

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) McGuire Nuclear Station - Unit 2	DOCKET NUMBER (2) 0 5 0 0 0 3 7 0	PAGE (3) 1 OF 0 3
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TITLE (4)
Abnormally High Failure Rate of Fire Detectors

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
0 9	1 6	8 4	8 4	0 2	4 0	0 1	0 2	2 8	McGuire - Unit 1	0 5 0 0 0 3 6 9
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THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

OPERATING MODE (9) 1	20.402(b)	20.406(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10) 1 0 0	20.406(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(c)
	20.406(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
	20.406(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
	20.406(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
	20.406(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME Scott Gewehr - Licensing	TELEPHONE NUMBER 7 0 4 3 7 3 - 7 5 8 1
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS
B	I/C	X/E	9 9 9 9	N					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE) NO

EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

During a semi-annual test of the fire detection system, an abnormally high number of failures of rate-of-rise fire detectors was discovered in the 2B diesel generator room. The cause of the failures is classified as a design deficiency, because the detectors were being used in an environment more severe than that recommended by the manufacturer. The manufacturer recommends that the detectors, which have a fixed-rate set point of 135 degrees F, not be used in areas where the ambient temperature exceeds 100 degrees. The detectors, Model E-135C (manufactured by Edwards Company), had experienced ambient temperatures of about 120 degrees for about 3 years. All failed detectors were replaced, and detectors in fire zones in Units 1 and 2 having ambient temperatures in excess of 100 degrees were tested and replaced if defective.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

INTRODUCTION: On September 16, 1984, during the performance of a Fire Detection System Semi-Annual Test, an abnormal number of failed rate-of-rise fire detectors were discovered in Unit 2 diesel generator (D/G) room 2B. The failures were the result of air leaking through degraded epoxy used as a sealant on the E-135C rate-of-rise detector housing. The epoxy degraded when exposed to ambient temperatures of approximately 120°F for long periods of time (approximately 3 years). The defective E-135C detectors (manufactured by Edwards Company and distributed by Walter Kidde Company) were immediately replaced and the new ones functionally tested for operability.

These failures were caused by a design deficiency, due to the improper application of the detectors as specified by the manufacturer.

Unit 2 was operating at 100% power at the time the failures were discovered.

EVALUATION: To satisfy the surveillance requirements of Technical Specifications (T.S.), Instrumentation and Electrical (IAE) personnel began testing the area fire detectors in 2B D/G room for operability. The T. S. requires at least one detector on each signal initiating circuit to be demonstrated operable once every six months by performing a trip actuation device operational test.

During testing of the rate-of-rise detector in fire zone 51 (2B D/G), the detector failed to alarm and provide the signal for early warning and notification. Fire zone 51 has eight rate-of rise detectors which can trip the diesel, its oil-related auxiliaries, and the ventilation blower (if an automatic diesel start is not initiated) to prevent the spread of potential fires.

The E-135C detectors are designed to alarm when the temperature rises at a rate of 15 degrees F or greater per minute or when temperatures exceed 135 degrees F (called the fixed rate). The rate-of-rise function is tested by spraying Quick Freeze on the detector housing and allowing the ambient temperature in the area (usually 100 - 110°F at floor level in 2B D/G) to cause the detector to alarm. As heated air inside the detector housing expands, it forces a diaphragm to deform, applying pressure on an electrical contact and creating a closed electrical circuit and alarm. The fixed rate function alarm actuates when a solder mixture melts (at 135 degrees F) causing a spring loaded plunger to collapse and hold the diaphragm on the electrical contact, creating the closed electrical circuit and alarm.

After replacing the defective detector and functionally testing the replacement for operability, IAE personnel decided to test another rate of rise detector in fire zone 51. When the second detector failed to alarm, two more were tested with the same results. A decision was made at that time to replace all 8 detectors, functionally test them for operability and take the defective detectors to the shop to determine why they had failed.

When 2A D/G room fire detectors were tested the following day, 5 of the 8 rate-of-rise detectors failed to alarm and were subsequently replaced and the new ones functionally tested.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Using a heat shrink gun to heat up the detector housing, IAE personnel determined that air inside the housing was escaping around the epoxy sealant that seals the housing to the plastic base plate. Since air was escaping, pressure could not build up causing the diaphragm to deform and the detector to alarm. The escaping air was verified using a bubble leak solution around the detector housing epoxy seal.

Representatives for Walter Kidde Company (the detector supplier) were contacted concerning the failures and were questioned about the application for which the detectors were designed. The supplier stated that the recommended application for the detectors was for areas where the ambient temperatures did not exceed 100°F. Underwriters Laboratory (UL) Standard 521 also suggests that all models of detectors with fixed rate set points of 135°F not be subjected to ambient temperatures in excess of 100°F.

The high failure rate of the detectors in the Unit 2 D/G rooms prompted IAE personnel to reschedule tests of detectors in D/G rooms for Unit 1 and immediately test them for operability. Two E-135C detectors failed to alarm in D/G 1A room and were immediately replaced and the new ones functionally tested. The remaining six detectors in D/G 1A as well as all eight of the detectors in D/G 1B alarmed satisfactorily. The acceptable detectors were S-135 rate-of-rise detectors and were also supplied by Walter Kidde Company. This model detector is no longer available because the manufacturer has discontinued production.

In addition to the Unit 1 D/G rooms being tested, IAE personnel tested fire zones 70, 87, 91, and 102 and all E-135 detectors alarmed satisfactorily. These areas have ambient temperatures in excess of 100°F and are T.S. controlled areas. During previous testing of the rate of rise detectors, all alarmed as designed and provided the proper isolation of equipment.

Various available detectors are being evaluated as replacements, with a model DT-135 manufactured by Pyrotronics the primary model being considered. Present drawings already allow DT-135 detectors as substitutes; however, only those E-135 detectors in high temperature areas are expected to be replaced.

CORRECTIVE ACTION: All detectors which have been identified as failed have been replaced, and the new detectors tested for operability. Detectors in Fire Zones with similar environment (i.e., ambient temperatures in excess of 100 degrees) have been tested to ensure operability. These zones include Unit D/G rooms 1A and 1B, Units 1 and 2 Auxiliary Feedwater Pump Rooms, and Units 1 and 2 Cable Rooms. As additional detectors are identified as having failed, they shall be replaced. As soon as practicable, all E-135C detectors will be replaced with models that are designed to withstand higher ambient temperatures.

SAFETY ANALYSIS: Although the rate-of-rise function failed to provide the signal for early warning and notification, the fixed rate function for each detector was still operable. In addition to the rate-of-rise detectors, a separate halon system exists for each D/G room and would have provided the necessary fire protection for those areas. This system is actuated by the systems own heat sensing thermostats or manually (either electrically or mechanically). Since adequate fire detection and fire fighting systems were operable throughout the event, the health and safety of the public was unaffected.

DUKE POWER COMPANY

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HAL B. TUCKER
VICE PRESIDENT
NUCLEAR PRODUCTION

October 22, 1984

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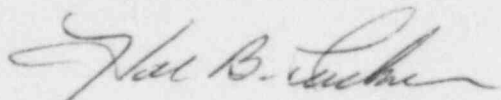
Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: McGuire Nuclear Station, Unit 2
Docket No. 50-370
LER 370/84-24

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report 370/84-24 concerning failed fire detectors, which is submitted in accordance with §50.73 (a)(2)(v). This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,



Hal B. Tucker

SAG:slb

Attachment

cc: Mr. James P. O'Reilly, Regional Administrator
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