

UNITED STATES NUCLEAR RECULATORY COMMISSION WASHINGTON, D. C. 20555

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NOTE TO: W. Johnston, NRR Z. Rosztoczy, NRR R. Feit, RES J. Austin, EDO W. Haass, NRR J. Conway, NRR V. Thomas, IE

DRAFT INFORMATION NOTICE ON TERMINAL BLOCKS

Enclosed is a draft copy of a proposed information notice on terminal blocks. It was prepared by Ron Feit with input from Vince Thomas. The portions prepared by Vince are underlined. Since IE did the typing of this latest version, we are transmitting it to all of the interested parties to expedite distribution. However, comments on this draft should be directed to Ron Feit. Resolution of comments will be included in the final issuance of the Information Notice by IE.

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Bob Baer, IE

Enclosure: As stated

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Proposed Information Notice Pertaining to Environmental Tests of Electrical Terminal Blocks

Discussion

This information notice pertains to the results of NRC sponsored research conducted on electrical terminal blocks typical of those utilized in many Nuclear Power Plants. The research program was conducted at Sandia National Laboratories in Albuquerque, N.M. and consisted of approximately 600 individual tests made on enclosed and open terminal blocks of the types used at TMI-2. The terminal blocks were subjected to 100% humidity conditions up to 186° F which were the conditions experienced by some terminal blocks during the TMI-2 accident. (Note: To date, there has been no evidence of terminal block failure which may have occurred during the TMI-2 accident.) No tests at design basis large LOCA conditions were conducted. Terminal block performance under the test conditions was measured by monitoring electrical terminal to ground leakage current with terminal to ground voltages of 120, 240, and 480 volts. The terminal blocks were installed in metal enclosures with a 6 mm pressure relief hold. These metal enclosures were mounted in a horizontal plane during the tests. Some tests were made with containment spray and various contaminants that may be found on terminal blocks in nuclear power plants.

The following are some important results of these tests:

 Terminal block failure as evidenced by unstable and increasing leakage current can be experienced at threshold leakage currents less than 50 ma when exposed to 100% humidity conditions at 186°F.

- (2) Some failed terminal blocks performed normally when allowed to dry indicating that post test performance is not a guarantee of performance during loss of coolant accident conditions.
- (3) The value of leakage current increased with the following:
 (a) vapor temperature
 - (b) the degree to which the terminal blocks are directly exposed to the vapor
 - (c) surface contamination
 - (d) the voltage between terminal and ground
- (4) Steam and alcohol cleaning was found to be effective in restoring failed terminal blocks with a small sample of failures for the types tested. However, it may not be effective and may even result in deleterious-surface contamination with some types of terminal blocks. Any cleaning procedure used should be verified by the terminal block manufacturer.

Guidance

It is recognized that cleanliness of terminations and terminal blocks in circuits important to safety is of concern to designers, constructors, and licensees. The cleanliness aspects are addressed in Appendix B 10 CFR 50. resultions. These regulations require the licensee to establish appropriate procedures based upon manufacturer's and constructor's recommendations, operating experience, and specific component characteristics to assure that equipment is stored, installed, and maintained in an acceptable state. To this end, several IEEE, ANS, ANSI Standards and MRC Regulatory Guides are being used by designers, constructors, and operators of power plants which address the installation, cleanliness, and en-going maintenance of Class IE electrical components, including terminal blocks. The Office of Inspection and Enforcement has general inspection procedures which are used by inspectors to monitor compliance with the above Standards, Guides, and recommendations. Terminal blocks are specifically a identified as an example of/component which must be inspected for cleanliness during construction of the power plant.

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In view of the above, licensees are reminded that the plant preventive maintenance program in use at their facilities should assure (1) proper operation of all essential components is achieved throughout the life of the plant; and, (2) that periodic inspection of those terminations and terminal blocks for cleanliness and installation integrity is performed following any maintenance activity affecting them.