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February 10, 1994

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

Gentlemen:

Subject: Oyster Creek Nuclear Generating Station (OCNGS)
Docket No. 50-219
Response to Request for Additional Information Regarding
Generic Letter 92-08, "Thermo-Lag 330-1 Fire Barriers"

NRC letter dated December 21, 1993 requested additional information regarding Generic Letter 92-08, "Thermo-Lag 330-1 Fire Barriers," in light of the completed NUMARC Phase I tests and the planned Phase II testing. The attachment to this letter provides an itemized response to the NRC request for additional information.

Sincerely,

J. J. Barton
Vice President and Director
Oyster Creek

Sworn and subscribed to before me this 10th day of February 1994.

JUDITH M. CROWE
Notary Public of New Jersey
My Commission Expires 1/31/95

Attachments
DJD/plp

cc: Administrator, NRC Region I
NRC Resident Inspector, OC
Oyster Creek NRC Project Manager
A. Marion - NUMARC

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Attachment I

REQUEST FOR ADDITIONAL INFORMATION REGARDING
GENERIC LETTER 92-08,
"THERMO-LAG 330-1 FIRE BARRIERS"
PURSUANT TO 10 CFR 50.54(f)

I. Thermo-Lag Fire Barrier Configurations and Amounts

B. Required Information

1. 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.

   The descriptions should 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).

2. For the total population of Thermo-Lag fire barriers described under Item I.B.1, submit 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 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

Attachment II provides the information requested in Items I.B.1 and I.B.2 above. Use of Thermo-Lag at Oyster Creek does not directly satisfy a condition of the plant operating license. However, its use is instrumental in the satisfaction of GPUN's requirement to "...implement and maintain in effect all provisions of the Fire Protection Program..." (License Condition 2.c.(3)), since the Fire Protection Program requires the use of Thermo-Lag for compliance with 10 CFR 50, Appendix R.

Thermo-Lag is also not used to meet or to satisfy any other licensing commitment.

II. Important Barrier Parameters

B. Required Information

1. State whether or not you have obtained and verified each of the aforementioned parameters for each Thermo-Lag barrier installed in the plant. If not, discuss the parameters you have not obtained or verified. Retain detailed information on site for NRC audit where the aforementioned parameters are known.

2. For any parameter that is not known or has not been verified, describe how you will evaluate the in-plant barrier for acceptability.

3. To evaluate NUMARC's application guidance, an understanding of the types and extent of the unknown parameters is needed. Describe the type and extent of the unknown parameters at your plant in this context.

Response

II.B.1

GPU Nuclear is currently performing detailed plant walkdowns of installed Thermo-Lag barriers to identify the parameters of importance, as applicable to each installation configuration. This information will be utilized to verify installed configurations bounded by NUMARC tests. Plant walkdowns of accessible fire areas, considering ALARA issues and plant operating restrictions, have been completed. The balance of these walkdowns will be completed as plant areas become accessible, but no later than the end of the 15R refueling outage (Fall 1994).

The information obtained during the walkdowns will be documented using digital photographs of the baseline installations in each fire area and walkdown data sheets. Barrier parameters being verified during the walkdowns include the following:

1. Orientation
2. Dimensions
3. Junction boxes
4. Raceway type and size
5. Support protection
6. Banding material, type, size, spacing
7. Stress skin location
8. Exposed joints, stress skin over joints, stress skin ties

Other parameters of importance will be verified by review of barrier installation documents, electrical raceway details, and cable pull slips. The parameters include:

1. Conduit material
2. Joint details (grooved and scored, butt, mitered, pre-buttered, etc.)
3. Cable details (size, type, jacket type, insulation type, cable operating temperature and cable maximum operating temperatures).

We are reviewing the listing of important performance parameters prepared by NUMARC to ensure that the required information is obtained during our walkdowns.

The OCNGS walkdowns are being conducted on a fire area basis. Currently, we have completed three (3) fire areas. Walkdown information is available for NRC review. These parameters will be inputed into a database that will permit systematic comparisons with NUMARC's Application Guide. We anticipate completing this database by the end of the third quarter of 1994 for areas accessible during operation. The balance of the database will be completed during an outage of opportunity, but no later than the end of the 15R outage (Fall 1994).

Please note that the parameter listing is considered preliminary. The final determination of important parameters is dependent on the final content and interpretation of the Application Guide.

II.B.2 and II.B.3

As stated in II.B.1 above, plant walkdowns are underway to determine and verify parameters of importance. The extent to which we will not be able to obtain these parameters will not be known to us until our walkdowns and installation document reviews are complete. It is our opinion that most of these parameters will be obtained, however we recognize that certain aspects of the barriers and the protected components may not be obtained during walkdowns. Examples of these conditions are banding covered by trowel grade, cable size, gap size, etc. Ongoing and future NUMARC testing could identify further parameters of importance, or demonstrate that some of the listed parameters are not significant.

Parameters internal to the barrier can be evaluated in various ways. These methods include utilization of as-built design documents, destructive examinations or limiting conditions assumptions. Outside of obtaining as-built information, other actions are dependent upon the scope and results of NUMARC's test program. Actions involving destructive examinations are costly and will not be undertaken without a full understanding of their need.

Cable detail parameters will be obtained and included within our database to ensure a desired level of completeness. Attachment III lists the cable information identified to date. This information is being collected on a fire area basis and will be completed by the end of the 15R outage. It is not clear to us that these parameters will be necessary for most barriers. Therefore, significant efforts to obtain these parameters, or describe how barriers will be evaluated in the absence of these parameters, are unjustified at this time. We believe that consideration of the cable parameters should be deferred until the scope of the cable functionality verification becomes clear.

If fire tests demonstrate temperature criteria exceedances, one optional approach to resolution, as provided in the NRC draft test and acceptance criteria, would be to evaluate cable functionality at the elevated temperatures. In this case, determination of cable performance at elevated temperatures would be necessary, using cable performance test data or information for specific installed cable types. However, NRC has yet to finalize requirements for cable functionality evaluation, nor are test results yet available that would clearly indicate the need for or scope of such evaluations. The degree and conservatism of cable functionality evaluation requirements implied by the NRC listing of cable parameters and discussed in proposed Supplement 1 to Generic Letter (GL) 86-10, significantly exceeds the original requirements of GL 86-10.

In regard to chemical testing of Thermo-Lag, NUMARC testing of a wide variety of aged samples has not revealed significant variations in chemical composition. It is our understanding that these results will be distributed by NUMARC along with Phase 1 test reports. It is also our understanding that NUMARC Phase 2 testing will include barrier material of various ages. Unless unexpected results are encountered, we do not believe that plant unique chemical evaluations are necessary.

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

B. Required Information

1. Describe the barriers discussed under Item I.B.1 that you have determined will not be bounded by the NUMARC test program.

2. Describe the plant-specific corrective action program or plan you expect to use 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.

3. If a plant-specific fire endurance test program is anticipated, describe the following:

   a. Anticipated test specimens.

   b. Test methodology and acceptance criteria including cable functionality.

Response

III.B.1

At this time we are unable to determine which of our electrical raceway fire barriers will not be bounded by NUMARC's test program. Phase 1 tests encompassed upgraded barrier designs that were not used at Oyster Creek. While we have been provided with information regarding configurations to be tested in Phase 2, we are aware that consideration is being given by NUMARC to potential expansions of the test program. Until further definition of future test scope is provided and bounded configurations are determined and documented in the Application Guide, we are not able to make specific determinations of which barriers will not be bounded by NUMARC. However, we can generally conclude that the following raceway barrier types that are installed at Oyster Creek are not currently included in the NUMARC Test Program Phase 1 or 2:

1. Air drops with flexiblanket and preform shapes on insulated cable and armored cable.

2. Box enclosures mounted to concrete.

Oyster Creek also utilizes Thermo-Lag to provide a one-hour fire barrier for a stairwell enclosure in the Reactor Building at Elevation 23'. The Thermo-Lag does not protect an Appendix R circuit but does perform an Appendix R function. It is our opinion that the development of a plant specific test for this barrier would not be cost-effective. Therefore, we are currently evaluating the feasibility of providing alternate material that would perform the same function as the Thermo-Lag in this area. It is anticipated that this work could be completed just after our next refueling outage (15R).

HVAC ductwork in the 480V Switchgear Rooms at Oyster Creek is also protected with Thermo-Lag to form a one-hour barrier. NUMARC has indicated that they will not be testing barriers in this configuration. We are investigating the ability of the metal ductwork to perform the function of the one-hour barrier and will take the necessary actions to document its acceptance.

III.B.2 and III.B.3

At this point, the ultimate scope of the NUMARC program has not been defined. Considering this, we are not able to respond to these questions at this time and will provide this information in a supplemental response following our review of the completed test program and Application Guide.

IV. Ampacity Derating

B. Required Information

1. For the barriers described under Item I.B.1, describe those that you have determined will fall within the scope of the NUMARC program for ampacity derating, those that will not be bounded by the NUMARC program, and those for which ampacity derating does not apply.

2. For the barriers you have determined fall within the scope of the NUMARC program, describe what additional testing or evaluation you will need to perform to derive valid ampacity derating factors.

3. For the barrier configurations that you have determined will not be bounded by the NUMARC test program, describe your plan for evaluating whether or not the ampacity derating tests relied upon for 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. Describe all corrective actions needed and submit the schedule for completing such actions.

4. In the event that the NUMARC fire barrier tests indicate the need to upgrade existing in-plant barriers or to replace existing Thermo-Lag barriers with another fire barrier system, describe the alternative actions you will take (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

Ampacity derating is an issue that applies only to cable raceways containing power cables. Ampacity derating factors determined for upgraded configurations can be conservatively applied to baseline configurations. The NUMARC program for ampacity derating evaluation contains the following elements:

1. For upgraded one hour conduits, NUMARC will be discussing with NRC the generic applicability of ampacity derating factors derived by TUEC using the methodology of IEEE P848 Draft 11, with some modifications. The IEEE P848 test methodology has been extensively discussed with NRC by NUMARC and TUEC. However, NRC acceptance of the methodology is still pending. NRC has informed NUMARC that they will issue a request for further information to TUEC regarding the submitted ampacity test report. The TUEC testing provided a preliminary ampacity derating factor of 11% for conduits, which is within the range of previously reported values.

2. NUMARC will conduct ampacity testing of upgraded three hour barriers to the requirements of IEEE P848, following determination of appropriate barrier upgrades for three hour installations and agreement with NRC on ampacity test methodology. It is expected that this testing would be conducted in the second quarter of 1994, at the earliest. To the extent that successful upgrades using alternative materials are identified, ampacity testing of these upgrades would be considered as well.

3. The IEEE P848 approach provides for testing of small and large conduits. The limiting conduit derating factor (of the two sizes tested) is applied to the range of conduit sizes, cable fills, etc. Thus, ampacity testing can be performed generically with broad applicability, unlike fire testing where many performance parameters must be considered. The NUMARC program is expected to provide ampacity derating factors for one and three hour barriers, for conduits. Assuming NRC agreement with the IEEE P848 approach, few if any installations are expected to fall outside the generic scope.

A schedule to address ampacity is dependent on completion of three hour fire duration tests and NRC acceptance of the initial TUEC tests and the IEEE P848 methodology, described above. An update on these issues is expected from NUMARC in April 1994. Following our review of these completed efforts, a plan and schedule for resolution will be provided.

V. Alternatives

B. Required Information

Describe the specific alternatives available to you 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. Upgrade existing in-plant barriers using other materials.

2. Replace Thermo-Lag barriers with other fire barrier materials or systems.

3. Reroute cables or relocate other protected components.

4. Qualify 3-hour barriers as 1-hour barriers and install detection and suppression systems to satisfy NRC fire protection requirements.

Response

As stated in III.B.1, we are evaluating the feasibility of replacing the Thermo-Lag material in the stairwell enclosure of the Reactor Building at Elevation 23' with an alternative fire barrier material. This replacement appears to be a cost-effective resolution to the issue for this particular fire area.

For other fire area installations, three (3) currently undefined factors must be considered in determining whether upgrades using additional Thermo-Lag materials are practical, and what alternatives would be most appropriate in case Thermo-Lag upgrades cannot be developed:

1. Test and acceptance criteria have not been finalized and issued by NRC. Proposed draft criteria contain new conservatism in fire test methods and acceptance criteria that could affect the scope and complexity of upgrades to installed barriers. The content of the final criteria, and the resulting impact on utility-specific action plans, is uncertain.

2. Complete Phase 2 test results will not be known until the mid-March time frame per the current NUMARC schedule. Results of baseline (as installed) and upgraded test configurations from Phase 2 must be considered to determine appropriate utility action plans to address specific configurations. Moreover, further generic testing may be undertaken following Phase 2, as noted previously.

3. The Application Guideline will include a matrix of important performance parameters and bounding conditions. Discussion with NRC will be necessary to reach agreement on the comparison parameters and bounding conditions. The results of these NRC interactions will define the final document and would directly impact the generic applicability of a given test to an installed configuration.

Based on the final outcome of these issues, Oyster Creek will determine the appropriate cost-effective alternative to Thermo-Lag based upgrades, where applicable. Combinations of specific alternative resolutions may be considered where appropriate. Alternative resolutions could also be considered appropriate for certain upgrades which may have been successfully tested.

Additional alternative resolutions which may be appropriate include:

1. Re-evaluation of engineering analyses used for determination of Appendix R safe shutdown pathways, equipment, and actions, could provide a basis for reduction in scope of protected circuits, and their associated fire barriers.

2. Exemption requests using baseline (non-upgraded) test results to demonstrate adequate protection for the installed hazard could be pursued. Alternatively or in conjunction, fire modeling or probabilistic safety analysis (PSA) could be used as an exemption basis, by demonstrating insignificant core damage frequency impacts assuming barrier inoperability.

3. Re-evaluation of licensing commitments that may exceed the requirements of the pertinent regulations may be undertaken.

VI. Schedules

B. Required Information

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 NUMARC program,

2. implementation and completion of plant-specific analyses, testing, or alternative actions for fire barriers outside the scope of the NUMARC program.

Response

Based on NUMARC's expected issuance of the Application Guide and Phase 2 test results by April 15, 1994, and issuance of the NRC acceptance criteria, detailed evaluation of baseline installed configurations utilizing plant walkdown data will begin. As stated in II.B.1, plant walkdowns of accessible areas have been completed. The balance of these walkdowns will be completed no later than the end of 15R (Fall 1994). Fire barrier configuration evaluation will then be scheduled to support completion of alternative resolutions involving Appendix R safe shutdown reevaluation, fire modeling, and/or exemption requests where appropriate by the end of 1995. Completion of resolutions involving plant modifications such as Thermo-Lag upgrades, replacement of Thermo-Lag with other materials, rerouting cables or relocating protective components, or installation of suppression and/or detection will be scheduled in accordance with the Long Range Planning Program pursuant to Operating License DPR-16, License Condition No. 2.C.(6). This schedule is tentative and must remain flexible to accommodate the results of possible NUMARC Phase 3 testing and/or plant specific testing, and to recognize various uncertainties regarding resolution of fire barrier testing acceptance criteria and cable ampacity issues.

As stated in III.B.1, Oyster Creek is evaluating the feasibility of corrective action to replace the installed Thermo-Lag fire barrier material in the Reactor Building at Elevation 23', as this appears to be a cost-effective resolution for this particular configuration. This replacement would be expected to be completed just after the 15R outage.

For the interim, Oyster Creek will maintain periodic roving fire watch inspections in fire areas utilizing Thermo-Lag fire barrier material as an equivalent compensatory measure.

VII. Sources and Correctness of Information

Describe the sources of the information provided in response to this request for information (for example, from plant drawings, quality assurance documentation, walkdowns or inspections) and how the accuracy and validity of the information was verified.

Response

GPU Nuclear's plant modification process requires a review of the impact of modifications on the Oyster Creek Plant Fire Hazards Analysis. The approximations on Thermo-Lag installed in the plant are from the input provided to the GPU Nuclear Fire Protection Program Coordinator as part of the modification process to initially install the Thermo-Lag. The purpose of each Thermo-Lag fire barrier installation was confirmed based on the Oyster Creek Plant Fire Hazards Analysis.

Cable parameters are being identified through review of the GPU Nuclear GMS-2 system plant equipment data base which incorporates data from the original plant design and construction cable/conduit schedule drawings, or from circuit pull/termination sheets which have been periodically updated to reflect as-found conditions.

Attachment II

Building	Fire Area/Zone	Rating	Raceway/ Dimension	Total Length (approx)	Purpose
Reactor	RB-FZ-1D	1 HR	Conduit/1" & 2"	203 Linear Ft.	1. Meet 10 CFR 50.48 or Appendix R to 10 CFR 50. 2. Achieve Appendix R Physical independence of electrical systems. 3. Support an exemption to Appendix R.
Reactor	RB-FZ-1E	1 HR	Conduit/1", 1 1/2", 2", & 3" Stairway Enclosure Electrical penetration boxes	155 Linear Ft. 650 Ft.[2]	1. Meet 10 CFR 50.48 or Appendix R to 10 CFR 50. 2. Achieve Appendix R Physical independence of electrical systems. 3. Support an exemption to Appendix R.
Reactor	RB-FZ-1F2	1 HR	Conduit/ 1 1/2"	15 Linear Ft.	1. Meet 10 CFR 50.48 or Appendix R to 10 CFR 50. 2. Achieve Appendix R Physical independence of electrical systems. 3. Support an exemption to Appendix R.
Turbine	TB-FZ-11C	3 HR	Conduit/ 3 1/2"	40 Linear Ft.	1. Meet 10 CFR 50.48 or Appendix R to 10 CFR 50. 2. Achieve Appendix R Physical independence of electrical systems.

Turbine	TB-FZ-11D	1 HR	Conduit/1", 1 1/2", 2 1/2", 3 1/2", & 4"	455 Linear Ft.	1. Meet 10 CFR 50.48 or Appendix R to 10 CFR 50. 2. Achieve Appendix R Physical independence of electrical systems. 3. Support an exemption to Appendix R.
Office	OB-FZ-6A	1 HR	Conduit/2"	50 Linear Ft.	1. Meet 10 CFR 50.48 or Appendix R to 10 CFR 50. 2. Achieve Appendix R Physical independence of electrical systems.
Office	OB-FZ-6B	1 HR	Conduit/1", 2", 3" HVAC Duct Wrap	202 Linear Ft. 600 Ft.^{2}	1. Meet 10 CFR 50.48 or Appendix R to 10 CFR 50. 2. Achieve Appendix R Physical independence of electrical systems. 3. Support an exemption to Appendix R.

Attachment III

LOCATION FIRE ZONE	COND. NO.	COND. SIZE	CIRCUIT NO.	CIRCUIT DESCRIPTION	CABLE SIZE & TYPE	CABLE JACKET TYPE	CABLE CONDUCTOR INSULATION TYPE	CABLE FILL %	CABLE TEMP.		SOURCE
									OPER.	MAX. OPER.	
TB-FZ-11C-	86-71	2 - 3 1/2	86-71	POWER FEED FROM DG2 SWGR TO 1D-4160V SWGR	6-500 MCM ANACONDA UNISHIELD MV-90 2 - 1/C #4 AWG	CPE 1.16OD Bare 0.2" OD	EP -	32.3%	NORMAL CONTINUOUS = 90°C	EMERGENCY 130°C AND SHORT CIRCUIT 250°C	OC, GMS-2 SYSTEM VENDOR CATALOG
OB - FZ - -6A	CNXA 1125	2"	832X0403	INSTRUMENT CIRC. FROM FUEL ZONE Pnl ER-622-080 TO TE-622-1020	2/C #16SH, OKONITE THEMOCOUPLE COPPER - CONST.	OKOZEL 0.22" OD	OKOZEL (ETFE FLUOROPOLYMER)	16.42%	NORMAL CONTINUOUS = 150°C	EMERGENCY 200°C	OC CABLE PULL SLIPS, B/A #402728 INFORMATION, ROLLUP FCN, VENDOR CATALOGS
			832X0404	INSTRUMENT CIRC. FROM FUEL ZONE Pnl ER-622-080 TO TE-622-1021	2/C #16SH, OKONITE THEMOCOUPLE COPPER - CONST.	OKOZEL 0.22" OD	OKOZEL (ETFE FLUOROP OLYMER)				
			822X0829	INSTRUMENT CIRC. FROM FUEL ZONE Pnl ER-622-080 TO PRESSURE TRANSMITTER PT-622-1018	2/C #16 SH, TSP, BRAND REX	HYPALON 0.316" OD	XLPE		NORMAL CONTINUOUS 90°C	EMERGENCY 130° AND SHORT CIRCUIT 250°C	
			822X0830	INSTRUMENT CIRC. FROM FUEL ZONE Pnl ER-622-080 TO DPT-622-1008	2/C #16 SH, TSP, BRAND REX	HYPALON 0.316" OD	XLPE				
			822X0831	INSTRUMENT CIRC. FROM FUEL ZONE Pnl ER-622-080 TO DPT-622-1009	2/C #16 SH, TSP, BRAND REX	HYPALON 0.316" OD	XLPE				
			822X0834	INSTRUMENT CIRC. FROM FUEL ZONE Pnl ER-622-080 TO PT-622-1019	2/C #16 SH, TSP, BRAND REX	HYPALON 0.316" OD	XLPE				
			822X0835	INSTRUMENT CIRC. FROM FUEL ZONE Pnl ER-622-080 TO DPT-622-1010	2/C #16 SH, TSP, BRAND REX	HYPALON 0.316" OD	XLPE				
			822X0836	INSTRUMENT CIRC. FROM FUEL ZONE Pnl ER-622-080 TO DPT-622-1011	2/C #16 SH, TSP, BRAND REX	HYPALON 0.316" OD	XLPE				