

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

December 10, 1997

NRC INFORMATION NOTICE 95-49, Supplement 1: SEISMIC ADEQUACY OF
THERMO-LAG PANELS

Addressees

All holders of operating licenses for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to inform addressees about the results of mechanical properties testing of Thermo-Lag 330-1 fire barrier material performed by the National Institute of Standards and Technology (NIST). The results of the testing indicated significantly lower mechanical properties than those used by the vendor to demonstrate the seismic adequacy of Thermo-Lag 330-1 panels. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

In response to a "seismic issue" concern raised by the Nuclear Information and Resource Service regarding the Thermo-Lag fire barrier (Accession Number 9208280125), the staff studied the issue and concluded that the "shattering of raceways or severing of cables required for safe shutdown were not credible scenarios" under postulated seismic events at nuclear power plant sites (Accession Number 9302110146). The staff's response was based on acceptance of the analyses performed by a consultant who used mechanical properties data for Thermo-Lag, which were provided by Thermal Science, Incorporated (TSI), the manufacturer and supplier of the Thermo-Lag fire barrier material.

The Tennessee Valley Authority (TVA) subsequently submitted the results of its simulated seismic tests and mechanical properties tests related to the use of Thermo-Lag fire barrier material at Watts Bar Nuclear Plant (Accession Number 9411250234). These tests indicated significantly lower mechanical properties values compared to those used by the TSI consultant.

The NRC staff, therefore, contracted with the NIST to perform appropriate mechanical properties testing of Thermo-Lag material. The tests, test methods, and test results are

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described in the NIST's letter report to NRC entitled "Mechanical Properties of Samples of a 'Subliming' Fire Barrier Panel Material as a Function of Temperature (Accession Number 9608140068)." NIST also compared its test results with TSI's and TVA's. NIST's test results for mean tensile strength, flexural strength, and elastic modulus of the 1-hour fire-rated Thermo-Lag material were at least 40 percent lower than TSI's at 23 °C (73 °F) and 50 °C (122 °F). NIST's test results were similar to those of TVA.

Discussion

As stated in Information Notice (IN) 95-49, "Seismic Adequacy of Thermo-Lag Panels," dated October 27, 1995 (Accession Number 9510240388), fire barriers may undergo damage during postulated seismic events, but the fire barriers should not be damaged to such an extent that they could reduce the functioning of the protected cables or other safety-related structures, systems, or components. Therefore, NRC is concerned that the correct or conservative values for pertinent mechanical properties may not have been used in evaluating the seismic adequacy of Thermo-Lag panels and, as a result, the fire barriers may not maintain their integrity during postulated seismic events.

The following is a summary comparison of the mechanical properties of Thermo-Lag 330-1 reported by TSI and NIST for the 1-hour fire-rated material at 50 °C (122 °F):

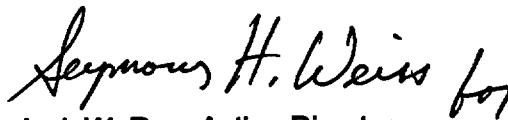
- Tensile Strength: TSI-5.0 MPa (720 psi); NIST-2.46 MPa (360 psi)
- Flexural Strength: TSI-12.4 MPa (1800 psi); NIST-4.56 MPa (660 psi)
- Modulus of Elasticity: TSI-379 MPa (54.9 ksi); NIST-137 MPa (19.9 ksi)

NIST summarizes the results as follows: "The mean values of the mechanical properties measured in this study are lower than those reported by the manufacturer in Technical Note 90181. Some of the differences can be attributed, in part, to the different testing methods that were used. However, the differences are sufficiently large to indicate that there are real differences between the tensile strength, flexural strength, and static modulus of elasticity of the samples used in the study by NIST and those used in the manufacturer's tests."

A reevaluation by the NRC staff of Thermo-Lag stresses under postulated seismic events, using NIST's test results, indicated that at 23 °C, properly installed [in accordance with TSI's installation procedure (see also IN 91-79, "Deficiencies in the Procedures for Installing Thermo-Lag Fire Barrier Material," and TSI's seismic evaluation criteria)] 1-hour fire-rated Thermo-Lag panels can safely withstand the seismic loadings imposed by 3.3 g vertical acceleration and

acceleration levels generated by design-basis seismic events at the locations of the Thermo-Lag protected cable trays or equipment could exceed the acceptable acceleration levels at a number of operating nuclear power plants. The dynamic forces generated by such accelerations could detach the large pieces of Thermo-Lag panels from the cable trays, which, in turn, could act as missiles and jeopardize the safety functions of the safety-related equipment and components in the vicinity. However, the potential for such a hazard depends on the plant specific installation, spatial separation, and sustained elevated temperature.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact the technical contact listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.



Jack W. Roe, Acting Director
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97-81	Deficiencies in Failure Modes and Effects Analyses for Instrumentation and Control Systems	11/24/97	All holders of OLs for nuclear power reactors except those who have ceased operations and have certified that fuel has been permanently removed from the vessel
97-80	Licensee Technical Specifications Interpretations	11/21/97	All holders of OLs for nuclear power reactors

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