February 20, 2001

Mr. Steve Byrne
Vice President, Nuclear Operations
South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
Post Office Box 88
Jenkinsville, South Carolina 29065

SUBJECT: REVIEW OF VIRGIL C. SUMMER NUCLEAR STATION TESTING OF KAOWOOL FIRE BARRIER SYSTEMS ON DECEMBER 28, 1999 (TAC NO. MA9190)

Dear Mr. Byrne:

On May 24, 2000, Virgil C. Summer Nuclear Station (VCSNS) provided the NRC staff with a copy of a fire-endurance test of Kaowool fire barrier materials. The testing commissioned by VCSNS was performed on December 28, 1999. The NRC staff committed to review the fire-endurance test and determine fire barrier ratings for the tested materials. The purpose of this memorandum is to evaluate the results of the fire-endurance test for completeness and acceptability in meeting 10 CFR Part 50 Appendix R, Section III.G.2. The results of the review are included in the enclosure to this letter.

This review identified that the test process was acceptable to meet NRC requirements and that two of the configurations may be suitable, based on the factors listed in the enclosure, for use without the submittal of a deviation.

Certain key details were not included in the test report transmitted on May 24, 2000. The weight of the raceways and of cables and the information on cable types should be a part of the report. The Insulation Resistance Measurement Data Sheets (Megger results) for items 2, 5 and 6 (pages 214 to 220) are incomplete and should be provided. Attachments 1 and 2, which were referenced in the test report, but were not included in the test report, should be provided.

If you require any additional information, please contact us.

Sincerely,

/RA/

Karen R. Cotton, Project Manager, Section 1
Project Directorate ll
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-395

Enclosure: As stated

cc w/encl: See next page

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VIRGIL C. SUMMER NUCLEAR STATION -
REVIEW OF KAOWOOL FIRE BARRIER SYSTEM TESTING
PERFORMED ON DECEMBER 28, 1999

On December 28, 1999, Virgil C. Summer Nuclear Station (VCSNS) commissioned a fire-endurance test of Kaowool fire barrier materials with Transco Products, Inc., at Omega Point Laboratories, San Antonio, Texas. The test objective was to perform a 1-hour test of large and small cable trays and conduits that are representative of those installed at VCSNS to determine if the fire barrier material was adequate to fulfill the 1-hour fire rating required in 10 CFR Part 50, Appendix R, Section III.G.2.

The test was generally performed in accordance with Generic Letter (GL) 86-10, Supplement 1. Contrary to the guidance in GL 86-10, Supplement 1, meggering was not performed throughout the testing. Without meggering in accordance with GL 86-10, Supplement 1, the meggering data is considered indeterminate. Therefore, this review will be based solely on the thermocouple (temperature) results.

Conduits, cable trays and air drop cables were tested. (An air drop is a cable which is not routed in a cable tray or in a conduit and the fire barrier is wrapped directly to the cable.) The conduits were tested in both free air and against walls and ceilings. Cable trays and air drops were tested in free air. All conduits are rigid steel and all cable trays are steel, ladder back type. All configurations were wrapped with three 1-inch layers of 8 lb. per cubic foot Kaowool fire barrier material.

Following a discussion with Mr. Andrew Robosky of SCSNS on September 13, 2000, he faxed the staff a table of the weight of the raceway (conduit or cable tray weight and weight of cable in the test specimen) on a pound per linear foot basis. This information has not been verified and is assumed to be accurate. This information should be included in the test report.

The type of cable used in the fire test is included in the test report by what appears to be a site-specific cable number with no reference to the type of cable, conductor material, cable jacket material or dimensions. The materials of the raceway, their dimensions and weights, were not included in the test report. Manufacturer's cut-sheets were not included for equipment used in the test assembly, such as tested cables, raceway and Kaowool data sheets. Although some of this information was provided in the September 13, 2000, fax, it should be included in the test report for completeness.

The Meggering information is incomplete. Pages 214 through 220 are missing the post-fire megger results for test assembly 2 (1¼" diameter and 4" diameter conduits), 5 (6"X36" cable tray), and 6 (1¼" diameter conduit). This information should be included in the test report. Although this data may not be adequate to show that the tested assemblies meet a 1-hour rating base of GL 86-10, Supplement 1, these results may be helpful in the evaluation of the proposed deviations.

Enclosure

The test report references Attachments 1 and 2 (see page 16 of the report), but they are not included in the test report. This information should be added to the test report for completeness.

Results of December 28, 1999 Kaowool Fire-Endurance Testing						
VCSNS Item No.	Size	Configuration	Cable Weight (lb/ft)	Raceway Weight* (lb/ft)	Raceway Total Weight (lb/ft)*	Rating (min)
Rigid Steel Conduit						
Item 4	1" ϕ	Free Air	0.4	1.5	1.9	43
Item 7**	1" ϕ	Free Air	0.4	1.5	1.9	44
Item 2	1¼" ϕ & 4" ϕ	Wall/Ceiling Mount	5.1	9.8	16.9	56
Item 1	4" ϕ	Free air	6.7	9.8	16.5	60
Item 6	1¼" ϕ	Wall/Ceiling Mount	0.3	2.0	2.3	60
Steel Ladder Back Cable Tray						
Item 3	6" X 6"	Free Air	5.3	8.0	16.2	46
Item 5	6"X36"	Free Air	18.5	15.0	33.5	58
Air Drop						
Item 10	Air Drop	Free Air	0.34	0	0.34	31

* Raceway Weight is the weight of the conduit or cable tray, if applicable. Total raceway weight is the weight of the cables combined with the weight of the raceway.
** Item 7 had an additional layer of intumescent cloth, over the three 1-inch layers of Kaowool.

It can be concluded from reviewing the fire endurance test that the fire endurance rating of fire barrier wraps is highly configuration dependent. The only configurations which passed based on the thermocouple results were a 4-inch diameter free air conduit, with a minimum total raceway and cable weight of 16.5 lbs. per linear foot, and a 1¼-inch diameter wall/ceiling mounted conduit, with a minimum total raceway and cable weight of 2.3 lbs. per linear foot.

An installed fire wrap configuration can be considered to be bounded by a tested wrap configuration only if the physical configuration (dimensions of the raceway, number of wraps, interfering items, protection of supports) are the same as the tested configuration and the weight of the raceway, including cables, equals or exceeds the weight of the tested configuration. For example, a 4-inch conduit with a raceway total mass (including conduit and cables) of 16.5 lbs. would bound a 4-inch conduit with a raceway total mass of 20 lbs. However, 4-inch conduit with a total raceway of 15 lbs. would be considered indeterminate when using this test data.

The other ratings did not meet the requirements of 10CFR50 Appendix R, Section III.G.2, of meeting a 1-hour rating. Therefore, deviations are required to be submitted to the NRC for review for all configurations which are not bounded by testing.

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