William S. Orser
Senior Vice President

Detroit Edison

Fermi 2
6400 North Dixie Highway
Newport, Michigan 48166
(313) 586-5201

Nuclear Operations

October 10, 1990
NRC-90-0154

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

Reference: Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

Subject: Relief Request for Inservice Testing Program for Pumps and Valves

In accordance with 10CFR50.55a(g)(5)(iii), Detroit Edison is transmitting Relief Request PR-10-R3.

Relief Request PR-10-R3 concerns a modification of the High Pressure Coolant Injection (HPCI) Main and Booster Pump vibration acceptance criteria through the application of the guidelines contained in ASME/ANSI OMa-1988, Part 6.

Detroit Edison is requesting approval of this relief request to provide reasonable vibration limits for the acceptable, alert, and required action vibration ranges of the HPCI Main and Booster Pump. At present, the HPCI Main and Booster Pump is being tested at double the usual quarterly testing frequency because the present vibration acceptance criteria are overly restrictive. Present vibration acceptance criteria place the HPCI Main Pump and Booster Pump in the alert range or at the high end of the acceptable range even though vibration test data indicates that there are no major vibration concerns that would prevent the HPCI Main and Booster Pump from performing its safety function. Approval of Relief Request PR-10-R3 will allow Detroit Edison to reinstate quarterly testing of the HPCI Main and Booster Pump and eliminate unnecessary testing.

A047
1/1

If you have any questions on this matter, please contact Mr. Bruce Sheffel at (313)-586-1848.

Sincerely,

Enclosure

cc: A. B. Davis
R. W. DeFayette
W. G. Rogers
J. F. Stang

RELIEF REQUEST PR-10 R3

PUMP: HPCI Main and Booster Pump

PUMP NO: E4101C001A and E4101C001B

CLASS: 2

FUNCTION: Provide High Pressure Coolant Injection

SECTION XI REQUIREMENTS: Vibration amplitude displacement shall be measured during inservice testing (Table IWP-3100-1 and IWP-3400 (a)). (Velocity readings are taken in lieu of mils displacement readings per Relief Request PR-1).

BASIS FOR RELIEF: During preoperational testing of the HPCI System, vibration of the HPCI Main and Booster Pump were measured and determined to fall within the Required Action Range of Relief Request PR-1. This high apparent vibration was caused by induced vane passing frequency from the 4 vane booster pump impeller.

Pursuant to this high apparent vibration, Relief Request PR-9-R2 and PR-10-R2 were written requesting relief from the requirements of Relief Request PR-1 until RF01 at which time the HPCI Booster Pump Impeller would be changed from a 4 to a 5 vane impeller, reducing the induced vane passing frequency caused by the 4 vane impeller design.

During RF01, the HPCI Booster Pump Impeller was changed from a 4 to a 5 vane impeller. This eliminated the induced vane passing vibration eminating from the Booster Pump. As part of the post modification testing, vibration data was taken to provide baseline vibration signatures. While vibration levels were reduced significantly, both pumps are still exhibiting vibration levels approaching or exceeding the IST Program Alert level of 0.236 in/sec of Relief Request PR-1.

RELIEF REQUEST PR-10 R3 (Continued)

The following table demonstrates the large reduction in vibration achieved when the HPCI Booster Pump Impeller was changed from a 4 to a 5 vane impeller:

HPCI Vibration Reference Values

	MAIN PUMP	
	Vertical Vibration (in/sec)	Horizontal Vibration (in/sec)
Before Impeller Changeout	.176	.598
After Impeller Changeout	.185	.230
	BOOSTER PUMP	
	Vertical Vibration (in/sec)	Horizontal Vibration (in/sec)
Before Impeller Changeout	.264	.549
After Impeller Changeout	.120	.145

Vertical and horizontal vibration velocities are frequency dependent with readings being higher for machines operating at higher speeds. HPCI operates at approximately 4000 RPM which is significantly higher than most rotating machinery (Typical machinery operate at 1800 RPM).

The HPCI Main and Booster Pump design is such that the vibration in the horizontal direction is resonant with the normal pump operating speed (approximately 4000 RPM) resulting in higher vibration levels. Vibration levels for the vertical direction will be less than the horizontal direction as pump design provides for a more rigid restraint in the vertical direction.

These higher levels of vibration are not detrimental to the long term operability of the machine and will not prevent early detection of pump degradation as intended by the ASME Section XI Code and the DECO IST Program.

In support of this conclusion it should be noted that if current HPCI vibration levels were taken in mils (as allowed by the ASME Section XI Code), the highest reading would be less than 1.4 mils overall which is well below the upper end of the acceptance range of 2.8 mils as provided by the Code for the specific HPCI Pump.

Given that the pump is operating acceptably at vibration velocities at or approaching the IST program Lower Alert Level, a new set of vibration velocity ranges have been developed. These new vibration velocity ranges will allow for early detection of pump degradation prior to component failure.

RELIEF REQUEST PR-10 R3 (Continued)

Alternate Testing: Pump vibration measurement will be taken in vibration velocities (in/sec) with the Acceptable, Alert and Required Action Ranges as follows:

Using the Guidelines contained in ASME/ANSI OMa-1988, Part 6, Table 3, (Ranges for Test Parameters).

Where V_r = Reference Vibration Velocity (in/sec) peak

Acceptable Range < or = 2.5 V_r

Alert Range > 2.5V_r to 6 V_r or >0.325 in/sec

Required Action Range > 6 V_r or >0.70 in/sec

Where Main pump V_r = 0.21 in/sec

Where Booster pump V_r = 0.13 in/sec

By applying the foregoing guidelines, the new HPCI Main and Booster pump vibration acceptance criteria are:

NEW PUMP VIBRATION ACCEPTABLE RANGES

MAIN PUMP

Acceptable Range	Alert Range	Required Action Range
< = 0.325 in/sec	0.326 in/sec to 0.700 in/sec	> .700 in/sec

BOOSTER PUMP

Acceptable Range	Alert Range	Required Action Range
< = 0.325 in/sec	0.326 in/sec to 0.700 in/sec	> .700 in/sec