3-Hour	Conduit	1.5"	None
214J1064	Fire Barrier	3-Hour	Conduit	2"	None
214J3C1C	Fire Barrier	3-Hour	Conduit	3"	None
214JJ046	Fire Barrier	3-Hour	Jct. Box	24" X 6" X 6"	None
214U1132	Fire Barrier	1-Hour	Conduit	3"	None
214U3B6D	Fire Barrier	1-Hour	Conduit	3"	None
214U3B6F	Fire Barrier	1-Hour	Conduit	4"	None
216J5B30	Fire Barrier	3-Hour	Tray Fire Stop	24" Wide	None

ATTACHMENT 3

12/19/94

Thermo-Lag 330-1 Barriers Installed to Meet Conditions of the
Plant's Operating License and to Satisfy Licensing Commitments (Appendix R)

BARRIER I.D.	INTENDED PURPOSE	FIRE RATING	TYPE	DIMENSION	NOTES
216U5D30	Fire Barrier	3-Hour	Tray Fire Stop	24" Wide	None
216U5E30	Fire Barrier	3-Hour	Tray Fire Stop	24" Wide	None
221J2027	Radiant Energy Heat Shield	3-Hour	Conduit	1.5"	None
221J2070	Radiant Energy Heat Shield	3-Hour	Conduit	2"	None
231U1E6N	Fire Barrier	3-Hour	Conduit	3"	None
234U3003	Fire Barrier	1-Hour	Conduit	2"	None
AL HV 32	Fire Barrier	3-Hour	Viv. Encl.	5' X 4' X 4'	CMP# 89-1047 removed valve enclosure
Buttress Hatch Cover 2026' El. - North	Fire Barrier	3-Hour	Hatch Cover	3.5' X 3.5'	None
Buttress Hatch Cover 2026' El. - South	Fire Barrier	3-Hour	Hatch Cover	3.5' X 3.5'	None
Buttress Hatch Cover 2047' El. - North	Fire Barrier	3-Hour	Hatch Cover	3.5' X 3.5'	None
Buttress Hatch Cover 2047' El. - South	Fire Barrier	3-Hour	Hatch Cover	3.5' X 3.5'	None
RHR & Cont. Spray Hatch Cover - North	Fire Barrier	3-Hour	Hatch Cover	11' X 13'	CMP#93-1010 replaced Thermo-Lag with 1/4" checker-plate steel
RHR & Cont. Spray Hatch Cover - South	Fire Barrier	3-Hour	Hatch Cover	11' X 13'	CMP#93-1010 replaced Thermo-Lag with 1/4" checker-plate steel
Field Junction Box to Conduits 4U1132 & 4U3B6D	Fire Barrier	1-Hour	Jct. Box	24" X 12" X 12"	None
Field Junction Box to Conduits 1J1E2A & 1J3C1A	Fire Barrier	3-Hour	Jct. Box	16" X 16" X 16"	None
Field Junction Box to Conduits 1U1037 & 1U1038	Fire Barrier	3-Hour	Jct. Box	14" X 11" X 11"	None
Field Junction Box to Conduits 3J1024 & 3J1034	Fire Barrier	3-Hour	Jct. Box	14" X 10" X 6"	None
Pull Box to conduit 211J1L1B	Fire Barrier	3-Hour	Jct. Box	24" X 8" X 8"	None

ATTACHMENT 4

12/13/94

Thermo-Lag 330-1 Barriers Installed to Achieve Physical Independance of Electrical Systems (IEEE 384)

BARRIER I.D.	INTENDED PURPOSE	FIRE RATING	TYPE	DIMENSION	NOTES
211J1019	Radiant Energy Heat Shield	1-Hour	Conduit	4"	None
211J1020	Radiant Energy Heat Shield	1-Hour	Conduit	4"	None
211J1021	Radiant Energy Heat Shield	1-Hour	Conduit	4"	None
211J1022	Radiant Energy Heat Shield	1-Hour	Conduit	4"	None
211J1062	Radiant Energy Heat Shield	1-Hour	Conduit	4"	None
211J1063	Radiant Energy Heat Shield	1-Hour	Conduit	4"	None
211J1130	Radiant Energy Heat Shield	1-Hour	Conduit	4"	None
211J1132	Radiant Energy Heat Shield	1-Hour	Conduit	4"	None
211J3A1B	Radiant Energy Heat Shield	1-Hour	Conduit	2"	None
211JJ038	Radiant Energy Heat Shield	1-Hour	Jct. Box	6" X 6" X 30"	Wrapped with 211JJ039
211JJ039	Radiant Energy Heat Shield	1-Hour	Jct. Box	6" X 6" X 30"	Wrapped with 211JJ038
211JJ043	Radiant Energy Heat Shield	1-Hour	Jct. Box	36" X 12" X 24"	None
211JJ044	Radiant Energy Heat Shield	1-Hour	Jct. Box	30" X 8" X 15"	None
211JJ075	Radiant Energy Heat Shield	1-Hour	Jct. Box	30" X 8" X 8"	None
211U1119	Radiant Energy Heat Shield	1-Hour	Conduit	2"	None
213J1033	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
213J1049	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
213J1050	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
213J1051	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
213U1010	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
214J1099	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
214J1101	Radiant Energy Heat Shield	1-Hour	Conduit	0.75"	None
214J1103	Radiant Energy Heat Shield	1-Hour	Conduit	0.75"	None
214J1115	Radiant Energy Heat Shield	1-Hour	Conduit	1"	None
214J3B1J	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
214J3C9V	Radiant Energy Heat Shield	1-Hour	Conduit	1"	None
214J5A1A	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
214J5B2D	Radiant Energy Heat Shield	1-Hour	Conduit	0.75"	None
214U1245	Radiant Energy Heat Shield	1-Hour	Conduit	1"	None
214U1260	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
214U3B2U	Radiant Energy Heat Shield	1-Hour	Conduit	1"	None
214U3D5R	Radiant Energy Heat Shield	1-Hour	Conduit	4"	None
214U3E7J	Radiant Energy Heat Shield	1-Hour	Conduit	2"	None
215J1040	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
215J1W1F	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
215J1W1L	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
216J1045	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
216J4A1L	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
216J5B4B	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
224G2A1A	Radiant Energy Heat Shield	1-Hour	Conduit	2"	None
224G2A1B	Radiant Energy Heat Shield	1-Hour	Conduit	4"	None
224G2A1C	Radiant Energy Heat Shield	1-Hour	Conduit	4"	None
224G2A1F	Radiant Energy Heat Shield	1-Hour	Conduit	1"	None
225J2A1R	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
231J1A2A	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
231U1H1A	Radiant Energy Heat Shield	1-Hour	Conduit	4"	None
232J1B1R	Radiant Energy Heat Shield	1-Hour	Conduit	3"	None
232J1B1S	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
232U1034	Radiant Energy Heat Shield	1-Hour	Conduit	0.75"	None
232U1B1E	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
232U1B1J	Radiant Energy Heat Shield	1-Hour	Conduit	3"	None
232U1B1K	Radiant Energy Heat Shield	1-Hour	Conduit	3"	None
232U1B1L	Radiant Energy Heat Shield	1-Hour	Conduit	3"	None
232U3004	Radiant Energy Heat Shield	1-Hour	Conduit	1"	None

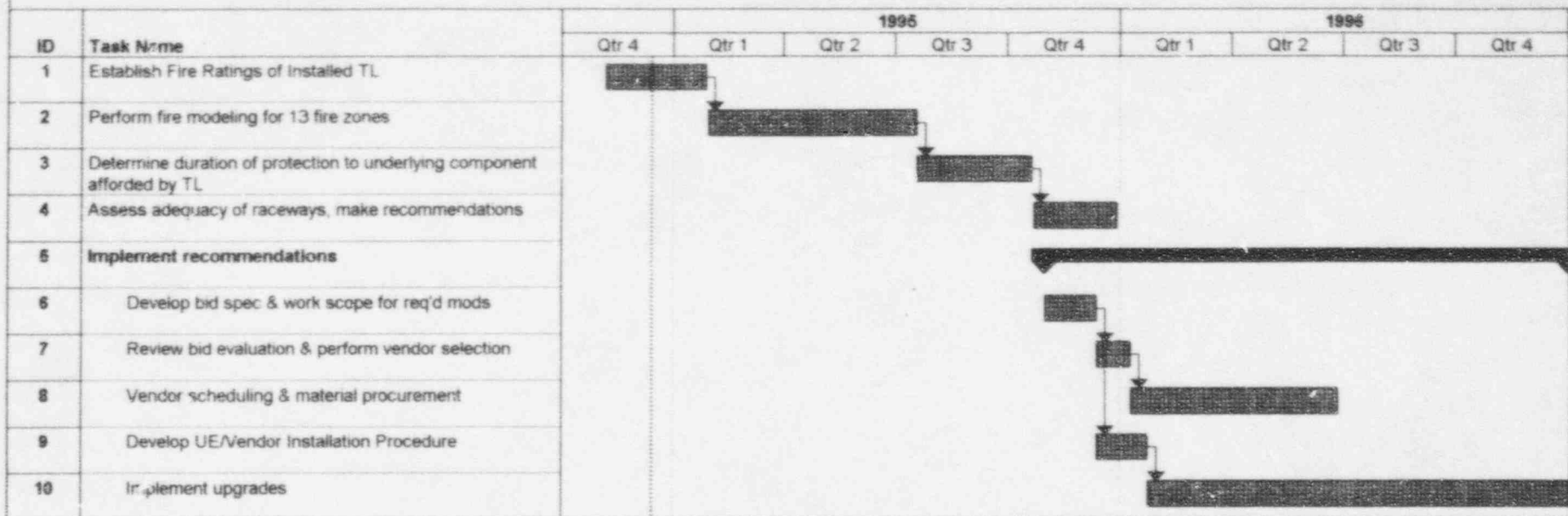
ATTACHMENT 4

12/13/94

Thermo-Lag 330-1 Barriers Installed to Achieve Physical Independence of Electrical Systems (IEEE 384)

BARRIER I.D.	INTENDED PURPOSE	FIRE RATING	TYPE	DIMENSION	NOTES
232U3014	Radiant Energy Heat Shield	1-Hour	Conduit	3"	None
232U3015	Radiant Energy Heat Shield	1-Hour	Conduit	3"	None
232U3016	Radiant Energy Heat Shield	1-Hour	Conduit	2"	None
232U3019	Radiant Energy Heat Shield	1-Hour	Conduit	0.75"	None
232U3021	Radiant Energy Heat Shield	1-Hour	Conduit	0.75"	None
232UJ025	Radiant Energy Heat Shield	1-Hour	Jct. Box	6" X 6" X 30"	Wrapped with 232UJ026 & 232UJ030
232UJ026	Radiant Energy Heat Shield	1-Hour	Jct. Box	6" X 6" X 30"	Wrapped with 232UJ025 & 232UJ030
232UJ030	Radiant Energy Heat Shield	1-Hour	Jct. Box	6" X 6" X 30"	Wrapped with 232UJ025 & 232UJ026
233U1B3A	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
261J6004	Radiant Energy Heat Shield	1-Hour	Conduit	2"	None
261J6008	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
261J6009	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
261J6010	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
261U6036	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
264J6008	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
264U6054	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
265J6A2D	Radiant Energy Heat Shield	1-Hour	Conduit	1.5"	None
Field Junction Box to Conduits 2U1034 & 2U3019	Radiant Energy Heat Shield	1-Hour	Jct. Box	12" X 12" X 8"	None
Field Junction Box to Conduits 3U1033, 3U1051, & 3U1049	Radiant Energy Heat Shield	1-Hour	Jct. Box	14" X 14" X 8"	None
Field Junction Box to Conduits 4U1245 & 4U3B2U	Radiant Energy Heat Shield	1-Hour	Jct. Box	12" X 12" X 8"	None
Pull Box of Conduit 2U1B1J	Radiant Energy Heat Shield	1-Hour	Pull Box	6" X 6" X 30"	Wrapped with Pull Box to Conduit 232U1B1L
Pull Box of Conduit 2U1B1L	Radiant Energy Heat Shield	1-Hour	Pull Box	6" X 6" X 30"	Wrapped with Pull Box to Conduit 232U1B1J

ATTACHMENT 5 Thermo-Lag Completion Schedule



NOTES:

- 6 Develop bid spec & work scope for req'd mods
 Bid Spec to be issued within 90 days of receiving NRC approval of results of fire modeling effort.

Project: Thermo-Lag - Callaway Plant
 Date: 12/14/94

Task		Summary		Rolled Up Progress	
Progress		Rolled Up Task			
Milestone		Rolled Up Milestone			