



WASHINGTON PUBLIC POWER SUPPLY SYSTEM

P.O. Box 968 • 3000 George Washington Way • Richland, Washington 99352

February 11, 1994
G02-94-038

Docket No. 50-397

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

Gentlemen:

Subject: **WNP-2 OPERATING LICENSE NPF-21,
10 CFR 50.54(f) RESPONSE TO REQUEST FOR ADDITIONAL
INFORMATION REGARDING GENERIC LETTER 92-08,
"THERMO-LAG 330-1 FIRE BARRIERS"**

- References:
- 1) Letter GI2-93-299 dated December 21, 1993
LF Callan (NRC) to JV Parrish (SS),
"Request for Additional Information Regarding
Generic Letter 92-08, Thermo-Lag 330-1 Fire Barriers,"
Pursuant to 10 CFR 50.54(f) - WNP-2
 - 2) Letter G02-93-276 dated November 29, 1993
JV Parrish (SS) to NRC, "Licensee Event Report No. 93-30"

This letter responds to the NRC request for additional information regarding Generic Letter 92-08, "Thermo-Lag 330-1 Fire Barriers," pursuant to 10 C.F.R. 50.54(f). The Staff required submittal of this additional information to supplement its review of NUMARC's guidance for applying its test results to plant-specific fire barrier configurations, and to better identify which configurations are within the specific scope of NUMARC's test results.

The Supply System has been independently addressing these and similar issues. As part of this effort, the Supply System has contracted with ABB Impell to validate the WNP-2 Appendix R analysis and to identify options for reducing the circuits that must be protected by Thermo-Lag. The Impell study provides an independent overview of our Appendix R calculations and investigated alternate means of compliance. The ABB Impell report is being reviewed by our technical staff. However, final decisions and associated corrective actions arising from the report recommendations will not be made until review of the NUMARC Industry Application Guide is complete.

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**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
REGARDING GL 92-08**

A walkdown of accessible plant areas to address ampacity issues was completed on January 31, 1994. The purpose of the walkdown was to ensure that the ampacity derating calculations had taken all Thermo-Lag installations into account and was reported in Licensee Event Report No. 93-030 for WNP-2.

The Supply System will consolidate its efforts to address Thermo-Lag-related problems into a resolution plan. The resolution plan will develop options for reducing reliance on Thermo-Lag protection. The plan will enable us to determine the extent that our installations are bounded by the NUMARC program, to complete an evaluation to determine cost-effective solutions to the Thermo-Lag issues found, and to develop a detailed corrective action plan to design, test and implement resulting upgrades and other corrective actions. This plan will be generally consistent with NUMARC guidance and will provide as much detailed information as existing uncertainties permit. Three initiatives require resolution before the plan can be finalized. These three initiatives are:

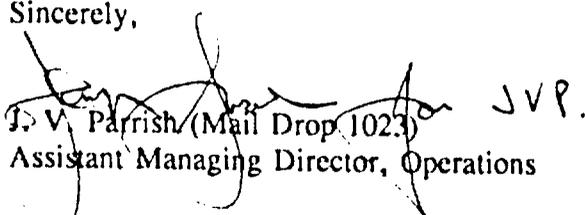
1. Finalization of the fire test and acceptance criteria by the NRC and comparison to existing Supply System methodology and results. The proposed criteria have conservatisms in fire test methods and acceptance criteria that could affect the scope and complexity of the upgrades to the barriers installed in WNP-2.
2. Completion of the NUMARC Thermo-Lag Phase 2 tests. Results are not expected to be available until April 1994. Results of baseline and upgraded test configurations from Phase 2 must be evaluated to determine WNP-2 action plans for specific configurations. If supplementary generic testing is undertaken by NUMARC following Phase 2 to cover additional configurations, corresponding delays in responding to the information request will result.
3. Completion and NRC approval of the NUMARC Industry Application Guide that will summarize test results and address attributes of installed configurations which are bounded by the NUMARC tests. The guidance will be finalized after Phase 2 tests are completed. The referenced tests and performance parameters will be analyzed against WNP-2 configurations to determine bounded installations. Configurations not bounded by the testing may require additional tests, plant modifications or analysis per Generic Letter 86-10. The final form of this NUMARC Industry Application Guide may have a direct impact on the generic applicability of a given test.

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**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
REGARDING GL 92-08**

Information requested by your letter is provided in the Attachment. Where the information requested is not available, the Supply System has discussed its plans for addressing that unavailability. The information discussed in the Attachment, as well as the overall Supply System plan to resolve Thermo-Lag issues, will be amended and finalized once the three initiatives noted above are completed. The schedule is addressed in Section VI of the attachment.

Sincerely,


J. V. Parrish (Mail Drop 1023) JVP.
Assistant Managing Director, Operations

JVP/JVH:dm

Attachment

cc: JW Clifford, NRC
KE Perkins, NRC RV
NS Reynolds, Winston & Strawn
DL Williams, BPA (399)
NRC Site Inspector (927N)

Attachment

REQUEST FOR ADDITIONAL INFORMATION REGARDING GENERIC LETTER 92-08 "THERMO-LAG 330-1 FIRE BARRIERS" PURSUANT TO 10CFR50.54(f)

This Attachment tracks to the specific requests in the Enclosure to the NRC 10 C.F.R. §50.54(f) information request. The Supply System has provided detailed responses to the NRC information request wherever possible. However, a number of these responses are somewhat general in nature or have been deferred. Such general or deferred responses will be treated in a more detail once the fire test criteria are finalized, the NUMARC Industry Application Guide is issued (expected in mid-April) and results from the NUMARC Phase 2 tests (and from any additional tests that may be undertaken) are known.

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 10CFR50.48 or Appendix R to 10CFR 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; and,*
- 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 1.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

I.B.1 and I.B.2

a. APPENDIX R

All of the 3-hour-rated raceway enclosures are located in the Reactor Building. These enclosures consist of trays, conduits and large penetration boxes. Thermo-Lag has also been used to protect instrument tubing supports in 3-hour areas.

All of the 1-hour rated raceway enclosures for Appendix R are located in the Radwaste, Diesel Generator and Turbine Buildings. The raceway enclosures consist of trays and conduits.

The quantities of 3-hour and 1-hour enclosures listed below are estimates.

3-Hour Cable Trays

All cable trays that are protected with 3-hour fire barriers are steel with 1,630 linear feet of 24-inch tray and 10 linear feet of 12-inch tray installed (approximately 8,200 square feet of Thermo-Lag). Side rails are 4-inches high for power trays and 6-inches high for signal and control trays. Ninety-eight percent are ladder trays (rung spacing is 3-inches for 24-inch tray and 5-inches for 12-inch tray) and 2% are solid bottom. The Thermo-Lag enclosure for trays is fabricated from two layers of 5/8-inch thick 330-1 boards using pre-buttered butt joints, with stress skin facing inward. There are enclosures where one 1 1/4-inch thick board was used in lieu of two 5/8-inch thick boards. Hardware cloth similar to TSI stress skin is wrapped around the envelope and stapled. Stainless steel wires are tied around the envelope and are spaced at 12-inch intervals. The heat flow path on hangers and intervening steel members is protected for 18 inches. Gravity supports for trays and conduit are protected to their point of attachment to the building.

3-Hour Conduits

All conduit is rigid steel with 989 linear feet of conduit installed in 3-hour areas. The linear feet by conduit size are as follows:

3/4-inch diameter	--	34
1-inch diameter	--	100
1 1/2-inch diameter	--	361
2-inch diameter	--	395
3-inch diameter	--	99
Total: 989 linear feet		

The Thermo-Lag envelopes are fabricated with preformed conduit half sections, 1 1/4-inch thick. The Thermo-Lag has stress skin on the inside and outside, all joints are pre-buttered. Box sections have been used for banks of conduits and fittings.

3-Hour Penetration Boxes

Electrical penetration boxes fabricated of stainless steel have been protected with Thermo-Lag. The sizes range from 4-ft. by 4-ft. by 4-ft. to 4-ft. by 4-ft. by 5-ft. The protective envelope is the same construction as the 3-hour cable trays.

Instrument Tubing and Trays

Steel supports for stainless steel instrument tubing and trays are also protected by 3-hour-rated Thermo-Lag installations for Appendix R. The thickness varies depending on the structural steel shape and dimensions. The thickness required decreases as the mass of the support member increases. Construction may be boxed board or spray/trowel application. Figures regarding square footage for these supports have not yet been derived but will be available at a later date.

1-Hour Trays

All cable trays are steel, 98% are ladder trays with rung spacing of 3-inches for 24-inch tray and 5-inches for 12-inch tray, 2% are solid bottom. There are 1,210 linear feet of 24-inch tray and 10 linear feet of 12-inch tray (approximately 6,000 square feet of Thermo-Lag). Side rails are 4-inches high for power trays and 6-inches high for signal and control trays.

The Thermo-Lag enclosure for the 1-hour tray is fabricated from 330-1 board using pre-buttered butt joints with the stress skin facing inward. Stainless steel wires are tied around the envelope and are spaced at 12-inch intervals.

The heat flow path on hangers and intervening steel members is protected for 9-inches back from the protected entity.

Approximately 100 linear feet of 1-hour rated tray installed in the Cable Spread Room is protected with 330-1 Thermo-Lag sprayed directly on the tray and cables.

1-Hour Conduit

All conduit is rigid steel. The distribution of the 786 linear feet by conduit size is as follows:

3/4-inch diameter	--	28
1-inch diameter	--	65
1 1/2-inch diameter	--	245
2-inch diameter	--	103
2 1/2-inch diameter	--	44
3-inch diameter	--	6
4-inch diameter	--	295
Total: 786 linear feet		

Thermo-Lag envelopes for 1-hour conduit were made using the extrusion spray method. The Thermo-Lag was pumped into the volume created by a layer of stress skin around the conduit. The outer layer was formed around spacers attached to the conduit with an annular space equal to 3/4-inch. The spacers are formed as scored 330-1 board 1 1/2-inch wide and spaced at 20-inch maximum intervals. The 330-1 was injected through a cut in the stress skin using an airless spray gun.

A section of 1 hour conduit made of preformed conduit sections is located in the Cable Spread Room, approximately 30 feet long.

3-Hour Wall

A concrete fire wall upgrade between the Turbine Building and Radwaste Building was necessary to meet Appendix R and FSAR commitments. The wall was upgraded to a 3-hour configuration by spraying 1/2-inch of 330-1 spray grade dry thickness directly on the wall, structural steel and roof deck. The concrete wall has approximately 600 square feet of Thermo-Lag and the steel and roof deck another 600 square feet.

20-Foot Noncombustible Zone

Seven-hundred linear feet of 24-inch cable tray has a direct spray of Thermo-Lag to encapsulate the combustible cables. This application of Thermo-Lag provides a 20-foot wide noncombustible zone to separate two fire areas. (Approximately 2,800 square feet of Thermo-Lag). Thermo-Lag is applied only on the cables in a 5/8-inch thick envelope. The 20-foot zone is necessary to meet Branch Technical Position 9.5.1, Appendix R and FSAR requirements.

e OTHER APPLICATIONS

Thermo-Lag is used for other fire barriers to meet Regulatory Guide (R.G.) 1.75 electrical separation and American Nuclear Insurer (ANI) requirements. Thermo-Lag is used to cover the gap created in metal covers for an air drop, fire stops at the end of tray covers, and separation protection for conduit. ANI requirements include use of Thermo-Lag to create a fire break on cables in trays with a vertical run greater than 30-feet. Fire breaks are a minimum of 4 feet long. The fire barriers used in these applications are not rated to ASTM E119. There are no explicit thermal performance requirements, test protocols or acceptance criteria established. Therefore, these fire barriers are not being included in the Thermo-Lag Upgrade Program. Accordingly, we have provided no measurements of the linear or square footage for these barriers.

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. The performance parameters listed below correspond to those listed in the Draft NUMARC Industry Application Guide while the number that follows within brackets "[]" corresponds to "important barrier parameters" as originally listed in Section II.A.

Raceway Parameters

- 1[1,2]. Tray orientation information is available on plant tray arrangement drawings, while conduit drawings are diagrammatic and do not provide needed orientation details. A walkdown will be performed to document the conduit construction details.
2. Tray (size) dimensions are documented on plant drawings whereas conduit (size) dimensions are allowed to be one trade size larger than specified on plant drawings and shall require a review of inspection records.
3. Conduit orientation and (size) dimensions are included in the scope of raceway parameters 1 & 2.
- 4[3]. Junction/tray extension boxes and lateral bends for trays are available on plant drawings. Junction boxes and lateral bends for conduits are controlled by specifications and will require a walkdown to document the construction details.
- 5[4]. Ladder-back cable tray can be identified from drawings, specifications and installation documentation. Single layer cable fill information consisting of a 15% cable tray fill shall be converted into a thermal mass equivalent. Raceway installations with the same or greater thermal mass shall be identified using the cable schedule and walkdown information. The walkdown information will be required to determine the intermediate cable tray fill installation due to cable entrance and exits.
- 6[5]. T-sections are shown on tray drawings.
- 7[6]. No aluminum raceways are used. Raceway material is identified in the Design Specifications.
- 8[7]. In 1986 the plant implemented "thermal short" protection in 1-hour and 3-hour fire areas consisting of 9-inch and 18-inches of Thermo-lag. Existing installations conform to these requirements. At this time, no further verification or documentation is contemplated.

- 9[8]. Air drop information has not been obtained. A walkdown will be performed to document the location of the air drops.
10. Boxed raceway barrier systems attached to concrete walls and ceilings shall be identified by walkdown.

Fire Barrier Parameters

- 1[9]. Baseline fire panel thickness is available from the Procurement Specification and Receiving Inspection documentation.
- 2[10]. Preformed conduit details are used in the Reactor Building and a short section was used in the Cable Spread Room. The installation procedure contains the details used for construction.
- 3[11]. Rib orientation will be identified during the walkdown.
- 4[12]. Unsupported span details have not been obtained. We suspect there is a problem in this area on 1-hour trays. A destructive examination will determine if there is a lack of support for the top panel on cable trays.
- 5[13]. Stress skin orientation will be verified. A walkdown will be used to document and verify this construction detail.
- 6[14]. Stress skin over joints will be verified. A walkdown will be used to document and verify this construction detail.
- 7[15]. Stress skin ties are known and will be included in the walkdown to document and verify the construction detail.
- 8[16]. Prebuttered joints were used on all installations. This will be confirmed during destructive examination.
- 9[17]. Joint gap width is known and controlled by procedure. Field verification will be accomplished with the destructive examination.
- 10[18]. Butt joints were used by procedure, but a walkdown is required to verify this construction detail.
11. Cable tray radial bends with separate mitered pieces will be documented and verified by walkdown.
- 12[19]. Tie wires were used throughout but will be verified by walkdown.

- 13[20]. Band/wire spacing is 12 inches maximum but will be verified by walkdown.
- 14[21]. Band/wire spacing to joints will be verified and documented by the walkdown.
- 15[22]. Internal bands in trays have not been determined. Destructive examination during the walkdown will confirm this detail.
- 16[23]. No significant trowel material was applied but will be verified by the walkdown.
- 17[24]. No edge guards were used on our installations.

It is felt that the above parameter listing is preliminary in nature due to the ongoing NUMARC testing. As a result, the need for verification, walkdown, etc. may not be required if the NUMARC tests indicate these parameters do not have an affect on test results. Accordingly, we feel it is justified to proceed with caution until the NUMARC Industry Application Guide is issued and approved by the NRC.

Cable Parameter

4. Cable fill is available through our raceway schedule. Intermediate cable fill; between tray nodes where conduits enter or exit the cable trays, is not available. This information will be obtained, for the Thermo-Lagged trays by walkdowns that will identify the sequential conduit locations between tray nodes (see raceway parameters, 5).

NUMARC notes that if the fire test results are satisfactory regarding temperature, only item 4 of the NRC cable parameter information needs to be validated. Accordingly, cable parameter items 1, 2, 3, 5, 6, 7 & 8 have not been provided. (See the discussion in Sections II.B. 2 and 3).

II.B. 2. If a required parameter is not known or verified, a walkdown, destructive examination, review of contractor work practices and procedures through documentation or testimony, or other available methods will be used to gain the necessary information. If the same parameter is known on another similar installation and the parameter had a high degree of control, it may, by comparison, be considered to be the same as the unknown parameter. Another technique being considered to limit the scope of barrier reviews is to assume certain limiting conditions. If these approaches are not feasible, appropriate engineering assessments may be performed to determine what additional actions, if any, are needed. Additional details on how barriers will be evaluated for unknown or unverified parameters will be provided as the test results become available and the Application Guideline and test criteria are finalized.

Providing a response for the list of cable parameters involves several considerations. If fire tests demonstrate temperature criteria exceedance, 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 temperature (item 8) would be necessary, using cable performance test data or information for specific installed cable types (items 1, 2, 3, and 7 of the NRC listing). However, NRC has not yet finalized requirements for cable functionality evaluation, nor are test results yet available that would clearly indicate the 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 86-10, significantly exceed the original requirements of Generic Letter 86-10.

Items 5 and 6 of the NRC listing address issues relative to potential cable/barrier contact for cable trays. This is an unresolved issue at this time, and barrier inspection in this regard would be difficult or impossible. Barrier contact would be most likely to occur in situations of large cable fills. However, the large cable fills also provide significant thermal mass that could improve barrier system performance and mitigate the effect of cables in contact with the barrier. NUMARC has agreed to provide additional thermocouples below the cable tray rungs in the Phase 2 cable tray tests to provide information to address NRC concerns relative to potential contact of cables with the cold side of the fire barriers. Further, note that a small piece of Sealtemp cloth (NRC item 6) was used only in NUMARC test Number 1-4 (24 inch steel cable tray with air drop, 3-hour test), and did not impact performance or useability of the test.

- II.B. 3. Use of the NUMARC Industry Application Guide apparently will require extensive, detailed information of the installation being qualified. These details have been controlled through different processes (procurement, design or installation) and to different degrees. In qualifying an installation, the details need to be obtained through drawings, specifications, walkdowns, etc. In addition, comparisons between installations may be made on some details depending on the degree to which they were controlled.

In view of the preliminary nature of the parameter listings and the uncertainty of their applicability as discussed above, a more detailed answer to this section will have to await completion of the NUMARC testing program and NUMARC Industry Application Guide.

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 it appears that the following barriers will not be bounded by the NUMARC test program:
- A. 3-hour cable tray envelopes.
 - B. The 1-hour direct spray on the cable trays in the cable spread room.

- C. The 1-hour extrusion spray method for conduits.
- D. Large penetration boxes in the 3-hour area.
- E. The 3-hour preformed conduit barriers.
- F. 1-hour cable trays with less than 15% fill. These trays have sagging tops on horizontal sections.
- G. The spray Thermo-Lag on the wall at 487-ft. elevation.
- H. Instrument hanger Thermo-Lag envelope.

A supplemental response will be submitted for the barriers on the above list after taking into consideration results of any expansion of the Generic NUMARC test program.

III.B.2. The initial plant-specific corrective action plan will be directed at:

- A. Documentation of the physical characteristics of the Thermo-Lag raceway envelopes.
- B. Analysis to justify reduction of 3-hour barriers to 1-hour.
- C. Reduction and/or re-routing of the Appendix R Div. 2 protected electrical functions to the extent that it proves cost-effective. Credit for manual actions will be evaluated as an alternate for protecting the Appendix R electrical functions.
- D. Conducting a formal review of the NUMARC Industry Application Guide to determine the barrier attributes that are qualified or that can be qualified. Justification of the non-complying configurations will require engineering analysis and/or additional plant-specific fire testing.

Generally, the above activities are expected to occur in parallel. Cost evaluations/comparisons of the various alternatives will provide a basis for developing a corrective action plan. The plan will involve engineering analysis, field modifications as appropriate, or additional fire testing before the design changes for upgrade can be prepared.

III.B. 2 and 3.

A more complete response to items III.B.2 & III.B.3 will be provided to the NRC in the August time frame. At that time, the results of the Phase 2 NUMARC testing and possibly plans for any additional testing can be evaluated. In addition, the final fire test acceptance criteria should be issued by then. The criteria are a prerequisite for planning a plant-specific fire test program. The potential for shared testing with other plants to reduce the scope of plant-specific fire testing could also be better evaluated at that time. The response for non-cable raceway barriers will also be addressed in the August time-frame.

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 barrier 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.*

Your response to Section IV.B may depend on unknown specifics of the NUMARC ampacity derating test program (for example, the final barrier upgrades). However, your response should be as complete as possible. In addition, your response should be updated as additional information becomes available on the NUMARC program.

Response

Preliminary answers to the questions concerning ampacity are provided below.

A final plan and schedule to address ampacity questions are dependent on completion of 3-hour fire duration tests and NRC acceptance of the initial TUEC tests (and the IEEE P848 methodology). An ampacity update will be included in the plan for the Thermo-Lag Upgrade Program.

IV.B(1) The table and associated notes below provide preliminary information requested.

- I NUMARC ampacity derating program
- II Outside NUMARC ampacity derating program
- III Ampacity derating does not apply

Table A

BARRIER DESCR	I	II	III	COMMENTS
APP. R				
3 HR TRAY	X			NOTES 1 & 2
3 HR CND	X			NOTES 1, 2
1 HR TRAY	X			NOTES 1 & 2
1 HR CND	X	X		NOTES 1, 2, 7
APP. R EXEMPTION	—	—	—	NOTE 3
ELECT. SEPARATION	—	X	—	NOTE 4
LICENSE CONDITION	—	—	—	NOTE 6
LICENSE COMMITMENT	—	—	X	NOTE 5

NOTES

1. Ampacity derating is provided on power cables which are routed in power raceways and have at least 6-ft. of continuous Thermo-Lag.
2. NUMARC's test results will be used to supplement existing tests and evaluations. The need for new tests will be evaluated.

3. At this time, based on the present Licensing Basis Documents, no exemptions exist for ampacity derating for Appendix R barriers (see Note 1).
4. The Thermo-Lag barriers that are used only for electrical separation are outside the NUMARC tests. The criteria described in Note 1 will be utilized and the appropriate derating factors will be used. The electrical separation barriers will be evaluated with NUMARC test results.
5. Thermo-Lag fire breaks that are less than 6 feet in length in vertical tray sections do not require ampacity derating per criteria in Note 1.
6. Other than the barrier types and notes listed above, there are no Thermo-Lag barriers that require ampacity derating.
7. Extrusion spray method Thermo-Lag conduits are outside the normal test results. Once final corrective actions for this type of barrier are determined, appropriate ampacity derating factors, per Note 1 criteria, will be applied.

IV.B(2) No new ampacity derating tests are contemplated at this time.

IV.B(3) WNP-2 has completed ampacity derating testing for the installed barrier configurations. When Thermo-Lag configurations are used that are outside the NUMARC program, appropriate testing, analysis, etc. will be completed to ensure ampacity limits are not exceeded.

IV.B(4) Alternative actions that require new barrier configurations also require tests to determine appropriate ampacity derating.

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.

For upgraded one hour cable trays and conduits, NUMARC will be discussing with NRC the generic applicability of ampacity derating factors derived by TUEC using the methodology of IEEE P848 Draft II, 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 preliminary ampacity derating factors of 32% for cable trays and 11% for conduits, which are within the range of previously reported values.

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.

The IEEE P848 approach provides for testing of a single cable tray, and small and large conduits. The limiting conduit derating factor (of the two sizes tested) is applicable to the range of conduit sizes, cable fills, etc. For cable trays, the single cable tray derating factor is applied to all sizes of cable trays, 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 cable trays and conduits. Assuming NRC agreement with the IEEE P848 approach, few if any installations are expected to fall outside the generic scope.

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

V.B. Three currently undefined factors must be considered in determining which alternatives would be most cost effective and appropriate to resolve Thermo-Lag deficiencies. These factors are:

1. Test and acceptance criteria which have not been finalized and issued by NRC. Proposed draft criteria contain new conservatisms in the 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 are uncertain.
2. Phase 2 test results which will not be known until the mid-March time frame. 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 NUMARC Industry Application Guide, to be final by mid-April, will include a matrix of important performance parameters and bounding conditions. Discussion with NRC will be necessary to reach agreement on the selection of comparison parameters and bounding conditions. The results of these NRC interactions will define the final content and would directly impact the generic applicability of a given test to an installed configuration.

The Supply System is considering a number of alternatives for achieving compliance with Appendix R requirements or otherwise resolving Thermo-Lag deficiencies. A general listing of these alternatives includes:

- replacement with a qualified system;
- upgrades;
- use of plant-specific fire tests for outlying configurations;
- rerouting of protected circuits;
- reevaluation;
- use of new procedures (e.g., evacuation of the Control Room for a fire in the Cable Spread Room);

- exemption requests based on a specific fire rating that results from an approved fire test in conjunction with a low fire loading in the affected area. Such exemption requests might also consider fire modeling and probabilistic safety analysis (PSA) to demonstrate a low level of core damage frequency;
- analysis to identify alternative shutdown paths or to reduce the scope of protected circuits (awaiting results of ABB Impell Appendix R validation efforts);
- evaluation of licensing commitments that may exceed the requirements of the pertinent regulations and;
- use of configuration deviation reviews, as described in Generic Letter 86-10, Enclosure 2, Section 3.2.2.

Further, it should be noted that implementation of alternative solutions may be considered even if upgrades have been successfully tested.

Alternatives being considered for specific Thermo-Lag configurations and plant locations include the following:

- Replacement, upgrade or additional testing are being considered for conduits protected by 1-hour extruded spray-on barriers. The most cost beneficial option will be chosen.
- Replacement or upgrade of sagging tray tops with adequately supported Thermo-Lag is being considered for boxed 1-hour horizontal trays with sagging top panels.
- Plant-specific testing of selected upgrades may be needed for configurations containing the low cable fill which is characteristic of some WNP-2 raceways. NUMARC test results may be applicable to some of these raceways but additional analysis would be necessary to assess the effects of the reduced cable fill.
- Reevaluation may be used to assess the need for the Thermo-Lag barrier applied to the block wall separating the Turbine Building 471 hallway from the Radwaste Building offices on 487.
- A new procedure for evacuating the Control Room for a fire in the Cable Spread Room may be developed. This alternative could remove altogether the need for certain Thermo-Lag barriers in the Cable Spread Room.

- No action appears necessary for Thermo-Lag used for ANI vertical fire breaks or certain electrical separation applications based on Regulatory Guide 1.75, because such Thermo-Lag applications are not based on Appendix R requirements.

VI. Schedules

B. Required Action

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

The Supply System is developing a corrective action plan that will address and provide direction to resolve our Thermo-Lag barrier issue. The first major effort of that plan is scheduled to be completed in August 1994. Implementation of this plan will ascertain 1) the extent of our installations that are bounded by the NUMARC program and 2) our options regarding Thermo-Lag reductions. Based on this knowledge, a schedule will be developed that will include any necessary independent testing, development of design change packages, and field implementation of these packages. The following describes the relative time frame and major elements of the corrective action plan and schedule in greater detail.

Compilation of As-Built Performance Parameters

The "performance parameters" regarding Thermo-Lag applications, as described by NUMARC, will be compiled by referencing the design data base and by conducting walkdowns and field inspections.

The compilation of as-built performance parameters will be completed by August 15, 1994. This date reflects the anticipated issuance of the NUMARC Industry Application Guide by the end of April.

The walkdowns and field inspections may use non-credited Thermo-Lag envelopes that have been abandoned. These installations provide readily accessible envelopes that can be easily examined, destructively if necessary, to ascertain the construction techniques used. The field inspections will document the attributes of raceway construction in order to permit use of the NUMARC Industry Application Guide.

Identification of Qualified Installations and Potential Upgrades

Qualified Thermo-Lag installations and potential upgrades will be identified by applying the NUMARC Industry Application Guide where appropriate. Consideration will be given to support loading, ampacity derating and other factors related to any such modifications. Our plan is based on final approval of NUMARC's Industry Application Guide by the NRC.

Application of the NUMARC Industry Application Guide will begin once they are issued. Assuming issuance by the end of April, this task should be completed by August 15, 1994.

Identification of Options

The investigation of options for reducing our reliance on Thermo-Lag will be conducted in a similar time frame.

Plant-Specific Fire Testing

Further testing of some of our unique Thermo-Lag configurations, if needed, may be pursued either solely by us or in conjunction with other utilities. The scope would naturally be affected by such factors as the pending NUMARC testing, completion of the NUMARC Industry Application Guide, issuance of final fire test criteria, the amount of testing done with others, the results of NUMARC Industry Application Guide, or engineering evaluations.

Design Change Packages for NUMARC-Bounded Configurations

The development of design change packages that will implement any NUMARC-bounded configurations is scheduled to begin once NUMARC upgrade testing is complete. Inherent in this effort is establishing that the NUMARC upgrades are the appropriate corrective action (e.g., cost beneficial) to install at WNP-2.

Design Change Packages Resulting From Plant-Specific Fire Testing

Any fire testing undertaken by the Supply System is intended to 1) qualify configurations unbounded by NUMARC and/or 2) qualify a more cost effective configuration for our particular plant (existing or upgrade) than configurations qualified by NUMARC. Therefore, fire testing programs we would undertake would have to be completed and evaluated prior to issuing the pertinent design change packages. Nevertheless, we anticipate working portions of design change packages in parallel with any testing programs. Development of complete design change packages, however, would not occur until after the completion of fire testing supporting the design change.

Design Change Packages for Upgrades beyond the Scope of NUMARC Testing

The development of design change packages that implement upgrades beyond the scope of NUMARC testing will be completed in parallel with NUMARC bounded upgrade packages.

Alternative Design Change Packages

Design change packages implementing cost beneficial alternatives to Thermo-Lag upgrades may be developed. The start dates for developing such packages would depend upon the identification of such alternatives. Proper identification of alternatives depends, in part, upon the application of the NUMARC Industry Application Guide and the completion of any independent fire testing we may undertake. Therefore, the start dates for these packages may be subsequent to these milestones.

Field Work

Field implementation of the design change packages would follow closely behind the completion of a particular design change package. The total installation effort is expected to continue through 1996.

A supplemental response providing a schedule of future fire testing, further design changes and implementation will be provided by September 30, 1994

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

The sources for the information contained in this response include: interviews with plant personnel familiar with installation procedures used during construction and with modifications made during operations; walkdowns of accessible abandoned and credited installations; review of design changes, fire tests, calculations, and installation procedures. The data is often approximate and is intended to quantify scope and to describe features known at this time. A configuration walkdown, planned for the Spring of 1994, will be used to verify and document details of construction.



WASHINGTON PUBLIC POWER
SUPPLY SYSTEM

INTEROFFICE MEMORANDUM

DATE: February 9, 1994

TO: W. G. Council, Managing Director (387)

FROM: J. V. Parrish, Assistant Managing Director, Operations (1023)

SUBJECT: DELEGATION OF AUTHORITY

REFERENCE:

I will be absent from the office February 11, 1994. Those authorized to act in my place on all matters except those which by policy can not be delegated are:

- JH Swailes for WNP-2 matters
- JW Baker for all other Operations Directorate matters

tmh

"Original Signed and Filed"

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