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References: (a) License No. DPR-28 (Docket No. 50-271)
(b) Letter, USNRC to All Licensees, Generic Letter 86-10, dated April 24, 1986
(c) Underwriters Laboratories Report on Fire Resistant Cables, File R10925-1, dated April 10, 1984

Subject: Request for Exemption from 10 CFR Part 50, Appendix R, Section III.G, "Fire protection of safe shutdown capability"

In accordance with the provisions of 10 CFR Part 50.12, Vermont Yankee Nuclear Power Corporation hereby requests an exemption from the provisions of 10 CFR Part 50, Appendix R, Section III.G, "Fire protection of safe shutdown capability." Specifically, an exemption is requested to permit use of Rockbestos Firezone®R Appendix R fireproof cable in plant areas that require enclosing cables in a fire barrier having a 1-hour fire rating.

Discussion:
10 CFR Part 50, Appendix R, Section III.G, "Fire protection of safe shutdown capability," paragraph III.G.2.c requires:

> "Enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour fire rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area."

Vermont Yankee utilizes the separation criteria of paragraph III.G.2.c as part of the overall compliance strategy for a fire that occurs in either the Cable Vault or in the motor generator (MG) set area of the Reactor Building (elevation 280 feet). Currently, Vermont Yankee uses Rockbestos Firezone®R Appendix R fireproof cable to control equipment necessary to ensure Reactor Building corner room cooling given a fire in the Cable Vault. Vermont Yankee also uses Firezone®R cable to power equipment located on redundant instrument racks on opposite

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sides of the Combustible Free Zone on the east side of Reactor Building for a fire in the MG set area. The fire resistant cable is routed to both instrument racks through the MG set area.

An exemption is requested from the above requirement to allow use of the Firezone®R cables instead of enclosing the cables in fire barriers having a 1-hour fire rating. An exemption is considered necessary because the Firezone®R cable does not meet the strict definition of a fire barrier based on standard fire barrier test criteria. Both locations meet Appendix R Section III.G.2.c criteria for fire detectors and automatic fire suppression systems.

Standard fire barrier test acceptance criteria consist of three distinct elements. One of the acceptance criteria is to prevent passage of flame or gases hot enough to ignite cotton waste on the opposite side of the barrier. Another criterion is to withstand hose stream application without creating openings in the assembly through which fire, hot gases, or water from the hose stream could pass to the opposite side of the barrier. The third criterion is to limit heat transmission through the barrier so as not to raise the temperature on the cold side of the barrier more than 250°F above its initial temperature.

Justification

This exemption is based on demonstrating that the Rockbestos Firezone®R Appendix R fireproof cable provides protection equivalent to that provided by enclosure of cables in a 1-hour rated fire barrier. A fire barrier is an assembly that has been assigned an hourly fire rating by testing laboratories based on meeting the acceptance criteria of standard fire barrier fire test methodologies. Such fire barriers are typically walls and floor/ceiling assemblies. Electrical raceways (conduits, cable trays, junction boxes, etc.) containing fire safe shutdown circuits required to demonstrate compliance with Appendix R are also often enclosed with fire barrier assemblies.

The Rockbestos Firezone®R Appendix R fireproof cable has been tested by Underwriters Laboratories Inc. in order to provide data on the electrical characteristics of the fire resistant cable under controlled fire exposure conditions and during an extended cool-down period [Reference (c)]. The testing program investigated fire resistant electrical cables installed in trays, conduits and air drops beneath a floor/ceiling assembly. The trays also contained nonfire-resistant cables to simulate fuel loading in actual installations.

During certification testing, the fire exposure in the furnace was controlled in accordance with the standard time-temperature curve per ASTM E119, Standard for Fire Tests of Building Construction Materials, for a one hour duration. The fire resistant cables were energized with predetermined steady-state low voltage ac electrical currents prior to and throughout the duration of, the fire exposure. Each cable was also energized with a dc voltage and monitored continuously for conductor to conductor, conductor to sheath/ground, conductor to shield and conductor to shield/ground electrical faults. The cables were de-energized for 10 seconds immediately prior to an inrush current test performed on each fire resistant cable during the last 15 minutes of the fire exposure.

Following the fire exposure, the installation was subjected to the impact, erosion and cooling effect of a water hose stream test. A second hose stream test was conducted after an extended (93 hour) cooldown period. The cables were de-energized during each hose stream test. The cables were energized throughout the extended cooldown period with steady-state low voltage ac electrical currents, except for 10 seconds immediately prior to the inrush current tests. Four inrush current tests were performed on each cable during the first 79 hours of the extended cooldown period, with a final inrush test conducted following the second hose stream test at the end of the extended cooldown period.

The results of the fire, hose stream, steady-state and inrush current tests revealed the following:

1. Other than discoloration of the fire resistant cable ends, no changes were noted in the appearance of the fire resistant cables following the one hour fire exposure test.

2. No electrical faults occurred in any of the fire resistant cable configurations during the fire endurance test.

3. Following the first hose stream test, each conductor of each fire resistant cable carried its steady-state current.

4. Each fire resistant cable remained electrically functional during the fire endurance test and during the extended cool-down period.

Based on these results, the Rockbestos Firezone®R Appendix R fireproof cables relied on in the Cable Vault and in the MG set area of Reactor Building directly meet the acceptance criteria to (1) prevent passage of flame or gases to the opposite side of the barrier and (2) withstand hose stream application without creating openings in the assembly through which fire, hot gases, or water from the hose stream could pass to the opposite side of the barrier.

The acceptance criteria to limit heat transmission through the barrier so as not to raise the temperature on the cold side of the barrier more than 250°F above its initial temperature is not directly met, since it was not directly included in the test program. However, the intent of the acceptance criteria is met since no electrical faults occurred in the fire resistant cable during the fire exposure test and because each cable (and each conductor of each cable) remained electrically functional during and after the fire exposure and hose stream tests.

As such, the Rockbestos Firezone®R Appendix R fireproof cables meet the intent of Appendix R Section III.G.2.c criteria for a 1-hour fire barrier, which is to ensure that one train of systems necessary to achieve and maintain hot shutdown conditions is free of fire damage.

Special Circumstances:
Special Circumstances, as defined in 10 CFR Part 50.12(a)(2)(ii), are present which warrant granting an exemption from the requirements of the regulation. The fire resistant cable has been tested under the standard one hour fire exposure required for fire barriers, inclusive of the hose stream test. The test results show that the cable remains electrically functional and free of electrical faults during and after the fire exposure and hose stream tests. Vermont Yankee believes, therefore, that use of the Rockbestos Firezone®R Appendix R fireproof cables achieves the underlying purpose of 10 CFR Part 50, Appendix R, Section III.G.2.c.

Conclusion
Based on the technical justification and special circumstances detailed above, Vermont Yankee requests an exemption from the requirements of 10CFR Part 50, Appendix R, Section III.G, "Fire protection of safe shutdown capability," paragraph G.2.c. The exemption is requested for use of Rockbestos Firezone®R Appendix R fireproof cables for Cable Vault and Reactor Building MG set area fires.

We trust that our request is acceptable; however, should you have any questions, please contact this office.

Sincerely,

VERMONT YANKEE NUCLEAR POWER CORPORATION

Jay K. Thayer
Vice President, Engineering

c: USNRC Region I Administrator
USNRC Resident Inspector - VYNPS
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