Wayne H. Jens
Vice President
Nuclear Operations

Detroit Edison

Fermi-2
6400 North Dixie Highway
Newport, Michigan 48166
(313) 5[illegible]-4150

October 22, 1984
EF2-72266

Director of Nuclear Reactor Regulation
Attention: Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Youngblood:

Reference: 1) Fermi 2
NRC Docket No. 50-341

2) Detroit Edison to NRC Letter, "Transmittal of Fire Protection Information", EF2-69218, August 4, 1984

3) Detroit Edison to NRC Letter, "Submittal of Deviations from Staff Interpretations of Fire Protection in 10CFR50, Appendix R and Justification", EF2-72717, August 3, 1984.

Subject: Qualification of 3M Fire Wrap

At the meeting with the NRC-NRR Chemical Engineering Branch (R. Eberly, V. Benaroya) on September 13, 1984, Edison provided information based on an evaluation performed by 3M that asserted the equivalence of the testing of the 3M fire wrap with testing previously accepted by the NRC staff. The NRC indicated that they could accept the 3M evaluation, if the 3M methodology was reviewed and deemed acceptable by an independent laboratory. An analysis and review was subsequently conducted by Underwriter's Laboratory (UL). Accordingly, attached is an evaluation by UL for 3M that concludes that the results of the 3M test provided in Reference (2) show acceptable results in comparison to tests of fire barrier wraps previously accepted by the NRC staff, when considering comparable test thermocouple placement readings. As noted in the attached, one thermocouple (No. 14) on the 300 MCM single-conductor cable produced readings just slightly above the acceptance criteria. Due to this minimal deviation, and justifications provided in Reference (3), Detroit Edison concludes these results are acceptable.

B002
1/1

Please direct any questions or additional comments to Mr. O. K. Earle at (313) 586-4211.

Sincerely,

Wayne H. Jens

cc: Mr. P. M. Byron
Mr. R. Eberly *
Mr. R. Ferguson *
Mr. M. D. Lynch
USNRC Document Control Desk
Washington, D.C. 20555

* With attachments

UNDERWRITERS LABORATORIES INC.
333 PFINGSTEN ROAD · NORTHBROOK, ILLINOIS 60062
an independent, not-for-profit organization testing for public safety

October 2, 1984

3M Company
Mr. Richard R. Licht
Supervisor, Product Development
207-1S 3M Center
St. Paul, MN 55144

Our Reference: Project 82NK21937, File R10125

Subject: Review Of Temperature Data From Fire Test Investigations Of Fire Barriers For Electrical Cables In Steel Cable Trays, Rigid Steel Conduit, Steel Junction Boxes And Air Drops

Dear Mr. Licht:

This is in response to your letter of September 14, 1984, concerning the above subject.

Per your letter, you met with officials from the United States Nuclear Regulatory Commission (NRC) on September 13, 1984 to discuss the criteria for NRC approval of fire barriers for electrical cables in redundant safety trains as outlined in "Fire Protection Program For Operating Nuclear Power Plants" (Appendix R to 10 CFR 50). Based upon your discussions with the NRC officials, it is your understanding that the criterion for NRC approval of a fire barrier for redundant safety trains is a maximum temperature rise of 250°F above the initial starting temperature at the hourly rating period time. It is also your understanding that the maximum temperature rise within the fire barrier is to be determined from measurements obtained from thermocouples positioned on the jacket of an electrical cable located in the center of the cable fill. The thermocouples are to be located on 12 in. centers along the cable with the thermocouple junction at the 12 o'clock position (cable bearing surface at 6 o'clock position).

In your letter, you requested that we review the temperature data from the fire test investigations of fire barrier systems which 3M Company conducted at Underwriters Laboratories Inc. (UL) to determine the time at which the maximum temperature rise of 250°F above the initial starting temperature occurred. Specifically, per our telephone conversation on September 19, 1984, you

requested that we review the temperature data from five separate fire barrier systems and that, during our review, we consider only the temperature measurements obtained from thermocouples placed on the jacket of the largest cable type included in each fire barrier system. The five fire barrier systems are summarized in the following table:

System No.	Description
"A"	Open-ladder steel cable tray wrapped with a single layer of Type M20-A intumescent mat and surrounded by an enclosure consisting of Type CS-195 composite sheet secured to steel channel framing (March 3, 1983 fire test described in UL Report R10125-1, -2 dated October 19, 1983).
"B"	Open-ladder steel cable tray wrapped with four layers of Type M20-A intumescent mat (July 14, 1983 fire test described in UL Letter Report R10125 dated November 2, 1983).
"C"	Rigid steel conduit wrapped with three layers of Type M20-A intumescent mat (December 21, 1982 fire test described in UL Report R10125-1, -2 dated October 19, 1983).
"D"	Cable air drop wrapped with five layers of Type M20-A intumescent mat (December 21, 1982 fire test described in UL Report R10125-1, -2 dated October 19, 1983).
"E"	Steel Junction box wrapped with two layers of Type M20-A intumescent mat and surrounded by an enclosure consisting of Type CS-195 composite sheet secured to steel channel framing (July 26, 1984 fire test described in UL Letter Report R10125 dated August 7, 1984).

During UL Classification investigations of electrical circuit protective systems (fire barriers), each system is evaluated with respect to its ability to protect a specific electrical wiring system against the occurrence of electrical faults during a standardized external fire exposure. In addition to monitoring each cable conductor within the fire barrier system for

electrical faults, numerous thermocouples are installed within the fire barrier in an attempt to quantify temperature rise at all anticipated hot spots. Because large electrical cables maintain cooler jacket temperatures than smaller, less massive electrical cables when exposed to the same air temperature rate-of-rise and because emphasis is placed on quantifying temperature rise at anticipated hot spots, fewer thermocouples are installed on the large electrical cables within the fire barrier systems. Consequently, in our review of the temperature data, the maximum temperature rise on the largest cable type in each of the five fire barrier systems was, in most instances, based on the temperature measurements obtained from thermocouples which were spaced greater than 12 in. OC.

In order to determine whether the measured temperature rise on the largest cable type in each fire barrier system was representative of that which would have been measured had the largest cable type been instrumented with thermocouples on 12 in. centers, the temperature data from thermocouples spaced 12 in. OC on the smallest cable type in each fire barrier system was also reviewed. Based upon the comparative review, it was determined that the measured temperature rise on the largest cable type in each fire barrier system reflected the maximum temperature rise on the cable at the hottest location within the fire barrier.

In System No. "A," the largest electrical cable type included in the fire barrier was a single-conductor 300 MCM power cable having an outside diameter of 0.755 in. The initial temperature of the cable at the start of the fire exposure test was 69°F. Therefore, based on a maximum temperature rise of 250°F, the limiting temperature on the cable was 319°F. The limiting temperature of 319°F was reached at 59 min (Thermocouple No. 14). At 60 min, the maximum temperature recorded on the single-conductor 300 MCM cable was 332°F (Thermocouple No. 14).

In System No. "B," the cable fill within the fire barrier system was comprised of bare copper conductors. The largest bare copper conductor included in the fire barrier was a 250 MCM stranded conductor having an outside diameter of 0.575 in. The initial temperature of the conductor at the start of the fire exposure test was 83°F. Therefore, based on a maximum temperature rise of 250°F, the limiting temperature on the conductor was 333°F. The limiting temperature of 333°F was not reached on the conductor during the fire exposure test. At 60 min, the maximum temperature recorded on the 250 MCM conductor was 287°F (Thermocouple No. 106).

In System No. "C," the largest electrical cable type included in the fire barrier was a single-conductor 300 MCM power cable having an outside diameter of 0.890 in. The initial temperature of the cable at the start of the fire exposure test was 68°F. Therefore, based on a maximum temperature rise of 250°F, the limiting temperature on the cable was 318°F. The limiting temperature of 318°F was not reached on the cable during the fire exposure test. At 60 min, the maximum temperature recorded on the single-conductor 300 MCM cable was 190°F in the conduit containing a nominal 40 percent cable fill (Thermocouple No. 149) and 286°F in the conduit containing a minimal cable fill (Thermocouple No. 186).

In System No. "D," the largest electrical cable type included in the fire barrier was a single-conductor 300 MCM power cable having an outside diameter of 0.890 in. The initial temperature of the cable at the start of the fire exposure test was 73°F. Therefore, based on a maximum temperature rise of 250°F, the limiting temperature on the cable was 323°F. The limiting temperature of 323°F was not reached on the cable during the fire exposure test. At 60 min, the maximum temperature recorded on the single-conductor 300 MCM cable was 293°F (Thermocouple No. 96).

In System No. "E," the largest electrical cable type included in the fire barrier was a two-conductor No. 14 AWG power/control cable with a flattened jacket measuring approximately 0.400 in. wide by 0.240 in. thick. The initial temperature of the cable at the start of the fire exposure test was 76°F. Therefore, based on a maximum temperature rise of 250°F, the limiting temperature on the cable was 326°F. The limiting temperature of 326°F was not reached on the cable during the fire exposure test. At 60 min, the maximum temperature recorded on the two-conductor No. 14 AWG cable was 242°F (Thermocouple No. 11).

If you have any questions or comments on the above, please don't hesitate to contact the undersigned.

Very truly yours,

C. J. JOHNSON
Engineering Associate
Fire Protection Department

Reviewed by:

K. W. HOWELL
Associate Managing Engineer
Fire Protection Department

CJJ/KWH:pr
LETTER