UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 6, 2010

Mr. Jack M. Davis
Senior Vice President and Chief Nuclear Officer
Detroit Edison Company
Fermi 2-210 NOC
6400 North Dixie Highway
Newport, MI 48166

SUBJECT: FERMI 2 - EVALUATION OF RELIEF REQUEST NOS: PRR-004, PRR-005, PRR-007, AND PRR-010 FOR THE THIRD 10-YEAR INTERVAL INSERVICE PROGRAM (TAC NOS. ME2552, ME2553, ME2554, ME2559)

Dear Mr. Davis:

By letter dated November 3, 2009, DTE Energy (the licensee), submitted eleven requests to the U.S. Nuclear Regulatory Commission (NRC) for relief from certain requirements of the American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code) at Fermi 2 for the third 10-year Inservice Testing Program interval. On February 5, 2010, the NRC requested the licensee to submit additional information to support relief requests PRR-004, PRR-005, PRR-007, and PRR-010. By letter dated March 22, 2010, DTE Energy submitted additional information pertaining to the requests addressed in this Safety Evaluation (SE).

The licensee requested to use the proposed alternative PRR-004 on the basis that complying with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety. Also, the licensee requested to use the proposed alternatives PRR-005, PRR-007, and PRR-010 on the basis that the alternatives provide an acceptable level of quality and safety. The NRC staff has completed its review of the subject requests for authorization of these alternatives. As documented in the enclosed SE, the NRC staff concludes that the proposed alternatives are justified that they provide an acceptable level of quality and safety. The analysis and evaluation that the licensee has performed provides reasonable assurance of operational readiness. Therefore, the NRC staff authorizes the proposed alternatives pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii) for PRR-004 and pursuant to 10 CFR 50.55a(3)(i) for PRR-005, PRR-007, and PRR-010. The Fermi 2 third 10-year Inservice Testing Interval, began on February 17, 2010 and ends on February 16, 2020.

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable.

Sincerely,

Peter S. Tam for

Robert J. Pascarelli, Branch Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-341

Enclosure: Safety Evaluation

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST NOS. PRR-004, PRR-005, PRR-007, AND PRR-010

FOR THE THIRD 10-YEAR INTERVIAL INSERVICE TESTING PROGRAM

DETROIT EDISON

FERMI 2

DOCKET NO. 50-341

1.0 INTRODUCTION

By letter dated November 3, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML093140302), DTE Energy (the licensee), submitted eleven requests to the U.S. Nuclear Regulatory Commission (NRC) for relief from certain requirements of the American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code) at Fermi 2 for the third 10-year inservice testing (IST) program interval. This safety evaluation (SE) addresses licensee relief request numbers PRR-004, PRR-005, PRR-007, and PRR-010. In an e-mail dated February 5, 2010 (ADAMS Accession No. ML100491856), NRC requested the licensee to provide additional information for relief requests PRR-004, PRR-005, PRR-007, and PRR-010. By letter dated March 22, 2010 (ADAMS Accession No. ML100820061), DTE Energy submitted additional information pertaining to the requests addressed in this SE.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii), the licensee requested to use the proposed alternative PRR-004 on the basis that complying with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety. Also, pursuant to 10 CFR 50.55a(3)(i), the licensee requested to use the proposed alternatives PRR-005, PRR-007, and PRR-010 on the basis that the alternatives provide an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

Title 10 of the *Code or Federal Regulations* 50.55a(f), requires that IST of certain ASME Code Class 1, 2, and 3 pumps and valves be performed in accordance with the specified ASME Code and applicable addenda incorporated by reference in the regulations. Exceptions are allowed where alternatives have been authorized or relief has been requested by the licensee and granted by the NRC pursuant to paragraphs (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a.

In accordance with 10 CFR 50.55a(f)(4)(ii), licensees are required to comply with the requirements of the latest edition and addenda of the ASME Code incorporated by reference in the regulations 12 months prior to the start of each 120-month IST program interval. In accordance with 10 CFR 50.55a(f)(4)(iv), IST of pumps and valves may meet the requirements set forth in subsequent editions and addenda that are incorporated by reference in 10 CFR 50.55a(b), subject to NRC approval. Portions of editions or addenda may be used provided that all related requirements of the respective editions and addenda are met. NRC guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provides alternatives to ASME Code requirements which are acceptable. Further guidance is given in GL 89-04, Supplement 1, and NUREG-1482 Revision 1, "Guidelines for Inservice Testing at Nuclear Power Plants." ASME OM code cases that are approved for use by the NRC are listed in Regulatory Guide 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code" dated June 2003. The Code of record for the Fermi 2 third 10-year IST program interval is ASME OM Code, 2004 Edition (no addenda), as required by 10 CFR 50.55a(f)(4)(ii). The Fermi 2 third 10-year IST program interval began on February 17, 2010 and ends on February 16, 2020.

The NRC staff's findings with respect to authorizing the proposed alternative to the ASME OM Code are given below:

3.0 TECHNICAL EVALUATION

3.1 RELIEF REQUEST PRR-004

3.1.1 Licensee's Relief Request and Proposed Alternative

The applicable ASME OM Code edition and addenda for the Fermi 2 third 10-year IST interval is the 2004 Edition.

ISTB-3540(a), "Vibration," requires that on centrifugal pumps, except vertical line shaft pumps, measurements shall be taken in a plane approximately perpendicular to the rotating shaft in two approximately orthogonal directions on each accessible pump bearing housing. Measurement shall also be taken in the axial direction on each accessible pump thrust bearing housing.

ISTB-5121(e), "Group A Test Procedure," and ISTB-5123(e), "Comprehensive Test Procedure," require that all deviations from reference values shall be compared with the ranges of Table ISTB-5121-1 and corrective action taken as specified in ISTB-6200.

Table ISTB-5121-1, "Centrifugal Pump Test Acceptance Criteria," requires that for Group A and Comprehensive tests, the vibration alert range for pumps (speed ≥600 revolutions per minute (rpm)) shall be from >0.325 to 0.700 inches per second (ips).

ISTB-6200(a), "Corrective Action - Alert Range," requires that if measured test parameter values fall within the alert range of Table ISTB-5121-1, Table ISTB-5221-1, Table ISTB-5321-1, or Table ISTB-5321-2, as applicable, the frequency of testing as specified in ISTB-3400 shall be doubled until the cause of the deviation is determined and condition is corrected.

The licensee requested relief from the requirements of Table-ISTB-5121-1 for the residual heat removal (RHR) pumps listed in Table 1-1 below. In lieu of meeting the Code requirements for the vibration alert range from >0.325 ips to 0.700 ips, the licensee proposes to increase the lower end of the alert range from 0.325 ips to 0.415 ips for the affected pump vibration tests.

TABLE 1-1

Pump	Description	Pump Group Classification	Operating speed (rpm)
E1102C001A	RHR Pump A	A	1800
E1102C001B	RHR Pump B	A	1800
E1102C001C	RHR Pump C	A	1800
E1102C001D	RHR Pump D	A	1800

(Note: the figures and trend referenced in the basis for requesting relief and alternative testing sections were submitted as part of the original package and have not been repeated in the staff's SE)

In this relief request, the licensee states:

Pursuant to 10 CFR 50.55a, "Codes and standards," paragraph (a)(3)(i), relief is requested from the vibration criteria requirements of ASME OM Code ISTB Table ISTB-5121-1 during the Group A or biennial comprehensive pump test or any other time vibrations are taken to determine pump acceptability (i.e., post-maintenance testing, other periodic testing, etc.). The proposed alternative would provide an acceptable level of quality and safety.

Relief is requested from ISTB Table ISTB-5121-1 requirements to test the pump on an increased periodicity due to vibration levels exceeding the ISTB alert range absolute limit of 0.325 ips. This request is based on analysis of vibration and pump differential pressure data indicating that no pump degradation is taking place.

Pump Testing Methodology

The RHR pumps at Fermi 2 are tested each quarter using a full flow recirculation test line back to the suppression pool. These pumps have a minimum flow line (per division) which is used only to protect the pump from overheating when pumping against a closed discharge valve. The mini-flow line isolation valve for each division is initially open when the pump is started, and flow is initially recirculated through the mini-flow line back to the suppression pool. Then, the full-flow test line isolation valve is throttled open to establish flow through the full-flow recirculation test line. The mini-flow line is then isolated automatically, and all flow remains through the full-flow test line for the IST test.

The RHR system is operated in the same manner and under the same conditions for each IST test, regardless of whether Fermi 2 is operating or shut down. Consequently, the pumps will experience the same potential for flow-induced, broad band vibration whenever they are tested, whether Fermi 2 is operating or shut down. As a result, this relief is requested for the inservice testing of RHR pumps when vibration measurements are required or any other time vibrations are recorded to determine pump acceptability (i.e., post-maintenance testing, other periodic testing, etc.).

NRC Staff Document NUREG/CP-0152

NRC Staff document NUREG/CP-0152, entitled "Proceedings of the Fourth NRC/ASME Symposium on Valve and Pump Testing," dated July 15-18, 1996, included a paper entitled Nuclear Power Plant Safety Related Pump Issues, by Joseph Colaccino of the NRC staff. That paper presented four key components that should be addressed in a relief request of this type to streamline the review process. These four key components are as follows:

I. The licensee should have sufficient vibration history from inservice testing which verifies that the pump has operated at this vibration level for a significant amount of time, with any "spikes" in the data justified.

II. The licensee should have consulted with the pump manufacturer or vibration expert about the level of vibration the pump is experiencing to determine if pump operation is acceptable.

III. The licensee should describe attempts to lower the vibration below the defined code absolute levels through modifications to the pump.

IV. The licensee should perform a spectral analysis of the pump-driver system to identify all contributors to the vibration levels.

The following is a discussion of how these four key components are addressed for this relief request.

I. Vibration History

A. Testing Methods and Code Requirements

Inconsistent and high vibration levels on the RHR pump motors has been a condition that has existed since original installation of these pumps in the 1970's. During preoperational testing in 1984, vibrations were measured in both displacement (mils) and velocity ips at three locations (horizontal in line with flowpath, horizontal perpendicular to flowpath, and axial) on each motor bearing and on the pump bearing. The vibration signals were recorded at multiple pump flow velocities. The intention was to baseline the vibration data throughout the expected hydraulic use range and to see if hydraulic disturbances were responsible for the observed phenomena. The data showed conclusively that the motor was vibrating with randomly distributed bursts of energy at the natural frequency of the system, in the range of 9-14 Hertz (Hz). Therefore, it was determined that the hydraulic disturbances found in the piping were the source of the energy.

The monitoring of multiple vibration points was not a requirement of Section XI of the ASME Code until the adoption of the O&M Standards/Codes. The Fermi 2 first interval IST Program (which began in 1983) was committed to the 1980 Edition, winter 1981 Addenda of Section XI. Paragraph IWP-4510 of this code required that "at least one displacement vibration amplitude shall be read during each inservice test." This code was in effect at Fermi 2 until the start of the second ten-year interval, which began in February 2000. The Fermi 2 second interval IST

Program was committed to the 1989 Edition of Section XI, which required multiple vibration points to be recorded during IST pump testing in accordance with the ASME/ANSI [American National Standards Institute] Operations and Maintenance Standard, Part 6, 1987 Edition with the 1988 Addenda.

However, at Fermi 2, the first and second ten-year interval IST Program Plans did include both vibration monitoring of multiple points and use of velocity measurement instead of displacement. This was a conservative testing regime based on expectations that this level of vibration monitoring would be beneficial in terms of early identification of degradation. Because of this, readily available data exists for two vibration points on each RHR pump from July 1984 to the present and on three motor vibration points from October 1996 to the present. Various analyses of this data are included in the figures provided with this relief request.

B. Review of Vibration History Data

RHR Pump IST vibration trend graphs (Figures 1-4 in this relief request), which include data from 2002 through the present, show essentially flat or slightly upward trends. These charts also show that vibration readings for all four pumps occasionally exceed the Code alert range criteria of 0.325 ips.

Differential pressure trend graphs (Figures 7-10) illustrate differential pressure data dating back to 1990 for all four RHR pumps. This data clearly shows no discernible evidence of hydraulic degradation. Average run hours for each RHR pump per cycle is approximately 300-400.

C. Review of "Spikes" in Vibration Data

In reviewing the long term trend data for vibration, which includes the code-required frequency ranges (one-third pump running speed to 1000 Hz), random spikes were observed throughout the data that resulted in values above the alert range. Most of the vibration that is measured on the motor casing is due to excitation of the structural resonances of the motor/pump by turbulent flow. These structural resonances are poorly damped and can be easily excited. Many vertical pumps exhibit similar characteristics, and it is not necessarily problematic by itself. A problem occurs when a pump has a continuous forcing function whose frequency coincides with a resonance (i.e., running speed). The forcing function in this case is flow turbulence caused in large part by the 90 degree elbow in the piping just off the pump discharge. The flow through this area generates lateral broadband forces that excite the resonances in a non-continuous fashion.

This is why the amplitude swings so dramatically on the motor and to some degree on the pump casing. See Figure 5 for an example of a single point on RHR Pump C motor that clearly shows significant variation/spiking about a fairly constant mean. Figures 12-14 show frequency spectrum results for three recorded measurements of a single location (RHR Pump motor EA1) taken 1 minute apart. The total peak values which would be recorded for IST purposes were 0.308, 0.253 and 0.195 ips. The system goes from brief periods of excitation to brief periods of no excitation. The discharge riser is also moving side to side from the same forces. Although the discharge piping configuration is less than optimum for this application, the design poses no threat to the long-term reliability of the pump, motor or the system piping.

As illustrated previously, there have been no significant degrading trends associated with vibration data for the past fifteen years. By analyzing this data using a moving average function (averaging of the last eight data points), the trends are relatively steady, and without the spikes that the code-required data contains. This further supports the fact that the spikes in the original code data are due to the piping-induced, non-detrimental broadband vibration occurring in the one-third to one-half pump running speed range. These spikes may exceed Code alert criteria, which triggers the corrective action process and the need to increase the testing frequency. These Code compliance actions are not appropriate or necessary because the true nominal average of the particular vibration point may be anywhere from 40-60 percent below the individual spike value. The Code alert triggered response is not because of true degradation that warrants remedial action, but merely data fluctuation as illustrated on attached figures 12 through 14.

II. Consultation - Pump Manufacturer/Vibration Expert

A. Expert Analysis of RHR Pump Vibration Issue

Each RHR Pump motor is vertically mounted to the pump casing, with the piping entering/exiting the pump casing horizontally. Each 2000 horsepower motor is 8 feet (ft.) tall and 42 inches (in.) in diameter, weighing approximately 14,000 pounds. The vendor describes the upper motor thrust bearing as having a minimum expected life of 5 years [operation]. With a conservative assumption of 500 run hours per year and appropriate lubrication activities, these bearings should last over 80 years. The pump casing is mounted on a reinforced floor pad and is approximately 4 ft. high and 6 ft. in diameter. The 24-in. suction piping enters the room level with the pump centerline but elbows horizontally 45 degrees 10 ft. from the pump center and then another 45 degrees 6 ft. from the pump. The 20-in. discharge pipe leaves the pump on nearly the same plane as the suction pipe but then elbows vertically 90 degrees at 6 ft. from the pump center. Six ft. up from this elbow is the pump discharge check valve and 3 ft. from the elbow is the 3-in. minimum flow piping connection (See Figures 15 and 16 showing the pump suction and discharge piping isometrics).

Figure 17 shows the vibration monitoring points on the RHR motor/pump assembly. Points A1, A2, A3, C1 and C2 are the specified locations for inservice testing data.

ASME OM Code 2004 Section ISTB-6400 states "If the reference value of a particular parameter being measured or determined can be significantly influenced by other related conditions, then these conditions shall be analyzed[1] and documented in the record of tests (see ISTB-9000)." The footnote to "analyzed," states "Vibration measurements of pumps may be foundation, driver, and piping dependent. Therefore, if initial readings are high and have no obvious relationship to the pump, then vibration measurements should be taken at the driver, at the foundation, and on the piping and analyzed to ensure that the reference vibration measurements are representative of the pump and that the measured vibration levels will not prevent the pump from fulfilling its function." This is exactly the case with the RHR pumps, where the flow noise significantly influences the vibration measurements of the pump and motor. The data for RHR Pump C was extensively analyzed and documented in IST Evaluation 97-042 by the Fermi 2 Level 3 Vibration Expert. Additionally, Engineering Research Report 85D15-5, Rev. 1, dated 1984, had identified the same resonant peaks in the other three RHR pumps.

This analysis identified a resonant frequency between 9-14 Hz. An impact test was also conducted with the pumps not running which again confirmed the 9-14 Hz resonant frequencies on the pumps. This resonance frequency, either alone or in combination with the running speed peak, occasionally results in the overall vibration amplitude exceeding the 0.325 ips Alert Range limit. Each structure has its own resonance frequency based on the mass and stiffness of the system. Minor changes in either of these two components will change the resonance frequency. A difference in piping and hanger design between the four RHR pumps is the cause for slight differences in the resonance frequency and therefore the vibration levels. The reason that the vibration levels change from run to run is that for a resonance frequency to "ring" it must be excited by some forcing function. In the RHR pumps this forcing function is flow noise, which causes a broadband forcing frequency that varies slightly during each run.

III. Attempts to Lower Vibration

As stated earlier, Engineering Research Report 85D15-5, Rev. 1, dated 1984, had identified these frequencies. At that time several attempts were made to stiffen the pump structure. These attempts only succeeded in transferring the energy to the piping. These supports were removed and the system returned to the previous configuration. When the upper motor bearing vibration data was added to the IST program and the data was found to be high, the shaft locking nut was checked along with the mounting bolts and hangers. No problems were identified. Additional vibration data was also collected and entered into a three-dimensional model (Figure 11) program. This program did not indicate any problems in either the pump or motor. Analysis of a high-resolution vibration spectrum shows the structural resonance and running speed peaks. These analyses indicate that the running speed spectral peaks remained unchanged while the resonant peak can change with each run. With the resonant frequency being a significant contributor in exceeding the alert vibration range there is little that can be done to the pump or rotating assembly (such as balancing or alignment) that will reduce this resonant vibration peak.

IV. Spectral Analysis

Spectral data indicates that the overall vibration levels (IST data) are primarily made up of the broad spectrum from 30 Hz up 100 Hz which undergoes random amplitudinal increases as a function of flow noise excitation. Spectral data does not indicate any problem with bearings or the rotating elements such as imbalance or misalignment. Uncoupled runs of the motors have shown very low vibration levels compared to pump running conditions. The overall peak amplitude value recorded for IST can vary by as much as 0.150 - 0.200 ips on readings taken a few seconds apart (Figures 12, 13 and 14). These noise-induced oscillations are neither consistent in amplitude or duration.

Basis for Code Alternative Alert Values

By this relief request Fermi 2 is proposing to increase the absolute alert limit for vibration from 0.325 ips to 0.415 ips for all four RHR pumps. The flow induced broadband vibration occasionally causes the overall vibration value for these points to exceed 0.325 ips, resulting in the pumps being placed on increased test frequency. In late 2005 a single reading on RHR pump A exceeded the Alert criteria. RHR pump A was placed on increased frequency and planning began for motor replacement. The motor for RHR Pump A was replaced during Refueling Outage 12 as corrective action due to exceeding the vibration alert. Initial examination of the replaced motor identified no evidence of degradation, and initial average vibration data for the new motor showed only a slight reduction compared to recent data on the old motor (Figure 6). This motor replacement was a high impact work item in the last refueling outage, incurring significant cost and dose. Expert analyses and maintenance history reviews have shown that this flow-induced vibration has not resulted in noticeable degradation to the pump or motor. Additionally, the overall vibration levels, when dampened using the moving-average technique, have remained essentially steady or risen only slightly over the past 15 years. Therefore, it has been demonstrated that doubling the test frequency and initiating corrective actions such as motor replacement under the current conditions does not provide additional assurance as to the condition of the pump and its ability to perform its safety function.

These new alert criteria values are reasonable as they represent an alternative method that still meets the intended function of monitoring the pump for degradation over time while keeping the required action level unchanged. The proposed values encompass all of the historical spiking values, which would eliminate the unnecessary actions associated with exceeding the Code Alert limits due to spiking. However, the more accurate moving average value for these pumps would typically still be within the original Code alert value of 0.325 ips at a point where any spiking in the data due to the high flow-induced broadband noise would exceed the requested 0.415 ips alert limit. Therefore, corrective actions triggered by exceeding the 0.415 ips alert value would be taken at a point commensurate with the intent of the Code guidance.

The Fermi 2 Vibration Specialist routinely performs a spectral analysis on all data recorded during RHR pump inservice testing per Fermi 2 procedure 47.000.02, "Mechanical Vibration Measurements for Trending". This analysis is in addition to the quantitative rendering of total vibration values recorded in the IST test procedures. The routine spectral analysis provides additional confidence in our ability to detect degradation at an early stage.

Each RHR Pump motor is also covered by various predictive maintenance program (PdM) activities. These include:

10 year detailed motor condition inspection/refurb PdM

Thermography and analysis every 182 days

Oil sampling and analysis every 92 days

Annual motor PdM including phase to phase winding tests, insulation checks and exterior cleaning

This maintenance and testing regime in addition to trending of IST data provides for early identification and analysis of any degradation.

Conclusions

Several expert evaluations have documented that no internal pump or motor degradation is occurring due to the piping-induced vibration, which has been present since the pre-operational testing time period. The available vibration data over the past fifteen years and differential pressure data over nearly the past eleven years supports this fact. A maintenance history review and a review of thermography and oil analyses results further support these conclusions.

Vibration data analysis clearly shows significant variations which are attributable to the external influence of the flow noise. These variations have frequently crossed the ASME Code Alert threshold of 0.325 ips and triggered unnecessary responses.

Based on this information, Fermi 2 concludes that doubling the test frequency and initiating costly corrective actions for the RHR pump motors at the 0.325 ips Code alert limit does not provide additional information nor does it provide additional assurance as to the condition of the pumps and their ability to perform their safety function. Testing of these pumps on an increased frequency and performing the associated corrective actions places an unnecessary burden on Fermi 2 resources. Establishing an Alert limit of 0.415 ips provides for necessary margin above the normal and expected vibration levels encountered with these components to prevent exceeding the Alert limit due to the data fluctuations caused by the system flow induced noise.

Figures 1 and 2 contained in Fermi RAI response dated March 22, 2010, provides the following details about location of the vibration measurements:

EA1 - Radial 0 degree measurement on top portion of motor in line with upper bearing housing
EA2 - Radial 90 degree measurement on top portion of motor in line with upper bearing housing
EA3 - Axial 0 degree measurement on top of motor upper end bell
EC1 - Radial 0 degree measurement on top portion of pump casing
EC2 - Radial 90 degree measurement on top portion of pump casing

3.1.2 NRC Staff Evaluation

ISTB-6200(a), "Corrective Action - Alert Range," requires that if the measured test parameter (vibration) values fall within the alert range (> 0.325 ips through 0.7 ips) of Table ISTB-5121-1, the frequency of testing specified in ISTB-3400 shall be doubled until the cause of the deviation is determined and the condition is corrected.

The Code requires that when the overall pump vibration measurement in any one measured direction exceeds 0.325 ips, the pump shall be declared in the alert range and the testing doubled until the cause of the deviation is determined and the condition is corrected. Although a pump is considered operable while in the alert range, increased vibration at this level may be an indication of degradation which would warrant further investigation. However, if a particular pump has been determined to be in good operating condition and has a historical record of vibration in specific measured directions being measured in the alert range, then it would be appropriate to adjust the alert level to take this into consideration. Requiring more frequent testing under these conditions is considered a hardship because the reason for the high vibration is understood and is known not to be indicative of pump degradation.

To accept pump vibration at a higher level than the Code-required alert range absolute limits, NUREG/CP-0152 recommends evaluating four key elements (1) vibration history to verify that pumps were operated at this level of vibration for a significant amount of time with justification of "spikes" in test data; (2) consulting with the pump manufacturer/vibration experts to verify that the vibration levels of the pumps are acceptable; (3) attempts to lower the vibration level through modifications to the pumps or the system and structures of the pumps; and (4) perform spectral analysis to identify all contributors to the vibration level. Under the relief request basis, the licensee provided all of this information, and its evaluation of all of these four key elements for the RHR pumps. In addition, the NRC staff found that the licensee has submitted sufficient vibration history to verify that the pumps have operated at this vibration level for a significant period of time with no adverse impacts on performance. Spike data have been justified by consultation with an independent pump expert. The licensee has described attempts to reduce vibration and has demonstrated that the cause of the vibration appears to be dependent on the piping and support configuration rather than the condition of the pumps. Spectral analysis of the pump-driver system was performed to identify all contributors to vibration levels. Based on the evaluation and the provided historical purnp vibration data, the NRC staff concluded that these are not indicative of degraded pump performance.

The licensee stated in its basis for the relief request that the four RHR pumps at Fermi 2 have a resonant frequency between 9-14 Hz that is excited by flow noise, which will occasionally result in increased vibration levels above the alert range. These conditions were identified during plant startup and attempts to stiffen the structures of the pumps did not significantly change the vibrations. The licensee's current analysis and assessments of these conditions determined that the vibrations were not exhibiting any degrading trends and current vibration levels were not damaging the pumps. From this evaluation, it was determined that the peak vibration levels occur at running speeds and the 9-14 Hz resonant point. Therefore, compliance with the Code requirements would be a hardship if an alternate testing acceptance criterion is not allowed.

Each RHR pump motor is also covered by various PdM activities. This maintenance and testing regime, in addition to trending of inservice test data, provides for early identification and analysis of any degradation.

The licensee has proposed to raise the vibration alert range for all four RHR pumps (note that the RHR pumps are vertical centrifugal pumps, where the pump and driver form an integral unit and the pump bearings are in the driver). The NRC staff reviewed the historical vibration information for the four RHR pumps and noted that the vibration parameters cited in the relief request for RHR pumps A, B, C, and D do exceed the 0.325 ips alert limit. The analysis and evaluation that the licensee has performed provides reasonable assurance of operational readiness. Additionally, the proposed alternative alert limit of 0.415 ips is below the required action limit of 0.700 ips and the licensee has demonstrated that these pumps have a normal operational history at this vibration level with no adverse consequences.

3.1.3 Conclusion

Based on the above evaluation, the NRC staff concludes that the licensee's alternative to use vibration "Alert Range" acceptance criteria of greater than 0.415 ips to 0.700 ips in lieu of the ASME OM Code, Table ISTB-5121-1 requirements of greater than 0.325 ips to 0.700 ips for RHR pumps A, B, C and D, is authorized pursuant to 10 CFR 50.55a(a)(3)(ii). Compliance with the specified requirements would result in a hardship without a compensating increase in the level of quality and safety. The proposed alternative is authorized for the third 10-year IST interval at Fermi 2, which began on February 17, 2010 and ends on February 16, 2020.

3.2 RELIEF REQUEST PRR-005

3.2.1 Licensee's Relief Request and Proposed Alternative

The applicable ASME OM Code edition and addenda for the third 10-year IST interval at Fermi 2 is the 2004 Edition.

ISTB-3300, "Reference Values," requires that initial vibration reference values be determined from the results of preservice testing or from the results of the first inservice test.

ISTB-5121(e), "Group A Test Procedure," and ISTB-5123(e), "Comprehensive Test Procedure," require that all deviations from the reference values shall be compared with the ranges of Table ISTB-5121-1, "Centrifugal Pump Test Acceptance Criteria."

ISTB-5221(e), "Group A Test Procedure," and ISTB-5223(e), "Comprehensive Test Procedure," require that all deviations from the reference values shall be compared with the ranges of Table ISTB-5221-1, "Vertical Line Shaft and Centrifugal Pumps Test Acceptance Criteria."

ISTB-5321(e), "Group A Test Procedure," and ISTB-5323(e), "Comprehensive Test Procedure," require that all deviations from the reference values shall be compared with the ranges of Table ISTB-5321-1, "Positive Displacement Pump (Except Reciprocating) Test Acceptance Criteria."

ISTB-6200 (a), "Corrective Action – Alert Range," states that if the measured test parameter values fall within the alert range of Table ISTB-5121-1, Table ISTB-5221-1, Table ISTB-5321-1, or Table ISTB-5321-2, as applicable, the frequency of testing specified in ISTB-3400 shall be doubled until the cause of the deviation is determined and the condition is corrected.

The licensee requested relief from the vibration testing requirements of Tables ISTB-5121-1, ISTB-5221-1, and ISTB-5321-1. Tables ISTB 5121-1, ISTB-5221-1, and ISTB-5321-1 establish ranges of acceptability of reference values. Specifically, the tables require the use of 2.5 vibration reference value (V_r) and 6 V_r in determining acceptable and alert ranges of vibration unless those calculated values exceed the absolute limits specified in the Tables.

The licensee states that in lieu of applying the vibration acceptance criteria ranges specified in Table ISTB-5121-1, Table ISTB-5221-1, or Table ISTB-5321-1, as applicable, smooth running pumps with a measured reference value below 0.04 ips for a particular vibration measure location will have subsequent test results for that location compared to an Acceptable Range limit of 0.100 ips and an Alert Range limit of 0.240 ips (based on a minimum reference value of 0.04 ips). These proposed ranges shall be applied to vibration test results during both Group A and Comprehensive tests. All Group B pumps are also treated as Group A pumps for vibration measurements. Relief was requested for the following pumps listed in Table 2-1:

Table-2-1

Pump No.	Description	Pump Type *	Pump Group	Speed rpm
E1151C001A	RHR Service Water Pump A	VLSC	A	1800
E1151C001B	RHR Service Water Pump B	VLSC	A	1800
E1151C001C	RHR Service Water Pump C	VLSC	A	1800
E1151C001D	RHR Service Water Pump D	VLSC	A	1800
P4400C001A	Emergency Equip Cooling Water Div. 1 Pump	CENT	B	1800
P4400C001B	Emergency Equip Cooling Water Div. 2 Pump	CENT	B	1800
P4400C002A	Emergency Equip Cooking Water Makeup Div 1 Pump	CENT	B	1800
P4400C002B	Emergency Equip Cooling Water Makeup Div 2 Pump	CENT	B	1800
P4500C002A	Emergency Equip Service Water South Pump	VLSC	B	1800
P4500C002B	Emergency Equip Service Water North Pump	VLSC	B	1800
R3000C001	EDG 11 Diesel Fuel Oil Xfer Pump A	PD	B	1200
R3000C002	EDG 12 Diesel Fuel Oil Xfer Pump A	PD	B	1200
R3000C003	EDG 11 Diesel Fuel Oil Xfer Pump B	PD	B	1200
R3000C004	EDG 12 Diesel Fuel Oil Xfer Pump B	PD	B	1200
R3000C009	EDG 13 Diesel Fuel Oil Xfer Pump A	PD	B	1200
R3000C010	EDG 14 Diesel Fuel Oil Xfer Pump A	PD	B	1200
R3000C011	EDG 13 Diesel Fuel Oil Xfer Pump B	PD	B	1200
R3000C012	EDG 14 Diesel Fuel Oil Xfer Pump B	PD	B	1200
R3000C005	EDG 11 DG Service Water Pump	VLSC	B	1800

R3000C006	EDG 12 DG Service Water Pump	VLSC	B	1800
R3000C007	EDG 13 DG Service Water Pump	VLSC	B	1800
R3000C008	EDG 14 DG Service Water Pump	VLSC	B	1800

* Pump Type codes in Table 2-1 above:

CENT Centrifugal Pump (except vertical line shaft centrifugal pump)

VLSC Vertical Line Shaft Centrifugal Pump

PD Positive Displacement Pump (except reciprocating pumps)

The pumps listed in Table 2-1 have at least one V_r that is currently less than or equal to 0.04 ips. For very small reference values, hydraulic noise and instrumentation error can be a significant portion of the reading and therefore affect the repeatability of subsequent measurements. Also, experience gathered from the PdM has shown that changes in vibration levels in the range of 0.04 ips are not typically indicative of degradation in the pump or motor condition.

When new reference values are established per ISTB-3310, ISTB-3320 or ISTB-6200(c), the measured parameters will be evaluated for each location to determine if the provisions of this relief request remain applicable. If the measured V_r is greater than 0.04 ips, the requirements of ISTB-3300 will be applied. Conversely, if a measured V_r is less than or equal to 0.04 ips, a minimum value of 0.04 ips will be used for V_r for the pumps included in the list of pumps.

In addition to the requirements of ISTB, the pumps in the ASME IST Program are included in the Fermi 2 PdM Program scope. The PdM Program currently employs predictive monitoring techniques such as vibration monitoring and analysis beyond that required by ISTB.

All data is collected currently utilizing an accurate data acquisition system, downloaded into the Vibration PdM Program software and then analyzed for vibration magnitude and discrete frequencies. Components exhibiting abnormal vibration trends would be subjected to more advanced diagnostics such as impact testing, thermography and detailed spectral analysis. Additional parameters typically monitored and trended are bearing temperature and oil sampling and analysis.

If the measured parameters are outside the normal operating range or are determined by analysis to be trending toward an unacceptable degraded state, appropriate actions are taken that may include:

- increased monitoring to establish the rate of change,
- review of component specific information to identify a cause, or
- removal of the pump from service to perform maintenance.

The PdM Program coverage typically entails periodic inspections of seals, bearings and other wear-expectant components. Preventive maintenance intervals vary as a function of component risk importance, type of duty, and operating experience.

All of the pumps in the IST Program will remain in the PdM Program scope even if certain pumps have very low vibration readings and are considered to be smooth running pumps.

All of the listed pumps are in standby systems. These pumps are typically run only for testing or other short duration system operations. On average, these pumps will see less than 150 operating hours per year. The residual heat removal service water pumps are operated slightly more often, with an average of 500-600 annual run hours.

Pumps with a measured reference value at or below 0.04 ips for a specific vibration measurement location shall have subsequent test results for that location compared to an acceptable range based on 0.04 ips. This will result in a minimum alert range of greater than 0.100 ips and required action range of greater than 0.240 ips. In addition to the Code requirements, all pumps in the IST Program are included in and will remain in the PdM Program scope regardless of their smooth running status.

All of the Table-2-1 pumps are treated as Group A pumps. Vibration is measured and evaluated on a quarterly basis. This exceeds the ASME Code requirements for Group B pumps.

3.2.2 NRC Staff Evaluation

ISTB-3540(a) requires that for centrifugal pumps, vibration measurements of each pump be taken in a plane approximately perpendicular to the rotating shaft in two orthogonal directions on each accessible pump-bearing housing. The measurement is also required to be taken in the axial direction on each accessible pump thrust-bearing housing. For vertical line shaft pumps, ISTB-3540(b) requires vibration measurements be taken on the upper motor-bearing housing in three orthogonal directions including the axial direction. ISTB-3540(c) requires that for reciprocating pumps, the location shall be on the bearing housing of the crankshaft, approximately perpendicular to both the crankshaft and the line of plunger travel. These measurements are required to be compared with the Code vibration acceptance criteria as specified in Table ISTB-5121-1, Table ISTB-5221-1, or ISTB-5321-1 as applicable, to determine if the measured values are acceptable.

Table ISTB 5121-1, Table ISTB-5221-1, or ISTB-5321-1 states that, if during an inservice test, a vibration measurement exceeds 2.5 times the previously established reference value V_r, the pump is considered to be in the alert range. The frequency of testing is then doubled in accordance with paragraph ISTB-6200(a) until the cause of the deviation is determined, the condition is corrected, and the vibration level returns below the alert range. Pumps whose vibration is recorded to be greater than 6 times V_r are considered in the required action range and must be declared inoperable until the cause of the deviation has been determined and condition is corrected. The vibration reference values are required by paragraph ISTB-3300 to be determined when the pump is known to be operating acceptably.

For pumps whose absolute magnitude of vibration is an order of magnitude below the absolute vibration limits in Table ISTB-5121-1, Table ISTB-5221-1, or ISTB-5321-1, a relatively small increase in vibration magnitude may cause the pump to enter the alert or required action range.

These instances may be attributed to variation in flow, instrument accuracy, or other noise sources that would not be associated with degradation of the pump. Pumps that operate in this region are typically referred to as "smooth-running." Based on a small acceptable range, a smooth running pump could be subjected to unnecessary testing and corrective action.

The NRC has authorized a minimum vibration level of 0.05 ips for smooth running pumps, at several nuclear plants. There have been no reports to the NRC of any degradation issues that have gone undetected in pumps at these facilities. However, at one particular plant, the minimum NRC authorized reference value was 0.1 ips. A pump bearing at this plant experienced significant degradation even though the vibration was below the minimum reference value in the approved alternative. This degradation was discovered during PdM program activities. After this issue was discovered, the NRC staff noted that only monitoring pump vibration at the approved minimum reference value for smooth running pumps, would not be sufficient to determine pump degradation.

The licensee's proposed alternative combines the minimum reference value V_r method with a commitment to monitor all the IST pumps with a PdM Program even if certain pumps have very low vibration readings and are considered to be smooth-running pumps. The licensee will assign a vibration reference value of 0.04 ips to any pump bearing vibration direction that, in the course of determining its reference value, has a measured value below 0.04 ips. Therefore, the acceptable range as defined in Table ISTB-5121-1, Table ISTB-5221-1, or ISTB-5321-1 will be less than or equal to 0.100 ips, the alert range will be greater than 0.100 to 0.240 ips, and the required action range will be greater than 0.240 ips.

The licensee's proposed alternative describes the PdM Program for all IST program pumps (Table 2-1) considered important to safe and reliable plant operation. The licensee states the Fermi 2 PdM Program goes beyond the IST requirements for pumps. The program includes bearing temperature trending, oil sampling and analysis, and thermographic analysis. The licensee states that if the measured parameters are outside the normal operating range or are determined by analysis to be trending towards an unacceptable degraded state, appropriate actions will be taken. These actions include increased monitoring to establish the rate of degradation, review of component-specific information to identify cause, and removal of the pump from service to perform maintenance. The proposed alternative is consistent with the objective of the IST which is to monitor degradation in safety-related components. The licensee states that all Group B pumps as specified in Table 2-1 will have quarterly testing including vibration measurement, which is above and beyond the Code requirements.

As described above, the NRC staff finds that the alert and required action limits specified in the alternative request sufficiently allows for detection of any pump problems, including degradation through specified PdM. The objective of the licensee's PdM Program is to detect problems involving the mechanical condition, even well in advance of when the pump reaches its overall vibration alert limit. Therefore, the licensee's proposed alternative will provide an acceptable level of quality and safety.

3.2.3 Conclusion

Based on a review of the information provided by the licensee, the NRC staff concludes that the licensee's proposed alternative provides adequate indication of pump performance and an acceptable level of quality and safety. Therefore, the alternative to the vibration requirements of ISTB-3300, Table ISTB-5121-1, or Table ISTB-5221-1 or Table ISTB-5321-1, of the OM Code is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety. This relief request is authorized for pumps shown in Table 2-1 for the third 10-year IST interval at Fermi 2, which began on February 17, 2010 and ends on February 16, 2010.

3.3 RELIEF REQUEST PRR-007

3.3.1 Licensee's Relief Request and Proposed Alternative

ISTB-3400, "Frequency of Inservice Tests," refers to Table ISTB-3400-1, "Inservice Test Frequency," which specifies that a comprehensive test be performed biennially for Group A and Group B pumps.

ISTB-5123, "Comprehensive Test Procedure," specifies the specific requirements for the comprehensive test for centrifugal pumps.

ISTB-5223, "Comprehensive Test Procedure," specifies the specific requirements for the comprehensive test for vertical line shaft pumps.

The licensee requested to use a modified quarterly Group A test for the IST in lieu of a quarterly Group A or Group B test (as applicable) and a biennial comprehensive test for the following pumps:

TABLE 3-1

Pump	Description	Current Classification
E1102C002A	RHR Pump A	Group A
E1102C002B	RHR Pump B	Group A
E1102C002C	RHR Pump C	Group A
E1102C002D	RHR Pump D	Group A
E1151C001A	RHR Service Water Pump A	Group A
E1151C001B	RHR Service Water Pump B	Group A
E1151C001C	RHR Service Water Pump C	Group A
E1151C001D	RHR Service Water Pump D	Group A
E4101C001	High Pressure Injection Pump	Group B
P4400C001A	Emergency Equip. Cooling Water Div. 1 Pump	Group B
P4400C001B	Emergency Equip. Cooling Water Div. 2 Pump	Group B
P4500C002A	Emergency Equip. Service Water South Pump	Group B
P4500C002B	Emergency Equip. Service Water North Pump	Group B
R3001C005	EDG 11 DG Service Water Pump	Group B
R3001C006	EDG 12 DG Service Water	Group B

	Pump	
R3001C007	EDG 13 DG Service Water Pump	Group B
R3001C008	EDG 14 DG Service Water Pump	Group B
T4100C040	South CCHVAC Chilled Water Pump	Group A
T4100C041	North CCHVAC Chilled Water Pump	Group A

The licensee proposes that in lieu of the requirements of ISTB-5123 and ISTB-5223, modified Group A tests will be performed quarterly, with instrumentation meeting the instrument accuracy requirements of Table ISTB-3510-1 for the biennial comprehensive test, and the comprehensive test would not be performed. For the centrifugal pumps, the acceptable range for differential pressure would be 0.90 to 1.06 of the reference value. For the vertical line shaft pumps, the acceptable range for differential pressure would be 0.95 to 1.06 of the reference value, and the alert range would be 0.93 to less than 0.95 of the reference value. The licensee is proposing this alternative for the pumps listed in Table 3-1. Pumps E4101C001, P4400C001A, P4400C001B, P4500C002A, P4500C002B, R3001C005, R3001C006, R3001C007, and R3001C008 are currently classified as Group B pumps and would be re-classified as Group A pumps.

All of the pumps in Table 3-1, except P4500C002A and B and R3001C005, 6, 7, and 8, tested quarterly using this alternative would be tested within ± 20 percent of pump design accident flow rate, as is required for the biennial comprehensive test. Pumps P4500C002A and B and R3001C005, 6, 7, and 8 will be tested within ± 20 percent of pump best efficiency point flow rate.

Pumps that would normally be categorized as Group B pumps, but are re-categorized as Group A pumps, will be tested according to the provisions of this alternative. As a result of this re-categorization from Group B to Group A, per Table ISTB-3000-1, additional data must be obtained quarterly rather than once every two years on the test parameters of vibration for these pumps.

Use of this alternative provides for consistent acceptance criteria for pump differential pressure tests. The licensee would consistently utilize the modified Group A test acceptance criteria (discussed above) for pump IST rather than having to utilize the comprehensive test criterion for one biennial test. The acceptance criteria for vibration tests would be the same as for Group A tests shown in Tables ISTB-5121-1 and ISTB-5221-1.

3.3.2 <u>NRC Staff Evaluation</u>

The licensee is proposing to re-classify the Group B pumps listed in Table 3-1 as Group A pumps, and perform IST for all the pumps listed in Table 3-1 in accordance with a modified Group A test procedure.

The ASME OM Code requires that for Group A pumps, a Group A test is performed every quarter, and a comprehensive test is performed biennially. The Group A test is performed within ± 20 percent of the pump design flow rate (if practicable), the pressure instrument accuracy is ± 2 percent, and the upper limit for the acceptable range for differential pressure is 110 percent of the reference value. The comprehensive test is performed within ± 20 percent of the pump design flow rate, the pressure instrument accuracy is ± 1/2 percent, and the upper limit of the acceptable range for differential pressure is 103 percent of the reference value. Vibration monitoring is performed during both the Group A test and a comprehensive test.

The ASME OM Code requires that for Group B pumps, a Group B test is performed every quarter, and a comprehensive test is performed biennially. The Group B test is performed within ± 20 percent of the pump design flow rate (if practicable), the pressure instrument accuracy is ± 2 percent, and the upper limit for the acceptable range for differential pressure is 110 percent of the reference value. The comprehensive test is performed within ± 20 percent of the pump design flow rate, the pressure instrument accuracy is ± 1/2percent, and the upper limit of the acceptable range for differential pressure is 103 percent of the reference value. Vibration monitoring is only performed during the comprehensive test.

The licensee proposes that for the pumps listed in Table 3-1 (all will be classified as Group A pumps), a modified quarterly test be performed every quarter, and the biennial comprehensive test is not required. The modified Group A quarterly test would be performed within ± 20 percent of the pump design accident flow rate for all of the pumps in Table 3-1 except P4500C002A and B and R3001C005, 6, 7, and 8. Pumps P4500C002A and B and R3001C005, 6, 7, and 8 will be tested within ± 20 percent of pump best efficiency point flow rate, which is acceptable because the pumps will be operating on a sloped portion of the pump curve where degradation is more detectable. The more accurate pressure instrumentation that is required for a comprehensive test (± 1/2 percent versus ± 2 percent) will be used. This modified quarterly test would replace the comprehensive test. The acceptable range for differential pressure for the modified Group A quarterly test is tighter than the range for the Group A quarterly test.

The licensee is proposing to perform a modified Group A pump test every quarter and not perform a comprehensive test. The licensee will use a more limiting upper bound of 106 percent for the Acceptable Range for differential pressure in lieu of 110 percent that is required by the OM Code for Group A tests. This proposed upper bound of 106 percent is greater than the upper bound of 103 percent for the biennial comprehensive test. The pumps that will be reclassified from Group B to Group A will now have vibration monitoring performed quarterly. The OM Code does not require vibration monitoring for Group B pump tests. All of the pump tests will be performed with pressure instruments with ± 1/2 percent accuracy. For the pumps that are currently classified as Group A, the elimination of the comprehensive test (with its more limiting Differential Pressure Acceptable Range upper bound of 103 percent) is compensated for by using more accurate pressure gauges on every quarterly test. This will provide for better trending of pump performance. Instead of performing seven tests with pressure instruments with ± 2 percent accuracy, and then performing the eighth test with pressure instruments with ± 1/2 percent accuracy, all eight tests will be performed with the same ± 1/2 percent accurate instruments. For the Group B pumps that will be re-classified as Group A pumps, the elimination of the comprehensive test is compensated for by using a tighter Acceptable Range for differential pressure on the quarterly tests, by using more accurate pressure instruments on every quarterly test, and by performing vibration monitoring on every quarterly test. This will provide for better trending of pump performance. Instead of performing seven tests with pressure instruments with ± 2 percent accuracy, with no vibration monitoring, and then performing the eighth test with pressure instruments with ± 1/2 percent accuracy and vibration monitoring, all eight tests will be performed with pressure instruments with the same ± 1/2 percent accuracy, all eight tests will include vibration monitoring, and seven of the eight tests will have a tighter Acceptable Range for differential pressure. The proposed alternative would provide reasonable assurance of the operational readiness for the pumps listed in Table 3-1

3.3.3 Conclusion

As set forth above, the NRC staff finds that the proposed alternative in Request PRR-007 provides reasonable assurance that pumps listed in Table 3-1 are operationally ready. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(i), and is in compliance with the ASME OM Code's requirements. Therefore, the NRC staff authorizes the alternative in Request PRR-007 for the third 10-year inservice testing interval, which began on February 17, 2010 and ends on February 16, 2020.

3.4 RELIEF REQUEST PRR-010

3.4.1 Licensee's Relief Request and Proposed Alternative

ISTB-3400, "Frequency of Inservice Tests," refers to Table ISTB-3400-1, "Inservice Test Frequency," which specifies that Group A and Group B tests be performed quarterly and a comprehensive test be performed biennially for Group A and Group B pumps.

ISTB-5322, "Group B Test Procedure," specifies the specific requirements for the Group B test for positive displacement pumps.

ISTB-5323, "Comprehensive Test Procedure," specifies the specific requirements for the comprehensive test for positive displacement pumps.

The licensee requested to use a modified quarterly Group A test for the IST in lieu of a quarterly Group B test and a biennial comprehensive test for the following pumps:

TABLE 4-1

Pump	Description	Current Classification
C4103C001A	Standby Liquid Control (SLC) Pump A	Group B
C4103C001B	SLC Pump B	Group B
R3000C001	EDG 11 Diesel Fuel Oil Transfer (DGFOT) Pump A	Group B
R3000C002	EDG 12 DGFOT Pump A	Group B
R3000C003	EDG 11 DGFOT Pump B	Group B
R3000C004	EDG 12 DGFOT Pump B	Group B
R3000C009	EDG 13 DGFOT Pump A	Group B

R3000C010	EDG 14 DGFOT Pump A	Group B
R3000C011	EDG 13 DGFOT Pump B	Group B
R3000C012	EDG 14 DGFOT Pump B	Group B

Standby Liquid Control Pumps

The licensee's Technical Specification (TS) 3.1.7.7 requires that each SLC pump shall be capable of delivering greater than 41.2 gallons per minute at a discharge pressure greater than 1215 pounds per square inch gauge (psig) to be considered operable. The sodium pentaborate concentrations are controlled at levels which support the TS flow rate plus a 25 percent design margin. This 25 percent margin is referenced in both TS B.3.1.7 and Updated Final Safety Analysis Report section 4.5.2.4.3 and is therefore a required aspect of the Fermi 2 licensing basis.

The licensee proposes that in lieu of the requirements of ISTB-5322 and ISTB-5323, modified Group A tests will be performed quarterly with the pumps operating at a reference discharge pressure of 1230 ± 10 psig with the flow rate measured and compared to its reference value. All instrumentation will meet the accuracy for comprehensive tests as listed in Table ISTB 3510-1 (an accuracy improvement from ±2 percent to ±1/2 percent for pressure instrumentation). The acceptable range for flow rate would be 0.95 to 1.06 of the reference value, the alert range would be 0.93 to less than 0.95 of the reference value, and the required action range would be less than 0.93 of the reference value or greater than 1.06 of the reference value. The licensee will evaluate all ranges against the design conditions to ensure that all procedural limits bound the more conservative of the design or ASME OM Code ranges. The biennial comprehensive test would not be performed. The SLC pumps listed in Table 4-1 are currently classified as Group B pumps and would be re-classified as Group A pumps.

The pumps, normally categorized as Group B pumps but re-categorized as Group A pumps, will be tested according to the provisions of this alternative. As a result of this re-categorization from Group B to Group A, per Table ISTB-3000-1, additional data must be obtained quarterly rather than once every two years on the test parameters of vibration for these pumps. The acceptance criteria for vibration tests would be the same as for Group A tests shown in Table ISTB-5321-2 for the Group A test. Corrective actions will be taken in accordance with ISTB-6200.

Use of this alternative provides for consistent acceptance criteria for pump tests. The licensee would consistently utilize the modified Group A test acceptance criteria (discussed above) for pump IST rather than having to utilize the comprehensive test criterion for one biennial test.

Diesel Fuel Oil Transfer Pumps

The licensee proposes that in lieu of the requirements of ISTB-5322 and ISTB-5323, modified Group A tests will be performed quarterly with the pumps operating at reference discharge pressures of between 9.50 psig (pump R3000C010) and 9.93 psig (pump R3000C004) with the allowable discharge pressure variation for each pump at ± 0.05 psig. Pump flow rate is then measured and compared to its reference value. All instrumentation will meet the accuracy for comprehensive tests as listed in Table ISTB-3510-1 (an accuracy improvement from ±2 percent to ±1/2 percent for pressure instrumentation). The acceptable range for flow rate would be 0.95 to 1.06 of the reference value, the alert range would be 0.93 to less than 0.95 of the reference value, and the required action range would be less than 0.93 of the reference value or greater than 1.06 of the reference value. The licensee will evaluate all ranges against the design conditions to ensure that all procedural limits bound the more conservative of the design or ASME OM Code ranges. The biennial comprehensive test would not be performed. The DGFOT pumps listed in Table 4-1 are currently classified as Group B pumps and would be re-classified as Group A pumps.

The pumps, normally categorized as Group B pumps but re-categorized as Group A pumps, will be tested according to the provisions of this alternative. As a result of this re-categorization from Group B to Group A, per Table ISTB-3000-1, additional data must be obtained quarterly rather than once every two years on the test parameters of vibration for these pumps. The acceptance criteria for vibration tests would be the same as for Group A tests shown in Table ISTB-5321-2 for the Group A test. Corrective actions will be taken in accordance with ISTB-6200.

Use of this alternative provides for consistent acceptance criteria for pump tests. The licensee would consistently utilize the modified Group A test acceptance criteria (discussed above) for pump IST rather than having to utilize the comprehensive test criterion for one biennial test.

3.4.2 NRC Staff Evaluation

The licensee is proposing to re-classify the Group B pumps listed in Table 4-1 as Group A pumps, and perform IST for all the pumps listed in Table 4-1 in accordance with a modified Group A test procedure.

The ASME OM Code requires that for Group B pumps, a Group B test is performed every quarter, and a comprehensive test is performed biennially. The Group B test is performed within ± 20 percent of the pump design flow rate (if practicable), the pressure and flow instrument accuracy is ± 2 percent, and the upper limit for the acceptable range for flow is 110 percent of the reference value. The comprehensive test is performed within ± 20 percent of the pump design flow rate, the pressure instrument accuracy is $\pm 1/2$ percent, and the upper limit of the acceptable range for flow is 103 percent of the reference value. Vibration monitoring is only performed during the comprehensive test.

The licensee proposes that for the pumps listed in Table 4-1 (all will be classified as Group A pumps), a modified quarterly test be performed every quarter, and the biennial comprehensive test is not required. The modified Group A quarterly test would be performed within ± 20 percent of the pump design flow rate, using the more accurate pressure instrumentation that is required for a comprehensive test ($\pm 1/2$ percent versus ± 2 percent). This modified quarterly test would replace the comprehensive test. The acceptable range for flow rate for the modified Group A quarterly test is tighter than the range for the Group A quarterly test.

The licensee is proposing to perform a modified Group A pump test every quarter and not perform a comprehensive test. The licensee will use a more limiting upper bound of 106 percent for the Acceptable Range for flow rate in lieu of 110 percent that is required by the OM Code for Group A tests. This proposed upper bound of 106 percent is greater than the upper bound of 103 percent for the biennial comprehensive test. The licensee will evaluate all ranges against the design conditions to ensure that all procedural limits bound the more conservative of the design or ASME OM Code ranges. The pumps that will be reclassified from Group B to Group A will now have vibration monitoring performed quarterly. The OM Code does not require vibration monitoring for Group B pump tests. All of the pump tests will be performed with pressure gauges with ± 1/2 percent accuracy. The elimination of the comprehensive test is compensated for by using a tighter Acceptable Range on the quarterly tests, by using more accurate pressure gauges on every quarterly test, and by performing vibration monitoring on every quarterly test. This will provide for better trending of pump performance. Instead of performing seven tests with pressure gauges with ± 2 percent accuracy, with no vibration monitoring, and then performing the eighth test with pressure gauges with ± 1/2 percent accuracy and vibration monitoring, all eight tests will be performed with pressure gauges with the same ± 1/2 percent accuracy, all eight tests will include vibration monitoring, and seven of the eight tests will have a tighter Acceptable Range for flow rate. The proposed alternative would provide reasonable assurance of the operational readiness of the pumps listed in Section 3.1.

3.4.3 Conclusion

As set forth above, the NRC staff finds that the proposed alternative in Request PRR-010 provides reasonable assurance that pumps listed in Table 4-1 are operationally ready. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(i), and is in compliance with the ASME OM Code's requirements. Therefore, the NRC staff authorizes the alternative in Request PRR-010 for the third 10-year Inservice testing interval, which began on February 17, 2010 and ends on February 16, 2020.

4.0 CONCLUSION

As set forth above, the NRC staff determines that proposed alternative PRR-004 provides reasonable assurance that the pumps are operationally ready, and proposed alternatives PRR-005, PRR-007, and PRR-010 provide an acceptable level of quality and safety. The NRC staff authorizes proposed alternatives PRR-004, PRR-005, PRR-007, and PRR-010 for the Fermi 2 third 10-year inservice testing interval, which began on February 17, 2010 and ends on February 16, 2020. All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable.

Principal Contributors:

Gurjendra Bedi – PRR-004, PRR-005
Robert Wolfgang – PRR-007, PRR-010

Dated: July 6, 2010

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable.

Sincerely,

/RA/ Peter Tam for

Robert J. Pascarelli, Branch Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-341

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