TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401

1630 Chestnut Street Tower II

April 12, 1985

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

By the October 23, 1979 letter from L. M. Mills to L. S. Rubenstein, NRC, we provided Revision 4 to our response for our Sequoyah Nuclear Plant to the fire protection review questions from the Auxiliary Systems Branch (ASB) of the NRC. In that submittal, we committed to the use of RTV silicone rubber sealant around cables in conduit on each side of the fire barrier, regardless of the conduit size. We consider this commitment to be overly conservative when compared to NRC's current design guidance.

NRC's branch technical position (BTP) CMEB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants" (Revision 2 - July 1981), allows conduits four inches in diameter and smaller to be sealed with a noncombustible material, i.e., mineral wool, to prevent the passage of smoke and hot gases.

In a telephone converstaion with C. Stahle and D. Kubicki of NRC on April 2, 1985, NRC representatives agreed with TVA's plans for utilization of the NRC BTP methodology for internal conduit sealing. As discussed in the April 2, 1985 telephone call, enclosed is a revision to our October 23, 1979 response to ASB question 3.B(iii) regarding use of internal conduit sealing. Also, as discussed with the NRC representatives, we request that NRC's acceptance of this position be documented in the forthcoming safety evaluation report on TVA's review of the fire protection program.

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Director of Nuclear Reactor Regulation April 12, 1985

If you have any questions concerning this matter, please get in touch with Jerry Wills at FTS 858-2683.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. A. Domer

J. A. Domer
Nuclear Engineer

Sworn to and subscribed before me
this 12th day of April 1985

Paulette H. White

Notary Public
My Commission Expires 8-24-88

Enclosure
cc (Enclosure):

U.S. Nuclear Regulatory Commission
Region II
Attn: Dr. J. Nelson Grace, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Mr. Carl Stahle
Sequoyah Project Manager
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, Maryland 20814

ENCLOSURE

REVISED RESPONSE TO ASB QUESTION 3.B.iii

B. (iii) The design of the Sequoyah electrical penetration fire stops (EPFS) for cables and cable trays and their installation are based on TVA tests of full-scale mockups that must seal against air pressure. The tested design was modified to provide a greater depth of sealant material to give protection equivalent to a 3-hour fire resistance rating. The modification was based on a similar design, using the same type of cables and sealant material, and tests conducted by others to the standard time-temperature curve of ASTM E-119.

The design of the wall and floor electrical penetration fire stops through a fire barrier utilize a separate cable sleeve or slot for each cable tray. The design and installation of these penetration fire stops employ Dow Corning 3-6548 silicone RTV (room temperature vulcanizing) foam as the sealant material and inorganic fire barrier materials. From each side of the wall or floor opening, the cables are separated within the cable sleeve or slot using an inorganic fiber. The sealant material is then installed within the cable sleeve or slot. The cable sleeve opening is covered with a fire barrier board that is cut to fit around the cables and cable tray configuration.

In addition, the exposed surfaces of cables are coated from the fire barrier board for a minimum distance of five feet or to the nearest electrical panel or enclosure with material similar to Flamemastic 77 that is approved by Factory Mutual Research Corporation. Typical electrical penetration firestops through walls and floors are shown in Figures 3.B.(iii)-1 and 3.B.(iii)-2, respectively. The bare metal barrier plate in the cable tray wall penetration shown in Figure 3.B.(iii)-1 will be protected or modified to afford a fire rating at least equivalent to that assigned to the installed fire barrier.

Openings in conduits greater than 4-inches in diameter, penetrating designated fire barriers, utilize RTV silicone foam or rubber as the sealant material with inorganic fiber on each side of the sealant material. This material is installed around the cables at the fire barrier penetration itself, whenever feasible. If not feasible, it will be installed around the cables on each side of the fire barrier penetration in the nearest available conduit box or the end of the conduit termination. Spare conduits are plugged or capped until used.

Openings in conduits 4-inches or less in diameter, penetrating designated fire barriers, are sealed as indicated above for conduits greater than 4-inches in diameter or utilize inorganic fiber material or RTV silicone foam to prevent the passage of smoke and hot gases. This material is installed around the cables at the fire barrier penetration itself, whenever feasible. If not feasible, it will be installed around the cables on each side of the fire barrier penetration in the nearest available conduit box or the end of the conduit termination.

The sealant material used in cable tray penetration fire stops is Dow Corning's 3-6548 silicone RTV foam (components A and B). This material in its cured foam state is noncorrosive and fire resistant. A sample of this material has been tested by an independent laboratory according to ASTM E-84, standard method of testing of "Surface Burning Characteristics of Building Materials." The result of the test was that the material has a flame spread rating of 20.

The fire barrier materials used in the design and installation of the penetration fire stops employ a combination of inorganic fiber and fiber board similar to Johns-Manville Cerafiber and Cera Foam Board. These materials are made from exceptionally high purity alumina and silica constituents and are capable of withstanding continuous exposure to a temperature range of 2000° to 2300°F.

TVA has conducted fire tests on full-scale assemblies of electrical penetration fire stops that must seal against air pressure. The required differential air pressure across the penetration under test was maintained by adjusting a normal damper together with an exhaust fan in the exhaust duct. An external gas burner was located under the cables outside the area of coated cables. The burner was ignited on the fire side of test facility and allowed to burn for 30 minutes before shutoff. The fire was allowed to self-extinguish; therefore, no water spray test was conducted.

The results of the tests were that no fire burned through the penetration onto the cold side of the test facility and pressure seal maintained its integrity. The results from the tests demonstrate that the design provides an effective fire stop and pressure seal under simulated conditions when tested as a completed system.

In addition, fire tests on similar designs using the same type of cables and sealant material have been conducted by others. Test results are recorded in report serial No. 26543 dated October 28, 1975, of Factory Mutual Research Corporation. TVA has done a comparative study between the Sequoyah design of cable-cable tray penetration fire stops and cable penetration assemblies tested to ASTM E-119 in Factory Mutual (FM) report No. 26543. From this study, TVA has determined that the Sequoyah cable penetration fire stops are equivalent to those portions of the FM test No. 26543 that passed a 3-hour ASTM E-119 fire test.

The installed cable tray supports are similar to those used in the fire tests. From a review of the design of the cable trays supports together with post-test observations of the TVA mockup, we have determined that in case of collapse of trays on the fire side of the barrier, no loss of seal integrity will occur.

The design of the inplant cable tray supports are typically shown in Figures 3.B.(iii)-1, and 3.B.(iii)-2 for wall and floor penetrations with cable trays, respectively. During the tests conducted by TVA, warpage of the cable trays and supports was observed to occur outside the cable coated area. No visual distortion of the cable trays or their supports was observed at the wall opening following the test.

The design of the mechanical penetration fire stops are based on similar designs that use the same type of sealant and damming materials and that have been tested by others to the standard time-temperature curve of ASTM E-119.

The design of the mechanical fire stops utilize pipe sleeves for each penetration. Fire stops for pipe and duct penetrations consist of foamed-in-place Dow Corning 3-6548 silicone RTV foam installed to a depth of 12 inches or the thickness of the wall (minimum 8 inches). A typical pipe penetration fire stop is shown in Figure 3.B.(iii)-4.

In those pipe penetrations where pipe movements are present, a fire stop assembly consisting of a rolled silicone foam coated ceramic fiber blanket is wrapped around the pipe and stuffed into the sleeve on each side of the penetration. Air-tight bellows seals are then installed over these fire stops. A typical fire stop of this type is shown in Figure 3.B.(iii)-5.

Fire tests on similar mechanical penetration fire stop designs have been conducted by Factory Mutual Research Corporation. The results are recorded in Factory Mutual Report Serial No. 26543 dated October 28, 1975. The tests were performed following the procedures for evaluating floor-ceiling assemblies as defined under the Standard for Fire Testing of Building Construction and Materials ASTM E-119 (NFPA 251).