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Dated: April 8, 1988

UNITED STATES OF AMERICA

UNITED STATES NUCLEAR REGULATORY COMMISSION

before the

ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of	
PUBLIC SERVICE COMPANY NEW HAMPSHIRE, et al.	Docket Nos. 50-443 OL-1 50-444 OL-1
(Seabrook Station, Units 1 and 2)	(On-site Emergency Planning Issues)

APPLICANTS' SUPPLEMENTAL RESPONSE ON ENVIRONMENTAL QUALIFICATION OF RG-58 COAXIAL CABLE

In ALAB-882, 27 NRC ___ (1988) the Appeal Board requested that the Licensing Board examine Applicants' claim that RG-58 cable does not perform an accident mitigating function and therefore, the high-potential withstand test is all that need be satisfied to demonstrate that the cable is environmentally qualified.[1] On March 2, 1988 the Licensing Board, responding to the Appeal Board's remand, issued a memorandum providing support for its determination that the

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[1] The Appeal Board also provided a summary of the procedural history regarding the issue of the environmental qualification of RG-58 coaxial cable.

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Applicants' claim is meritorious. Memorandum to Appeal Board on Environmental Qualification of Coaxial Cable RG-58 (March 2, 1988) ("Board Memorandum"). Relying only on the established record, the Licensing Board found that "there is an adequate evidentiary record to show that full environmental qualification of coaxial cable RG-58 is not required, that requirements of the high potential withstand test are all that is needed to demonstrate its environmental qualification, and that the successful environmental qualification of coaxial cable RG-59 can serve to qualify the untested RG-58 cable by comparison." Board Memorandum at 9. Pursuant to the Appeal Board's scheduling order of March 3, 1988 New England Coalition on Nuclear Pollution ("NECNP") filed a supplemental memorandum in which it disagrees with the conclusions of the Licensing Board. ("NECNP Memorandum") Applicants herein respond.

ARGUMENT

The simple issue which has been before the Licensing Board and the Appeal Board is whether or not, on the basis of the record produced during the on-site hearings, the Licensing Board correctly determined that the RG-58 coaxial cable is environmentally qualified. As the RG-58 cable has itself not been tested, the question is whether it was proper to establish the environmental qualification of the RG-58 cable on the basis of the tests of the similar RG-59 cable. See 10 CFR § 50.49(f)(2) In support of this proposition, the Applicants, arguing on the basis of the Environmental Qualification File ("E.Q.F."),[2] stated that because the RG-58 cable does not perform an accident mitigating function, acceptable performance of the RG-58 cable when exposed to harsh conditions is measured only by the cable's ability to remain intact, i.e. the insulation system will not fail. See, Applicants' Response Regarding Environmental Qualification of RG-58 Coaxial Cable (November 25, 1987) at 3; 10 CFR § 50.49(b)(2). The Licensing Board found the Applicants' argument was correct:

> The answer to the question can be found in the record as to whether cable RG-58 must be 'fully' qualified or whether meeting the requirements of only the high potential withstand test (by comparison with the successfully tested RG-59 cable) is sufficient. As Applicants point out, and as we indicate above, the information is contained in EQF 113-19-01 (NECNP Exh. 4, References 1, 2, 6, and 7). References 1 and 7 indicate that cable RG-58 is color coded black with a red trace, and Reference 6 indicates the requirement that cables marked other than with the single color red, white, blue or yellow must only remain intact (e.g. no shorting to ground). That the high

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[2] The E.Q.F. was introduced without limitation as NECNP Exhibit 4.

> potential withstand test does measure leakage/charging current between the main conductor and the shield (i.e., shorting to ground) is indicated in Reference 2 (Table 3, at 15, n. "d" in regard to test results of cable A5550-2C [RG-59]).

Board Memorandum at 8.

NECNP argues that the Licensing Board erred because it "has done nothing to enhance the record." NECNP Memorandum at 3. However, the task of the Licensing Board was not to "enhance" the record, but as the primary fact finder, to review the existing record to determine if there was sufficient support for the Applicants' claim that the RG-58 cable was environmentally qualified. After such a review, the Licensing Board made appropriate findings.

NECNP further argues that the record is not sufficient to support the Applicants' argument that RG-58 cable has a very limited post accident function since the argument is based solely on a telephone memorandum, Reference 6 of Exhibit 4. That memorandum notes that color coding is designed to indicate which cables must perform a safety function subsequent to accident events. Contrary to the view taken by NECNP, this is not novel information. Cables at Seabrook Station such as the RG-58 and RG-59 cables are color coded in accordance with the scheme described in the phone memorandum and fully detailed in the F.S.A.R.[3] See F.S.A.R. §§ 8.3.1.3 and 8.3.1.4.k. (attached).[4]

Moreover, the issue of the performance requirements of equipment which does not perform an accident mitigating function is again not open to question. The uncontradicted statement in Reference 6 that such equipment need only remain intact is entirely supported by the affidavit of Harold Walker submitted on behalf of the NRC Staff. In his affidavit, Mr. Walker stated, "I agree that the different operating requirements of the cables, specifically the differing requirements for insulation resistance are important in determining similarity of performance of the two cables. However the functional requirements of the cables and the potential failure modes must also be considered. In this case, these are important considerations because the RG-58 cable only has to remain intact, and is not required to

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[3] This information is further confirmed by United Engineers & Constructors, Inc., Conduit and Cable Schedule, CASP Design Guide at Table 3, 6-2 -- 6-4 (attached). This Design Guide is the separation document referred to in NECNP Exhibit 4, Reference 6. We are informed that the entire Guide, which contains proprietary information of United Engineers & Constructors, Inc., if necessary, can and will be made available for review to the Board and the parties.

[4] It should be noted that F.S.A.R. § 8.3.1.4.k indicates that certain cables are not identified by this color code scheme. In the case of the RG-58 cable, however, the specification clearly demonstrates that the cable purchased is subject to the color coding scheme. See NECNP Exhibit 4, Reference 1 at A1.

mitigate an accident." Affidavit of Harold Walker at A6, NRC Staff Response to Memorandum of Licensing Board and New England Coalition on Nuclear Pollution Regarding Environmental Qualification of RG-58 Coaxial Cable (December 11, 1987) (attached).

In addition, there is ample support in the record to demonstrate, as the Licensing Board found, that the color code of the RG-58 cable demonstrates that it does not perform an accident mitigating function. See NECNP Exhibit 4, References 1, 6 and 7. Therefore, the RG-58 cable is environmentally qualified on the basis of the acceptable tests results of the high potential withstand test for the RG-59 cable which had been subjected to the full test regime -- e.g. thermal aging, irradiation, LOCA environment, etc. -- as detailed in NECNP Exhibit 4, Reference 2.

Finally, it should be noted that while NECNP repeatedly suggests that Applicants' position on the RG-58 cable is "new" and therefore somehow suspicious, in fact Applicants' position on this matter is not inconsistent with any previous position. Applicants' witness at the hearing testified that the purpose of the E.Q. files is to keep a verifiable record that the equipment is qualified for the environment to which it may be subjected in an accident. (Tr. 360). As NECNP, on cross-examination, did not challenge the appropriateness of the environmental qualification testing of RG-58 cable to projected accident conditions, it was appropriate for Applicants to rely on the record (NECNP Exhibit 4) in this regard. When on appeal, however, it became necessary to make explicit the argument why RG-58 was environmentally qualified, Applicants put forward their position -- a position based entirely on the record created during the on-site proceedings.

CONCLUSION

For the foregoing reasons, the decision of the Licensing Board is correct and NECNP's request to reopen the record should be denied.

Respectfully submitted,

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8.3.1.3 Physical Identification of Safety-Related Equipment

All cables, raceways and safety-related equipment are assigned to a particular channel or train. There are two redundant trains of power and controls, and four redundant channels of instrumentation. Each channel or train is assigned a particular color, as shown below:

Separation Group	Equipment Nameplate	Raceway Tag	Cable Color	
A. Channel I and Train A	Red	Red	Red	
Train A Associated	Black		Black w/Red Tracer	47
B. Channel II and Train B	White	White	White	
Train B Associated	Black		Black w/White Tracer	47
C. Channel III	Blue	Blue	Blue	
D. Channel IV	Yellow	Yellow	Yellow	52

Each piece of electrical equipment is marked with the node number indicated on the design drawings, in the particular color corresponding to the channel or train to which that equipment is assigned. Similarly, trays and exposed conduits are marked with color-coded markers. The cable jacket color code serves as its identification. The operator or maintenance craftsman needs only to observe the color of the nameplate of any piece of equipment or the cable jacket color to determine which channel or train it serves. For exceptions to the above cable and raceway identification criteria, see Subsection 8.3.1.4.k. 55

8.3.1.4 Independence of Redundant Systems

a. General

The Seabrook Station complies with the requirements of FSAR Appendix 8A, IEEE 384-1974 and Regulatory Guide 1.75, Rev. 2. These documents describe acceptable methods of complying with IEEE 279-1971 and Criteria 3, 17 and 21 of Appendix A to 10 CFR Part 50 with respect to the physical independence of the circuits and electrical equipment comprising or associated with the Class 1E power system, the protection system, systems actuated or controlled by the protection system, and auxiliary or supporting systems that must be operable for the protection system and the systems it actuates to perform their safety-related functions. Preservation of independence of redundant systems within the control boards and all other field mounted racks is discussed in Subsection 7.1.2.2. 52

Penetrations for 600 volt service and below are modular type with a header plate welded to the outside of a 12 inch containment sleeve. Because of the concern regarding leakage currents of terminal blocks during accident conditions, low level instrumentation circuit conductors inside containment are connected to the penetration conductors with qualified splices. Safety-related 480 volt power, 120 volt ac and 125 volt dc control circuit conductors inside containment required to function for LOCA and main steam line break conditions are also connected to the penetration conductors with qualified splices. The balance of medium power 480 volt conductors, and control and instrumentation conductors are terminated on terminal blocks inside terminal boxes both inside and outside containment. 480 volt heavy power conductors are terminated with lugs on special termination plates inside terminal boxes both inside and outside containment. Nuclear instrumentation detector circuits are terminated with connectors inside terminal boxes both inside and outside containment. Penetrations for medium voltage have header plates welded to the outside of an 18 inch containment sleeve. Each penetration consists of three 1000 MCM conductors terminated with premolded stress cones inside terminal boxes both inside and outside containment. 56

The capability of the electrical penetrations to withstand the total range of time versus fault current without loss of containment integrity under worst case environmental conditions was demonstrated by test. These test results are summarized in the response to RAI 430.56. 52

The penetrations are arranged in two levels, with one power train and two channels entering above the intermediate floor of the containment building, and the redundant train and two channels entering below the intermediate floor. Once inside the containment, this floor provides the necessary physical separation and protection between the redundant trains; outside the containment, this separation is continued by separate tunnels connecting the penetration area to the switchgear and cable spreading areas of the control building.

Penetration conductors are sized using ICEA guidelines with an additional restriction of a 65°C ambient temperature. 52

The design, construction, and installation of the penetration assemblies are in accordance with IEEE 317 and Regulatory Guide 1.63. (See Subsections 8.1.5.3, 8.3.1.1, and 8.3.1.2 for further details on compliance to Regulatory Guide 1.63).

k. Cable and Raceway Identification 41 52

The computerized conduit and cable schedule provides a permanent record of the routing and termination of cables. Circuit level coding identifies the individual channel or train assigned to each raceway and cable. These data are entered into the conduit and cable program, which in turn produces reports designating the unique number with origin, destination, channel or train, and specific path for every cable. Every cable is identified by a tag affixed at each end, bearing the unique cable number.

Each channel or train is assigned a particular color, as described in Subsection 8.3.1.3.

All safety-related cables have jackets of the color assigned to the particular channel and train so there is no difficulty in distinguishing between cables of redundant channels. Non-safety related cables are associated with either Train A or B and have black jackets with a red trace for cables associated with Train A and a white trace for cables associated with Train B. It is immediately evident to the operator or maintenance man, by observing the color of the cable jacket, that a given cable is safety-related 52
and that it is a particular channel or train. This system also prevents placing a cable of one channel or train with cables of another, by the obvious dissimilarity of jacket color.

Each cable is further identified by a footage and cable code on the jacket of the cable at intervals of approximately five feet. Reference to pulling records reveals the cable number, routing, separation, circuit type, and use of any cable at any accessible point in the raceway system where the footage marker and cable code can be identified. 56

Exceptions to the above cable identification criteria exist for vendor supplied speciality cables for radiation monitoring system and portions of various other systems (for example telephone system, lighting and fire protection/detection). For these exceptions, the necessary information to ensure adequate control of separation, installation, inspection, etc. is provided in the construction documents. 55

Raceways which are part of the computerized cable and conduit schedule are marked to identify their number and circuit level. Conduit raceways are identified at each end where conduit terminates and at both sides of walls, floors and in-line boxes. Tray raceway markers are spaced at 15 foot or less intervals. These markings are in the same colors assigned to the channels and trains. For example, a raceway with a red section marking is utilized only by cables with red (or black with red tracer) jackets. Hence, it is readily apparent that a given cable is routed with its respective channel.

Raceways which are not part of the computerized conduit and cable schedule may not be marked with a unique identification number, but their function is obvious by tracing the raceway to its end device. These raceways may be used to carry vendor supplied speciality cables for radiation monitoring system and portions of various other systems such as telephone system, lighting and fire protection/detection. For these raceways, the necessary information to ensure adequate controls of separation, installation, inspection, etc. is provided in the construction documents. 55

Since, in general, there is no sharing of safety-related systems between the two units (see discussion of compliance to GDC 5, Subsection 8.3.1.2), there is no need to distinguish the safety-related cables of one unit from the safety-related cables of the other unit. As such, the cable and raceway coloring scheme is identical for the two units. In the common areas, the unit to which a cable belongs is not apparent from the raceway or cable markings. If it is required to know the unit to which a cable belongs, it can be obtained by observing the equipment designation number, which has the unit number as a prefix. The basis for cable and raceway identification is to distinguish between redundant channels, indicate which channel is involved, and which cables are safety-related.

1. Administrative Responsibility and Control

Administrative responsibility for assuring compliance with applicable design criteria and bases relative to independence of redundant systems rests with the A/E's Project Electrical Engineer. He is responsible for coordination with the A/E's field electrical supervisor to verify that the independence, separation and availability of Class 1E equipment is preserved during installation of the electric power system. 47|52

The following control procedures are established by the A/E's Project Electrical Engineer to assure compliance of the electric power system with the design criteria and bases:

1. Periodic design reviews with the cognizant engineer, the design supervisor, and the reviewing engineer to assure the criteria are being interpreted and followed,

2. Issuance of periodic administrative and design directives covering procedures, and

3. Periodic field reviews at the job site by the Project Electrical Engineer and/or the cognizant engineer to check field installation procedures, to provide interpretation of design drawings and guidance for solution of field installation problems, and to verify compliance with criteria.

The design of the conduit and raceway system is guided by the recommendations of applicable IEEE, ICEA and NEC standards. For instance, the limiting percentages of fill of internal area of the various size conduits or cable trays are fixed in one of the input forms of the computer conduit and cable schedule and these limits are automatically applied to all conduits and cable trays by the computer. If the conduit or cable tray is one which the computer is free to size, it designates the size which accommodates the cables to be enclosed. If the conduit or cable tray size is designer-designated and the fill exceeds the limiting percentage, the computer indicates an error message so that either the conduit can be made a larger size, or the cables routed by another path. By these methods, all raceways are assured of being of adequate capacity. 52

Correct installation practice assures that the design criteria by which the equipment was selected are not violated during construction. Installation bases are prescribed, where necessary, by the

TABLE 3

CABLE CODE CHARACTER SIGNIFICANCE

4 CHARACTER CODE = CC1E

Voltage, Conductor and Cable Construction

Number of Conductors or Pairs

Outer Jacket Color

Conductor Size

1st CHARACTER (CONSTRUCTION)

A	600 V Multi-Conductor Control Cable
B	600 V Multi-Conductor Power Cable
C	600 V Triplex Power Cable
D	600 V Single Conductor Cable
E	600 V Multi-Conductor Shielded Cable
G	TP&L Power & Control Cable
H	15 KV Loxarmor Power Cable
J	5 KV Loxarmor Power Cable
K	5KV Triplex Power Cable
M	300 V Shielded Twisted Pair Cable
N	300 V Twisted Pair Cable
Q	Specialty Multi-Conductor
S	1000 V Shielded Multi-Conductor Control Cable
T	Coaxial Cable
U	Triaxial Cable
V	Three Conductor Twisted Shielded Cable
W	Westinghouse Supplied Cable
X	300 V Copper-Constantan Thermocouple Cable
Y	300 V Chromel-Alumel Thermocouple Cable
Z	300 V Chromel-Constantan Thermocouple Cable

Table 3 (Cont'd)

2nd CHARACTER (NO. of CONDUCTORS or PAIRS)

A	One
B	Two
C	Three
D	Four
E	Five
F	Six
G	Seven
J	Nine
K	Thirty-four
L	Eleven
M	Twelve
N	Thirteen or One-Hundred
P	Fourteen
Q	Fifteen
R	Sixteen
S	Eighteen or four-hundred
T	Twenty
U	Twenty-four
V	Nineteen or Two-hundred
W	Twenty-seven
X	Thirty-seven or Thirty
Y	Forty-two or Forty-eight
Z	Forty-seven or Six-hundred

3rd CHARACTER (JACKET COLOR)

	COLOR	VITAL CIRCUITS
1.	Red	Train A and Channel I
2.	White	Train B and Channel II
3.	Blue	Channel III
4.	Yellow	Channel IV

Table 3 (Cont'd)

		ASSOCIATED CIRCUITS - Non-Vital
6.	Black w/Red Tracer	Train A, Channel I and BOP
7.	Black w/White Tracer	Train B and Channel II
8.	Black w/Blue Tracer	Channel III
9.	Black w/Yellow Tracer	Channel IV
0.	Black	Temp Power, Fire Pump House

TABLE 3 (Cont'd)

4th CHARACTER (CONDUCTOR SIZE)

A - 750 MCM	J - 4 AWG	S - # 4/0 AWG AL
B - 500 MCM	K - 6 AWG	T - 18 AWG
C - 350 MCM	L - 8 AWG	U - 17 AWG
D - 250 MCM	M - 10 AWG (19/22)	V - Not Used
E - 4/0 AWG		W - 20 AWG
F - 2/0 AWG	N - 12 AWG (19/25)	X - 22 AWG
G - 1/0 AWG	P - 14 AWG	Y - Undefined
H - 2 AWG	R - 16 AWG	Z - Plug cable (various sizes)
I - 350 MCM AL		

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NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket Nos. 50-443 OL-01
	)	50-444 OL-01
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE, et al.	)	On-site Emergency Planning and Safety Issues
	)	
(Seabrook Station, Units 1 and 2)	)	

AFFIDAVIT OF HAROLD WALKER

I, Harold Walker, being first duly sworn, hereby affirm that the answers to the questions set forth herein are true to the best of my knowledge:

Q1: Mr. Walker, by whom and in what capacity are you employed?

A1: I am employed by the U.S. Nuclear Regulatory Commission as a Reactor Engineer in section B of the Plant Systems Branch, Division of Engineering and Systems Technology, Office of Nuclear Reactor Regulations.

Q2: Have you prepared a statement of your professional qualification?

A2: Yes, a statement of my professional qualifications is attached as an exhibit to this affidavit.

Q3: Mr. Walker, what is the purpose of your affidavit?

A3: My affidavit responds to the memorandum submitted to the Appeal Board by the Licensing Board and the New England Coalition on Nuclear Pollution (NECNP). In its memorandum, the Licensing Board

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explained its reasons for concluding that "the pertinent EQF [environmental qualification file] shows that the dimensional differences between the RG58 and the RG59 cables are of such little importance that the test results for the RG59 cable can serve to qualify the untested RG58 cable." In its memorandum to the Appeal Board, NECNP challenged this conclusion on a number of grounds.

Licensing Board's Memorandum

Q4: Mr. Walker, do you agree with the statement at page 2 of the Licensing Board's memorandum that:

> [T]he dimensions of the copper conductors (#21 AWG stranded wire in cable RG58, and #24 AWG stranded wire in cable RG59) have little, if any, significance to environmental qualification of the cables, except that the dimensions reflect the different applications for which the cables are intended.

A4: Yes I agree.

Q5: Mr. Walker, the Licensing Board states at pages 2-3 of its memorandum that it "could find no requirements in the environmental qualification acceptance criteria, or in the environmental qualification tests themselves, that depended upon the diameter or cross-sectional area of the conductors." Do you agree with the Licensing Board?

A5: I am unaware of any requirement in the environmental qualification acceptance criteria or in the environmental qualification test themselves that depends upon the diameter or cross-sectional area of the conductors.

Q6: Mr. Walker, at page 3 of its memorandum the Licensing Board states that "different operating requirements of the cables, specifically the differing requirements for insulation resistance (IR), provide a basis for justifying the similarity of the two cables whose primary insulation thickness differs by a factor of approximately 1.5." Do you agree with this statement?

A6: I agree that the different operating requirements of the cables, specifically the differing requirements for insulation resistance are important in determining similarity of performance of the two cables. However, the functional requirements of the cables and the potential failure modes must also be considered. In this case, these are important considerations because the RG58 cable only has to remain intact, and is not required to mitigate an accident. It is also important to note that the materials used in construction, type of cable (single conductor vs multiconductor) and whether the cables were made by the same manufacturer also are important. The Staff believes that all these factors collectively, provide a basis for justifying the similarity of the two cables whose primary insulation thickness differs by a factor of approximately 1.5.

Q7: Mr. Walker, in light of your previous answer, do you agree or disagree with the Licensing Board's statement at page 3 of its memorandum that "the predicted performance of the smaller RG58 cable under conditions of environmental qualification testing would be proportional to the lower required operating resistance of its insulation"?

A7: 10 C.F.R.§ 50.49(f)(2) provides, in pertinent part, that an equipment item may be qualified by testing a similar item with a supporting analysis to show that the equipment to be qualified is acceptable. In this context, the Staff believes that the term "similar", means to be alike in substance or in essential respects. On the other hand, the term "proportional" implies a more exact comparison or a ratio. In the context of 10 CFR 50.49 the Staff does not believe that similar and proportional are synonymous.

Nevertheless, when one considers the known attributes of cables RG58 and RG59 such as the functional requirements under accident conditions, the difference in insulation thickness of only 20 mils, the same materials of construction and type of construction and that RG59 did not fail as a result of the environmental qualification testing, the ability of RG58 to perform its function by remaining intact is a reasonably conservative prediction.

Notwithstanding the above described attributes, proportional performance under the conditions of environmental qualification testing may be a reasonable expectation but it is not assured. However, proportional performance is neither required or necessary in order for RG58 to perform its required function under accident conditions, nor is it necessary in order to demonstrate similarity.

Q[illegible]: Mr. Walker, in its order of November 6, 1987 the Appeal Board asked the NRC Staff to discuss "whether in view of the specification that coaxial cable must pass an 'AC Voltage Withstand' test at 5000 volts, the Licensing Board erroneously relied upon the value of 80 volts per mil of insulation" as the applicable acceptance criteria. Please address the Appeal Board's concern.

A[illegible]: The Voltage withstand test of 5000 Volts, identified in the specification for coaxial cable, is in accordance with Military specification MIL-C-17E, which is identified by Applicants as the acceptance criteria that this particular cable must meet in order to be accepted for use at Seabrook. The NRC acceptance criteria is 80 Volts AC per mil of insulation, as set forth by the Institute of Electrical and Electronics Engineers (IEEE) in the "IEEE Standard for Type Test of Class 1E Electric Cables, Field Splices, and

Connections for Nuclear Power Generating Stations" ("IEEE Standard 383-1974"). This standard is endorsed by NUREG-0588 Revision I, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment".

NECNP's Memorandum

Q9: Mr. Walker, NECNP argues (at pages 3-4 of its memorandum) that the Licensing Board's conclusion that "the predicted performance of the smaller RG59 cable under conditions of environmental qualification testing would be proportional to the lower required operating resistance of its insulation" is contradicted by information in the same equipment qualification file relating to the environmental qualification of RG11 cable. Do you agree with NECNP, and if so, is this point significant?

A9: I agree with NECNP but as I explained above (A7), this point is not significant.

Q10: Mr. Walker, NECNP states at page 4 of its memorandum:

> Given the fact that neither the insulation resistance operating requirement nor the measured insulation resistance after testing of the RG11 and RG59 cables is proportional to the cables' insulation thickness, the Board's Memorandum raises questions as to what other factors might influence the qualification of these cables.

Are there other factors which might influence the qualification of these cables?

A10: Yes, see my response to Question 6.

Q11: Mr. Walker, at page 5 of its memorandum, NECNP argues that it is not possible to infer with an adequate degree of conservatism that an untested cable can be qualified by comparison to a tested cable having thicker isulation and similar or higher insulation resistance requirements. Do you agree?

A11: The concept of demonstrating similarity is somewhat complex, but I do not agree that it is impossible. The Staff believes that the demonstration of similarity increases in complexity as differences between the items in question become greater (i.e., the more they are different the less they are similar). In the case of the RG58 and RG59 cables, the Staff believes qualification has been demonstrated in accordance with 10 C.F.R. §50.49(f)(2) because the materials of construction and type of construction is the same for both cables, the insulation thickness for RG59 is 1.5 times greater but the specified operating resistance is 10 times greater. Finally, there is added conservatism in that RG58 is only required to remain intact (i.e., no short to ground) as indicated in NECNP Ex. 4, reference 6.

Q12: Mr. Walker, please address NECNP's comment (at page 6) that "the test methods used to qualify the RG59 cable provide a questionable basis either for qualifying the RG59 cable or qualifying the RG58 cable by comparison."

A12: 10 C.F.R. §50.49 sets forth the requirements for environmental qualification of electrical equipment important to safety for nuclear power plants. The NRC acceptance criteria for cables is described in IEEE standard 383-1974. I believe that environmental qualification of RG58 and RG59 is in compliance with the requirements of 10 CFR 50.49.

The following is the relationship of insulation resistance to cable length:

Formula to calculate the insulation Resistance of a given length of Cable:

$$RL = \frac{Rm \times CTSL}{L}$$

R_M = Measured resistance of tested cable in Megohms

C_{TSL} = Cable test specimen length in feet

R_L = Insulation resistance for cable of L feet in megohms

L = length in feet

Reference MIL C-17F, January 1983.

Q13: Does this complete your affidavit?

A13: Yes it does.

Harold Walker

Harold Walker

Subscribed and sworn before me this 11th day of December 1987:

Peggy J. Brown

My commission expires July 1, 1991

PROFESSIONAL QUALIFICATION
OF
HAROLD WALKER

I am a Reactor Engineer in Section B of the Plant Systems Branch, Division of Engineering and Systems Technology, Office of Nuclear Reactor Regulation, United States Nuclear Regulatory Commission. My duties include serving as a principal reviewer in the area of nuclear plant protection to assure against various hazards and certain aspects of containment, radio-active waste processing and other support systems assigned to the Branch. Prior to this assignment I was a Mechanical Engineer in the Electrical, Instrumentation and Control Systems Branch where I reviewed the integrity, operability and functional capability of mechanical and electrical equipment, mechanical components, and their supports needed for safe operation and safe shutdown of nuclear facilities.

Prior to being assigned to the Electrical Instrumentation and Control Systems Branch, I was a Mechanical Engineer in the Equipment Qualification Branch where my duties included performing technical reviews, analyses and evaluations of the adequacy of the environmental qualification of electrical and mechanical equipment whose failure, due to such environmental conditions as temperature, humidity, pressure and radiation, could adversely affect the performance of safety systems. I was previously a Materials Engineer in the Materials Engineering Branch where my duties and responsibilities involved the review and evaluation of materials performance from the standpoint of operability and functional capability and integrity under normal, abnormal, and accident loading conditions, and analyzing fracture toughness of reactor vessel materials, including specific data to assure that the materials will behave in a non-brittle manner.

Prior to my position in the Materials Engineering Branch, I was a Materials Engineer in the Engineering Branch, Division of Operating Reactors. My duties and responsibilities included the review of operating problems to determine whether safety requirements were being satisfied and to assure that operating problems were corrected, and met with due regard for safety and environmental protection.

Prior to my position in the Engineering Branch, I was a ACRS Fellow at the Advisory Committee on Reactor Safeguards. My duties included collecting and consolidating information pertaining to non-destructive testing methods.

I hold a B.E. degree in mechanical engineering from the City College of the City University of New York and I have taken graduate courses at the University of Pittsburgh.

Prior to joining the NRC, I was an engineer at Westinghouse Research Corporation in Pittsburgh, Pennsylvania where my duties included the application of the state of the art fracture mechanics as well as the study of structural integrity of materials in various environments and under various loading conditions.

CERTIFICATE OF SERVICE

I, Deborah S. Steenland, one of the attorneys for the Applicants herein, hereby certify that on April 8, 1988, I made service of the within document by mailing copies thereof, postage prepaid to:

Alan S. Rosenthal, Chairman
Atomic Safety and Licensing
Appeal Panel
U.S. Nuclear Regulatory
Commission
Washington, DC 20555

Thomas S. Moore
Atomic Safety and Licensing
Appeal Panel
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