SNUPPS
Standardized Nuclear Unit
Power Plant System

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July 28, 1983

SLNRC 83-0042 FILE: 0278
SUBJ: Environmental Qualification of Safety-Related Electrical Equipment

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Docket Nos. STN 50-482 and STN 50-483

Dear Mr. Denton:

The enclosure provides additional information applicable to several NRC comments resulting from the environmental qualification site audits of the SNUPPS plants. Copies of the NRC audit team comments and initial SNUPPS responses were provided in writing to the audit team during the audit. These comments and responses have also been incorporated into the environmental qualification files at the SNUPPS plants for future reference.

Very truly yours,

Nicholas A. Petrick

MHF/nld5a28
Enclosure: Additional Information Applicable to NRC Audit Comments

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Enclosure

ADDITIONAL INFORMATION APPLICABLE TO NRC AUDIT COMMENTS

PROGRAM COMMENTS

1. Instrument Accuracies:

Test program instrument accuracy data is maintained by Westinghouse for NSSS-supplied equipment. For BOP equipment, the programs which require additional data are being identified; and where this information is available, it will be added to the qualification files or adequate justification for the lack of data will be developed.

2. Thermal Lag Analysis:

The following will be incorporated into section 6.2.2 of the EQ Submittal in the next revision:

"For MSLB environments, credit was taken for specific equipment surface temperature response. The methods used to calculate equipment surface temperatures are described in Bechtel topical report BN-TOP-3, Revision 4, Section 3.4. The Bechtel standard computer program COPATTA (NE100) is used to model the SNUPPS containment. Westinghouse-supplied blowdown data, the performance of the various engineered safety features, and heat sink data are input to the program and the resulting containment pressure and temperature as well as the heat sink temperatures are calculated. The equipment of interest is modeled as a heat sink in the SNUPPS containment model and its temperature is calculated as part of the COPATTA calculation. The heat transfer methods used to model the equipment heat sinks are taken from NUREG-0588, Revision 1, Appendix B. The heat transfer rate equations and the convective and condensing heat transfer coefficients used in the COPATTA analysis of equipment surface temperature are taken directly from NUREG-0588, Appendix B.

A typical selection of representative equipment and components designed to accomplish protective actions in response to a design basis event and thus requiring environmental qualification includes motor-operated valves, containment penetrations, electronic differential pressure transmitters, and cables.

To conduct a transient temperature analysis with the COPATTA code, equipment modeling is required. The technique adopted, as outlined below, is primarily based on equipment size (heat transfer area) and material properties (thermal conductivity).

a. Motor-operated valves are modeled as a slab. The air gap was reduced to maximize heat transfer to the inside and the wall thickness utilized is smaller (conservative) than any SNUPPS motor-operated valves.

b. Containment penetrations are modeled as a slab, with a steel cover, air gap, and cable consisting of insulation and a copper core. Again, the air gap was reduced to maximize heat transfer to the inside.

c. Electronic pressure transmitters are modeled as a slab consisting of a cast aluminum cover and an air gap to a copper wire.

d. Power, control, and instrument cables are modeled as a cylinder consisting of jacketing, insulation, and a copper core in the most conservative configuration relative to the SNUPPS procured cable....."

3. Electrical Cable Surveillance:

The surveillance and maintenance requirements for safety-related motors include a provision for a megger of the insulation in accordance with manufacturer's recommendations, typically every 18 to 24 months. This testing is planned to be performed for the motors from the associated motor control center or switchgear. Thus, for motors inside containment, the cables and electrical penetration assemblies will be meggered with the motor windings. This surveillance is capable of detecting insulation degradation and the location of degradation can be traced to determine which component is at fault.

4. Beginning of Qualified Life:

The SNUPPS Utilities consider the qualified life of the equipment to commence at commercial operation of each site. This position is considered acceptable based on the following information:

1) During construction storage, the vendor's shelf life recommendations have been followed. There are procedures in place at each site for the controlled storage of safety-related equipment.

2) The average ambient temperature experienced by the equipment prior to commercial operation is below the temperature assumed in the Arrhenius aging analysis.

3) The maximum expected normal ambient temperature to be experienced by the equipment was utilized as the normal continuous temperature for the qualified life development and results in the inclusion of significant margin in the aging analysis.

4) Equipment operation prior to commercial operation is typically not at design conditions (i.e., reduced operating time, reduced frequency of operation and reduced ambient temperatures).

5) Even though the beginning of qualified life is considered to occur for the equipment at commercial operation, a preventive maintenance program is initiated on the safety-related equipment during the startup testing phase prior to release for operation.

5. Westinghouse Auditable Link Document:

The Westinghouse Auditable Link Documents for each SNUPPS plant will be incorporated into the files at each plant.

6. Qualification Files:

As they are discovered, checklists containing information which is difficult to read will be reworked to improve legibility.

E-028

1. Torque Requirements for Terminal Blocks:

During the walkdown at the Callaway site, the NRC EQ audit team noticed printed instructions about a 25 inch-pound tightening torque on the terminal box containing Marathon terminal blocks. The area of concern was that the amount of torque applied to the mounting screws/nuts of the terminal blocks to the terminal box should be such as not to cause cracking of the terminal block due to differential thermal expansion of the terminal block phenolic material and mounting panel metallic material. Actually, the tightening torque printed on the terminal box is not the torque specified for mounting screws/nuts, but is the vendor recommended torque for terminal screws/nuts. SNUPPS review of the qualification test report (Ref. Page 258, Section 1.3 and Page 6, Section 1.1.3 of E-028-0044-01) reveals that during the test the terminal screws/nuts were tightened in accordance with the vendor recommendations to simulate actual installation procedures, i.e.,

- Even number series circuits torqued to 25 (+0, -5) inch pounds.
- Odd number series circuits hand tightened until snug, then tightened an additional 1/8 to 1/4 turn.

Accordingly, the installed conditions will match the tested conditions.

E-058

1. Exposed Electrical Cable Ends:

(This response is applicable to all cables used inside the containment at the SNUPPS facilities.)

SNUPPS has reviewed the qualification programs for the cable being utilized inside the containment to address the NRC concern of water entering exposed cable ends between the jacket and the insulation and thereby providing a new ground plane for the case in which the insulation fails. This concern was identified because of the difference between the installed and tested configurations.

SNUPPS has determined that with the exception of cable procured under four specifications, all of the cable utilized inside the containment was tested without the jacketing installed (i.e., the insulator was exposed to the test environment). For these cables it is obvious that the scenario of moisture penetrating the jacket to insulation interface and providing a ground plane for the cable is not as severe as the tested condition. These cables are considered qualified by virtue of the testing performed being more severe than the installed condition.

Two of the remaining four types of cable are sealed with qualified materials at the terminations and accordingly are considered qualified based on the tested configuration and the installed configuration being the same.

The two remaining types of cable (Specification E-058 and E-062) are also considered qualified based on the following information:

a) The cable is routed its entire length without splicing (i.e., source to load).

b) The cable is only terminated inside of a housing (e.g., motor termination box, electrical penetration, terminal box, etc.).

c) During terminal block testing, the terminated ends on the terminal blocks are tested in a configuration that demonstrates that the exposed lugs will not short (terminal to ground or terminal to terminal) in an accident environment.

d) The construction method for both types of cable is to extrude the insulation and the jacket together. This methodology provides for some bonding of the two materials.

e) Neither end of the cable is sealed and accordingly no differential pressure across the ends of the cable will exist (i.e., there will be no driving force to cause the water to enter the jacket to insulation interface).

f) The construction material for the insulation is the same that was tested by other vendors with the jacketing not installed (it is recognized that there are probably minor differences in the actual materials between vendors, but the primary constituents are common).

Based on the fact that the cable is constructed in a manner that causes the jacket and insulation to be bonded together, that there is no differential pressure to drive the liquid between the jacket and insulation, and the fact that the terminated ends are always in a housing there appears to be no legitimate mechanism that would introduce this "new ground plane" to the cable and therefore cause the tested and installed configuration to be significantly different.

J-481

1. Electrical Cable Used for Transmitters:

The level transmitters purchased under specification J-481 are connected to 600 volt, 3 conductor, single shielded twisted triple number 16 AWG instrumentation cable purchased and qualified under specification E-062.

ESE-3

1. Soldered Electrical Connections:

The soldering of ESE-3 transmitter electrical connectors, as recommended by Westinghouse to avoid erratic behavior, has been accomplished at both SNUPPS plants.

HE-2/5

1. Field Change Notices

To document completion of Field Change Notices, a copy of the completed, signed-off notices will be placed in the qualification files.