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POWER BUILDING
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WILLIAM O. PARKER, JR.
VICE PRESIDENT
STEAM PRODUCTION

TELEPHONE: AREA 704
373-4083

April 8, 1980

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Robert L. Baer, Chief
Light Water Reactor Branch No. 2

Re: McGuire Nuclear Station
Units 1 and 2
Docket Nos. 50-369, 50-370

Dear Mr. Denton:

Attached is Duke Power Company's response to the request for information contained in Mr. Robert L. Baer's letter of February 19, 1980 concerning environmental qualification of containment pressure transmitters. Also included are three copies of the qualification test report for the containment pressure transmitters and sensors.

Mr. Baer's letter of February 15, 1980 requested Duke Power Company to evaluate the McGuire Class 1E equipment qualification program against the guidelines of NUREG-0588. It is our intention to submit this information according to the following schedule:

1. Equipment inside containment. — May 5, 1980
2. Equipment outside containment exposed to high energy line break environment. — June 6, 1980
3. Equipment outside containment exposed to loss of HVAC environment. — July 7, 1980

Items 2 and 3 above include all Class 1E equipment located outside the containment with the exception of equipment located in the control complex. The environment in the control complex remains within a normal range for all postulated accidents because this area contains no high energy piping and because it is served by a redundant Class 1E HVAC system. The ability of the Class 1E equipment located in the control complex to function in its normal, controlled environment is demonstrated by its continued operation and/or by periodic tests. Additionally, no equipment has been identified for which aging mechanisms in a controlled environment are not amendable to assessment by routine in-service inspection, surveillance, and/or periodic testing.

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Duke's response to Mr. Baer's letter of March 7, 1980 which requested additional information on hydrogen skimmer and containment air return fan motors will be submitted consistent with the above schedule, i.e. on May 5, 1980.

Very truly yours,

William O. Parker, Jr.

GAC:scs

Attachments

MCGUIRE NUCLEAR STATION

Environmental Qualification
of
Containment Pressure Transmitters

Wyle Laboratories test report 43904-1 (Volumes I and II) documents the testing performed on two Barton Model 386A/351 and one Model 386A electronic pressure transmitter. This document also contains the test results and supports our conclusion that the transmitters are qualified for use as containment pressure transmitters.

Pressure Spike or Ringing Phenomena

Westinghouse test of the Barton Model 351, as reported in WCAP-9157, shows a pressure spike or ringing occurring between 59 and 111 seconds into the test. Pressure was approximately 67 PSI with spikes up to approximately 93 PSI. Westinghouse initially concluded that the phenomena was attributable to the limited size of the test chamber and that the spike would not occur in the large containment.

The hydraulic fluid used by Westinghouse as a fill for the 351 sensor assembly was distilled water. We feel the pressure spikes were possibly caused by rapid uneven heating or flashing of the distilled water in the capillary, rather than the limited size of the test chamber. This matter was discussed with representatives of the NRC Staff by Westinghouse in a meeting on January 29, 1980 and similar conclusions were reached concerning the observed pressure spike.

The Barton Model 351 sensor assemblies used by Duke for containment pressure are filled with Dow Corning 704 diffusion pump fluid. This fluid has a flash point of 221°C (430°F) at atmospheric pressure. Since the worst case post accident containment temperature will not exceed 340°F, flashing will not occur.

The test conducted by Duke and reported in Wyle Laboratories test report 43904-1 shows that two Barton Models 351 with Dow 704 fill were subjected to a post accident test of 340°F. Transmitter output was continuously monitored visually for 24 hours and no pressure spikes were observed attributable to flashing.

When used in pressure gauges, Dow Corning 704 may crystallize if subjected to temperatures below 21°C (69.8°F). Duke will provide trace heating for containment pressure transmitter installations to prevent crystallization.

Other Anomalies

Test Report 43904-1 lists four anomalies which occurred during the testing. The discussion below addresses each of the anomalies and supports Duke's position that these transmitters are acceptable for their intended function.

Anomaly No. 1 — Abnormal output on the upper end of the scale during post radiation functional testing.

The manufacturers published reference accuracy is ± 0.5% full scale at 80°F. Radiation effects result in an additional 5.0% error for radiation dosages up to

5×10^7 rads (Gamma). The McGuire transmitters were subjected to 2×10^8 rads making the expected deviation greater than 5.5% due to higher radiation dosage. Since these transmitters are located in the annulus (outside containment), the cumulative radiation dosage to which the transmitters would be exposed is much less than 5×10^7 rads. It is concluded that this anomaly was not cause for rejection of the transmitter.

Anomaly No. 2 — Random spikes on high voltage output of transmitter S/N 102 during LOCA test.

On completion of LOCA testing and prior to post accident functional test, technicians were able to reproduce these spikes by moving the lead wires at points external to the test chamber. Moisture was also observed exiting from the test chamber at the lead wire penetration. Post test inspection confirmed that erratic behavior of test item No. 2 can be attributed to cracked external lead-in wires with moisture causing shorting. The external lead wire configuration used during testing does not reflect a true installed configuration. Therefore, it is concluded that this anomaly does not represent a failure of transmitter S/N 102.

Anomaly No. 3 — Temperature fluctuations during test period.

The redundant safety controller for the steam solenoids dropped out eight (8) times during the 24-hour test period, causing the temperature in the sensor chamber to drop by as much as 50°F for short periods of time. The total time involved is approximately 38 minutes. The technician involved reset the controller each time, but neglected to correct the controller set-point to a higher temperature to prevent the recurrence of this condition. This anomaly occurred after the 340°F temperature phase of the test and was attributed to test equipment malfunction rather than specimen malfunction. Since the highest temperature phase had been completed and the added temperature excursions increased to some degree the conservatism of the test, this anomaly did not jeopardize the validity of the test data.

Anomaly No. 4 — Spike on high voltage output of transmitter S/N 103 during LOCA test.

This anomaly is the same as that experienced with test item S/N 102 with the exception that the spike was limited to a single surge of longer duration. The cause of the spike and evaluation of effect on transmitter qualification is the same as of Anomaly No. 2.