DRAFT VALUE/IMPACT STATEMENT

1. THE PROPOSED ACTION

1.1 Description

In the course of construction of a nuclear power plant, cables and cable raceways penetrate barriers such as walls, floors, or floor-ceiling assemblies throughout the plant. When these barriers are rated as fire resistive barriers, the cable penetrations should have the same resistance to fire as the barriers. The fire rating for a barrier with no penetrations is arrived at by testing it according to the procedure outlined in ANSI/ASTM Standard E119-71, "Methods of Fire Tests of Building Construction and Materials." This rating is expressed in hours and represents the ability of the barrier to withstand exposure to a standard fire for that length of time without failure (acceptance criteria are given in ANSI/ASTM Standard E119-71). Up to now there has not been a standard qualification test for rating a rated fire barrier with a cable penetration. The proposed action will provide guidance for establishing a standard type test for qualifying cable penetration fire stops when mounted in rated fire barriers used in the construction of nuclear power plants.

1.2 Need for the Proposed Action

There is no detailed or formal staff position on a standard qualification test for cable penetration fire stops other than a reference made in Regulatory Guide 1.120 to a draft standard being developed by Task Force 12-40 of the IEEE Insulated Conductors Committee on testing cable penetration fire stops. This draft is now an approved standard (IEEE Std 634-1978, "IEEE Standard Cable Penetration Fire Stop Qualification Test"), and a definite need exists for an established NRC position on the use of this standard for qualification testing cable penetration fire stops in nuclear power plants.

505 253

1.3 Value/Impact of the Proposed Action

There will be less time spent by the staff in licensing actions if a standard qualification test of cable penetration fire stops is endorsed by the NRC. This will relieve the staff of determining a special test for each facility application on a case-by-case basis. The value/impact of each regulatory position supplementing the endorsed IEEE standard is discussed below:

1.3.1 Regulatory Position C.1 - This position provides information to the user of the guide on how to apply referenced standards and has no impact.

1.3.2 Regulatory Position C.2 - The IEEE standard states that the test assembly should be representative of an actually installed cable penetration fire stop. Regulatory position C.2 lists items that might not normally be considered in constructing the test assembly.

Value - This position will ensure more nearly representative conditions in the qualification test.

Impact - Test assemblies will be more difficult to construct, especially the type having a differential pressure with the high pressure on the exposed side, since test furnaces are normally operated at a pressure below atmospheric.

1.3.3 Regulatory Position C.3 - The IEEE standard does not discuss the case of intentional modification of a fire stop to add additional elements and the subsequent resealing of that fire stop. Regulatory position C.3 provides for requalification of a fire stop that undergoes the above procedure if the prototype was not successfully tested under such conditions.

Value - This position will ensure that fire stop resealing procedures are adequate to prevent a reduction in the effectiveness of the fire stop.

Impact - This position will require the preparation and testing of an additional representative assembly.

1.3.4 Regulatory Position C.4 - Section 5.3.3 of the IEEE standard states that the cable on the exposed side shall protrude a minimum of 1 foot. This distance of 1 foot is considered an artificial reduction in the combustible loading for fire stops rated at 1 hour or less. Regulatory position C.4 states that

3 feet of cable should be used on the exposed side for such applications to provide a more representative deviation from the standard time-temperature curve during the initial burning of the cable jacket.

Value - This position will ensure more nearly representative testing of fire stops rated at 1 hour or less.

Impact - The use of an additional 2 feet of cable is expected to have little impact on the complexity of design or testing of the representative assembly.

1.3.5 Regulatory Position C.5 - Section 5.3.5 of the IEEE standard states that cable penetration fire stop designs that are unsymmetrical may require testing on both sides for qualification. Regulatory position C.5 calls for testing on both sides of fire stops that are unsymmetrical with respect to the use and application of fire stop materials.

Value - This position will ensure adequate symmetry of fire spreading resistance for unsymmetrical fire stops.

Impact - More testing will be required, since each fire stop that is unsymmetrical with respect to the use and application of fire stop materials will have to be tested twice.

1.3.6 Regulatory Position C.6 - Section 5.3.10 of the IEEE standard states that a minimum of three thermocouples shall be used on the unexposed side and designates the minimum distribution pattern for these thermocouples. Regulatory position C.6 provides for more reliable temperature measurements on the unexposed side by requiring three thermocouples for each point of interest.

Value - This position will preclude the inherent unreliability of single-point measurements and will ensure that the temperature at each possible point of interest is sampled.

Impact - The complexity of the instrumentation layout will be increased slightly.

1.3.7 Regulatory Position C.7 - Section 6.1.1 of the IEEE standard contains some ambiguity on the passage of flame. Specifically, the phrase "hot enough to ignite ..." could be interpreted to modify the noun "flame" as well as the noun "gases." Regulatory position C.7 provides clarification by stating that any passage of flame should be considered to terminate the endurance of the fire stop.

Value - This position will prevent errors in endpoint determination caused by misinterpretation of the IEEE standard.

Impact - This position is merely a clarification and has no impact.

1.3.8 Regulatory Position C.8 - Section 6.1.2 of the IEEE standard states that the transmission of heat through the cable penetration fire stop shall not raise the temperature on its unexposed surface above the self-ignition temperature of various listed materials and states that the maximum temperature measurement shall not exceed 700°F. Regulatory position C.8 adds conservatism to this maximum temperature by stating that it should not exceed 600°F or 400°F depending on the location of the thermocouple. The 600°F limit is based on the self-ignition temperature of various materials that could pass through the penetration. The 400°F limit is placed on thermocouples located 1 inch away from the 600°F thermocouples and is based on the self-ignition temperature of common shipping containers that could be placed in the proximity of the fire stop in the floor/ceiling application.

Value - This position will ensure that the maximum allowable temperature on the unexposed side is well below the self-ignition temperature of materials expected to pass through the fire stop and will ensure that common violations of good housekeeping procedures will not contribute to the spreading of fire between compartments separated by a fire barrier.

Impact - The complexity of the instrumentation layout will be increased slightly. Increased cost in fire stop construction because of the lowering of the temperature limit is not expected.

2. TECHNICAL APPROACH

2.1 Technical Alternatives

A fire-rated barrier is qualified in accordance with ASTM Standard E119-71, "Methods of Fire Tests of Building Construction and Materials." The proposed action involves qualifying, by testing, a rated fire barrier that has been changed by the addition of a physical penetration (i.e., a cable or cable tray). The technical approach should provide guidance that will, as a minimum, result in testing equal to the testing of the rated fire barrier, since the rating of the qualified fire barrier with the penetration should equal the rating of the

505 256

qualified fire barrier. Since the rated fire barrier, tested to E119-71, is accepted by the staff as an acceptable technical approach taken in lieu of attempting to simulate the design basis fire for every cable penetration in the plant and then testing t it, it appears technically feasible to modify the method and acceptance criteria of the ASTM E119-71 test for the purpose of testing a fire stop in a cable penetration that penetrates a rated fire barrier.

2.2 Discussion and Comparison of Technical Alternatives

Not applicable as there are no other reasonable approaches available at this time.

3. PROCEDURAL APPROACH

3.1 Procedural Alternatives

Potential SD procedures that may be used to promulgate proposed action and technical approach include the following:

1. Regulatory Guide
2. Branch Technical Position
3. ANSI Standard, endorsed by a Regulatory Guide
4. NUREG
5. Regulation

3.2 Value/Impact of Procedural Alternatives

A regulation requiring that the design of safety-related equipment be verified by such measures as the performance of a suitable testing program is already in effect. However, detailed methods for qualifying a particular item of equipment are not appropriate for a regulation. A NUREG is not a viable alternative because the guidance will contain positions. An IEEE (Institute of Electrical and Electronics Engineers) standard (IEEE Std 634-1978, dated April 19, 1978, "IEEE Standard Cable Penetration Fire Stop Qualification Test") is in existence and could be endorsed by a regulatory guide. There are no branch technical

positions that address the specifics on how to qualify cable penetration fire stops.

3.3 Decision of Procedural Approach

A regulatory guide that endorses, with appropriate exceptions, IEEE standard 634-1978 dated April 19, 1978, should be prepared.

4. STATUTORY CONSIDERATIONS

4.1 NRC Authority

Authority for this guide would be derived from the safety requirement of the Atomic Energy Act through the Commission's regulations, in particular, General Design Criterion 3, "Fire Protection," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," which requires that structures, systems, and components important to safety be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. In addition, Criterion III, "Design Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50 requires, among other things, that design control measures provide for verifying the adequacy of design by such measures as the performance of a suitable test program. Where a test program is used to verify the adequacy of a specific design feature, it is required to include suitable qualification testing of a prototype unit under the most adverse design conditions.

4.2 Need for NEPA Assessment

No environmental impact statement is required.

5. RELATIONSHIP TO OTHER EXISTING PROPOSED REGULATIONS OR POLICIES

This guide will supplement Regulatory Guide 1.120, "Fire Protection Guidelines for Nuclear Power Plants."

505 258

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505 259