MAR 9 1993

MEMORANDUM FOR: Conrad E. McCracken, Chief
Plant Systems Branch
Division of Systems Safety and Analysis

THRU: Ralph E. Architzel, Chief
Special Projects Section
Plant Systems Branch
Division of Systems Safety and Analysis

FROM: Patrick M. Madden,
Senior Fire Protection Engineer
Special Projects Section
Plant Systems Branch
Division of Systems Safety and Analysis

SUBJECT: TRIP TO OMEGA POINT LABORATORIES REGARDING TENNESSEE VALLEY AUTHORITY'S THERMO-LAG FIRE BARRIER TEST PROGRAM

The enclosed trip report covers the NRC's activities associated with witnessing Tennessee Valley Authority's construction of their conduit and junction box Thermo-Lag fire barrier test fire test specimens. The construction of these test specimens were inspected by Mr. R. Architzel, NRR/DSSA/SPLB, on February 3-5, 1993, G. Wiseman, Region II, on February 8-12, 1993, and P. Madden, NRR/DSSA/SPLB, on February 16-19, 1993. The construction took place at Omega Point Labs in San Antonio, Texas.

Patrick M. Madden,
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Enclosure: As stated

Distribution: See next page

SPLB:DSSA	SPLB:DSSA	SPLB:DSSA
PMadden	RArchitzel	CMcCracken
3/8/93	3/8/93	3/9/93

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ENCLOSURE

TRIP REPORT

Facility:	Omega Point Laboratories, San Antonio, Texas
Licensee:	Tennessee Valley Authority
Plant:	Watts Bar Nuclear Plant
Docket No.:	50-390, 50-391
Trip dates/Reviewer:	February 3 through 4, 1993 Ralph Architzel, NRR
	February 8 through 12, 1993 Gerry Wiseman, Region II
	February 16 through 19, 1993 Patrick Madden, NRR

INTRODUCTION

On February 3-4, 8-12 and 16-19, 1993, R. Architzel, G. Wiseman, and P. Madden respectively, visited Omega Point Laboratories (OPL), San Antonio, Texas. The purpose of these visits were to witness and monitor Tennessee Valley Authority's (TVA) construction of conduit and junction box Thermo-Lag 330-1 fire barrier test specimens. Licensee personnel and contractors contacted during these visits were J. J. Pierce and M. Salley of TVA, Wayne White and Gary Headrick, Insulators with Ebasco (assigned to Watts Bar), and Larry Starnes and Dan Headrick, Insulators with Bechtel (assigned to Sequoyah). In addition, the following OPL personnel were contacted: Deggary Priest, President OPL; Constance Humphry, Quality Assurance Manager and Vice President, OPL; and, Kerry Hitchkock, Shop Foreman, OPL.

EXECUTIVE SUMMARY

R. Architzel, NRR, G. Wiseman, Region 2, and P. Madden, NRR, visited Omega Point Laboratories Incorporated (OPL), San Antonio, Texas, on February 8 through February 19, 1993. The purpose of the visit was to observe TVA's construction of conduit/junction box Thermo-Lag fire barrier test specimens (specimens 94943A, B, C, D, and E). These test specimens are currently scheduled to be subjected to a 1-hour fire endurance test during the week of March 29, 1993 and April 5, 1993.

Background

In a January 25, 1993, meeting between the NRC and TVA held in the NRC's headquarters office in Rockville Maryland, TVA identified that they would be constructing additional conduit and junction fire barrier test specimens. These tests will include fire barrier system upgrades and the results are intended to assess the overall adequacy of the Thermo-Lag fire barrier program at Watts Bar Nuclear Plant. TVA contracted Omega Point Laboratories (OPL) San Antonio, Texas, to conduct this test program, perform quality assurance check point inspections, and write the final test report. TVA stock Thermo-Lag fire barrier materials were being utilized in the fabrication of the fire test specimens. TVA site craft personnel (TVA Watts Bar and Sequoyah insulation installers) were used to install the Thermo-Lag materials. These

installations were performed in accordance with the attached, "TVA draft Thermo-Lag installation procedure."

Construction of Test Specimens

During these laboratory visits, the NRC observed TVA's construction of various conduit/junction box fire barrier test specimens. The construction of five test assemblies (94943A-E) was observed.

Assemblies 94943A and 94943B consisted of sets of 1-inch, 1-1/2-inch, 2-inch, 3-inch, and 4-inch steel conduits with lateral bends (LDB) and radius bends. The fire barrier upgrade application on these conduits consisted of a layer of nominal 5/8-inch and nominal 3/8-inch thick conduit pre-shapes. Test specimen 94943B included a 3-inch aluminum conduit specimen (aluminum conduits used at Sequoyah) with a nominal 5/8-inch preformed Thermo-Lag with a nominal 3/8 inch pre-shape overlay; and, 2-inch and 4-inch tube steel support specimens. The outside of the conduits and the inside of the Thermo-Lag pre-shapes were pre-buttered prior to installation. This pre-buttering technique included the conduit pre-shape overlay.

One of the items that TVA is trying to accomplish by conducting the tube steel support fire tests is to determine the validity of the 18-inch rule for interferences and penetrating objects into the Thermo-Lag fire barrier systems. Most utilities use 18 inches as the minimum penetration length to be protected in a fire barrier system. TVA through this test plans to will establish a minimum length that needs to be protected to prevent heat transfer into the fire barrier system resulting in damage to protected cable within the barrier. The tube steel stubs on the support assembly are 30 inches long with 12 inches protected by Thermo-Lag. The remaining 18 inches stub will be exposed to the test fire.

Test Specimens 94943C and 94943D (see attached sketch) consisted of identical specimens of 1, 2, 3, and 5-inch conduits with junction boxes (JB) and lateral bends (LDB) and conduits installed up against the concrete test deck. Test specimen 94943D had upgrades applied to the conduits and the JBs and LDBs were covered with a single layer of 1/2 inch panel (nominal 5/8 inch). The fire barrier construction for the JBs and LDBs were unique in that they were constructed out of a single piece of Thermo-Lag panel cut in such a manner that the stress skin side of the Thermo-Lag panel was continuous. This allowed for stress skin overlap at all the joints on the inside of the JB or LDB. Once the pre-cut Thermo-Lag panel is ready for installation the JB or LDB and interfacing side of the Thermo-Lag was pre-buttered with trowel grade. Then the Thermo-Lag pre-cut configuration is installed on raceway component. This pre-buttering technique was done for the conduits also.

Test Specimens 94943C had Thermo-Lag cover designs that could provide access to some of the junction box. The JBs on this test specimen were covered with two layers of nominal 5/8 inch panels.

Assembly 94943E consisted of three 4-inch steel conduits installed to a 48 x 36 x 12 inch junction box mounted to a concrete slab with two 4-inch square tubes. The 4 inch conduits were protected with a single layer nominal 5/8 Thermo-Lag conduit pre-shape. The JB Thermo-Lag fire barrier design had a removable cover. The JB was protected with a nominal 5/8 inch panel and a

nominal 3/8 inch panel overlay. The outside joints and seams of the JB Thermo-Lag fire barrier were reinforced with stress skin and a skim/finish coat applied.

Thermocouple Installation

The installation of the test instrumentation wiring and the placement of the thermocouples (Tc) on the fire test assemblies were observed. Internal temperatures of the conduits and junction boxes are measured using thermocouple placed on a #8 bare copper conductor used to simulate electrical circuits. To read external temperatures, thermocouples were installed on the outside of the conduits every 6 inches, on the inside surface of the junction boxes (one Tc for every square foot of inside JB surface area; minimum of one Tc per inside surface), and Tc were installed every 2 inches on the tube steel support installations. It was verified that these installations were in accordance with the TVA test plan. We consider that the thermal data produced by these Tcs will be sufficient to demonstrate the thermal performance of these fire barrier systems. No cables were installed in the test specimens. Internal raceway temperature is being measured by a bare copper 8AWG wire, instrumented every 6 inches with Tcs. All thermocouples on the test specimens are of the teflon-coated type due to anomalies observed with glass-type coated thermocouples in previous TVA fire tests.

Thermo-Lag Installation Process Observations

During these site visits are reviewed the TVA generic Thermo-Lag installation procedure, the proposed fire test design details and fabrication drawings, and an OPL proposal to conduct the overall fire test program. The licensee's installation procedure included instructions for applying the Thermo-Lag conduit pre-shapes and panels. In addition, this procedure relied heavily on "skill-of-the-craft" for the application of trowel grade materials. The craftpersons involved in the fire barrier test specimen construction completed their training on the installation procedure on February 4, 1993. However, the NRC provided several comments on the procedure that provided more detailed clarifications for Thermo-Lag installation steps (e.g. the use of doubled-temporary tie wires and tamping to draw-up the preformed Thermo-Lag shapes tight to the conduits) that had been observed during fabrication of the test specimens. The NRC also discussed with the licensee the role of QA/QC in the fabrication of these Thermo-Lag test specimens. These discussions included the establishment of quality inspections and measurements of the materials prior to issuance to the field craftpersons similar to those being implemented during the fabrication of these test assemblies. During the TVA test specimen construction process at OPL, approximately 10 percent of the stock Thermo-Lag pre-shape conduit pieces measured for thickness (3/8-inch or 5/8-inch nominal,+ or - 1/8-inch) were rejected for use in whole or in part. In addition, discussions were held with the licensee with regard to the implementation of additional QC Hold-Points during construction to assure proper order and record of installation, pre-buttering and securing of all pieces, final tie wire placement, and final inspection and circumference measurement. Based on the NRC's observations, the fabrication of the TVA test specimens was accomplished in a skilled and professional manner.

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