February 17, 2000

Mr. Douglas R. Gipson
Senior Vice President
Nuclear Generation
Detroit Edison Company
6400 North Dixie Highway
Newport, MI 48166

SUBJECT: FERMI 2 - RELIEF REQUESTS FOR THE SECOND 10-YEAR INTERVAL OF THE PUMP AND VALVE INSERVICE TESTING PROGRAM (TAC NO. MA6390)

Dear Mr. Gipson:

In its letter of August 19, 1999, the Detroit Edison Company (the licensee) submitted the second 10-year interval inservice testing program for pumps and valves for Fermi 2. The NRC staff has reviewed the proposed alternative testing methods contained in the program against the requirements of the 1989 edition of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (Code), pursuant to Section 50.55a of Part 50 to Title 10 of the Code of Federal Regulations (10 CFR 50.55a).

The staff reviewed Relief Requests VRR-001, VRR-002, VRR-003, VRR-004, VRR-005, VRR-006, VRR-007, VRR-008, VRR-009, VRR-010, PRR-001, PRR-002, PRR-003, and PRR-004. The results are provided in the enclosed safety evaluation.

Relief is granted for VRR-002, VRR-005, VRR-006, and VRR-010 for the second 10-year interval pursuant to 10 CFR 50.55a(f)(6)(i). In making this determination, the staff has considered the impracticality of performing the required testing and the burden on the licensee if the requirements were imposed.

The proposed alternatives to the Code requirements described in VRR-009 and PRR-001 are authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternatives providing an acceptable level of quality and safety. The alternatives are authorized for the second 10-year interval.

The proposed alternatives to the Code requirements described in VRR-008 and PRR-003 are authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the second 10-year interval. Compliance with the specified requirements of these sections would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The proposed alternatives to the Code requirements described in VRR-003 and VRR-004 are approved pursuant to 10 CFR 50.55a(f)(4)(iv). These alternatives meet the requirements of the 1995 OM Code, paragraph ISTC 4.5.4(c), which has been incorporated by reference into 10 CFR 50.55a (64 FR 51370).

The alternative proposed in VRR-001 is denied for pressure isolation valves E4150F006 and E5150F013 since the licensee has not shown that relief is warranted pursuant to

10 CFR 50.55a(f)(6)(i) or otherwise proposed an acceptable alternative pursuant to 10 CFR 50.55a(a)(3)(i) or (a)(3)(ii). Relief is not needed from the requirements of OM-10, paragraph 4.2.2.3(a), to implement the proposed alternative for the remaining bypass leakage valves that also serve as containment isolation valves because paragraph 4.2.2.3(a) does not apply to these valves. Likewise, the alternative proposed in VRR-007 does not require relief from OM-10 paragraph 4.2.2.3(a).

Provisional relief is granted for the parallel pump testing described in PRR-002, pursuant to 10 CFR 50.55a(f)(6)(i), based on the impracticality of performing testing in accordance with the Code requirements, and in consideration of the burden on the licensee if the Code requirements were imposed on the facility. The relief is granted for the second 10-year interval, provided that the licensee incorporates the following two items into Relief Request PRR-002:

1. The licensee shall adjust the required action range high acceptance criteria to >1.05. The acceptable range shall also be adjusted to 0.965 to 1.05, and

2. The licensee shall either establish new reference curves or reverify the current curves after either pump in the division has been repaired, replaced, or serviced.

The NRC staff has determined that imposing these additional requirements is acceptable, having given due consideration to the burden associated with these requirements.

The proposed alternative for testing the core spray pumps using reference curves, also described in PRR-002, is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) based on the determination that compliance with the specified requirements results in a hardship without a compensating increase in the level of quality and safety. This alternative is authorized for the second 10-year interval.

The alternative described in PRR-004 is authorized for the residual heat removal (RHR) pumps B and C in directions: motor horizontal inline, motor horizontal 90°, and motor vertical. Relief is authorized for the second 10-year interval pursuant to 10 CFR 50.55a(a)(3)(ii) based on the determination that compliance with the specified requirements results in a hardship without a compensating increase in the level of quality and safety. The alternative described in PRR-004 for RHR pumps A and D is not authorized because the data provided indicates that RHR pumps A and D have adequate and consistent performance and do not warrant additional margin to account for the resonant frequency.

Sincerely,

/RA/

Claudia M. Craig, Chief, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-341

Enclosure: Safety Evaluation

cc w/encl: See next page

10 CFR 50.55a(f)(6)(i) or otherwise proposed an acceptable alternative pursuant to 10 CFR 50.55a(a)(3)(i) or (a)(3)(ii). Relief is not needed from the requirements of OM-10, paragraph 4.2.2.3(a), to implement the proposed alternative for the remaining bypass leakage valves that also serve as containment isolation valves. Likewise, the alternative proposed in VRR-007 does not require relief from OM-10 paragraph 4.2.2.3(a).

Provisional relief is granted for the parallel pump testing described in PRR-002, pursuant to 10 CFR 50.55a(f)(6)(i), based on the impracticality of performing testing in accordance with the Code requirements, and in consideration of the burden on the licensee if the Code requirements were imposed on the facility. The relief is granted for the second 10-year interval, provided that the licensee incorporates the following two items into Relief Request PRR-002:

3. The licensee shall adjust the required action range high acceptance criteria to >1.05. The acceptable range shall also be adjusted to 0.965 to 1.05, and

4. The licensee shall either establish new reference curves or reverify the current curves after either pump in the division has been repaired, replaced, or serviced.

The NRC staff has determined that imposing these additional requirements is acceptable, having given due consideration to the burden associated with these requirements.

The proposed alternative for testing the core spray pumps using reference curves, also described in PRR-002, is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) based on the determination that compliance with the specified requirements results in a hardship without a compensating increase in the level of quality and safety. This alternative is authorized for the second 10-year interval.

The alternative described in PRR-004 is authorized for the residual heat removal (RHR) pumps B and C in directions: motor horizontal inline, motor horizontal 90°, and motor vertical. Relief is authorized for the second 10-year interval pursuant to 10 CFR 50.55a(a)(3)(ii) based on the determination that compliance with the specified requirements results in a hardship without a compensating increase in the level of quality and safety. The alternative described in PRR-004 for RHR pumps A and D is not authorized because the data provided indicates that RHR pumps A and D have adequate and consistent performance and do not warrant additional margin to account for the resonant frequency.

Sincerely,
/RA/
Claudia M. Craig, Chief, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-341

Enclosure: Safety Evaluation

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUESTS FOR RELIEF FROM ASME CODE SECTION XI, REQUIREMENTS

FOR THE SECOND 10-YEAR INTERVAL INSERVICE TESTING PROGRAM

DETROIT EDISON COMPANY

FERMI 2

DOCKET NO. 50-341

1.0 INTRODUCTION

Section 50.55a of Part 50 to Title 10 of the Code of Federal Regulations (10 CFR 50.55a) requires that inservice testing (IST) of certain American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 pumps and valves be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code (the Code) and applicable addenda, except where alternatives have been authorized or relief has been requested by the licensee and granted by the Commission pursuant to paragraphs (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a. In proposing alternatives or requesting relief, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety; (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance is impractical for its facility. Section 50.55a authorizes the Commission to approve alternatives and to grant relief from ASME Code requirements upon making the necessary findings. NRC guidance contained in Generic Letter (GL) 89-04, “Guidance on Developing Acceptable Inservice Testing Programs,” provides alternatives to the Code requirements that are acceptable. Further guidance is given in GL 89-04, Supplement 1, and NUREG-1482, “Guidelines for Inservice Testing at Nuclear Power Plants.”

By letter dated August 19, 1999, Detroit Edison, the licensee for Fermi 2, submitted the second 10-year interval inservice testing (IST) program for pumps and valves. The second 10-year interval is scheduled to begin on February 17, 2000, and end on February 16, 2010. The program was developed in accordance with the requirements of the 1989 edition of the ASME Code, which references the ASME Code for Operations and Maintenance of Nuclear Power Plants (OM Code) Part 1, Part 6, and Part 10 (OM-1, OM-6, and OM-10) for IST of safety and relief devices, pumps, and valves.

The NRC’s findings with respect to authorizing alternatives and granting or denying the IST program relief requests are given below.

ENCLOSURE

2.0 VALVE RELIEF REQUESTS

2.1 Relief Request Number VRR-001

Relief is requested from the test frequency requirements of OM-10, paragraph 4.2.2.3(a), for 37 bypass leakage valves that also serve as primary containment isolation valves. The licensee proposes to test the valves at a frequency based on 10 CFR Part 50, Appendix J, Option B, but not exceeding 60 months.

2.1.1 Licensee's Basis for Requesting Relief

The licensee states:

> There are 37 Bypass Leakage Valves, which are also Primary Containment Isolation Valves. Both groups of valves are tested in accordance with ANSI/ANS 56.8-1994, with one test satisfying both Programs requirements. Presently all 37 valves are required to be tested each refuel to satisfy the testing periodicity requirements of OM-10 Section 4.2.2.3(a) for the subset of Containment Isolation Valves that also serve as Bypass Leakage Valves.
>
> Originally both the Primary Containment Isolation Valves and the Bypass Leakage Valves were leak rate tested at the same frequency of once per every two years in accordance with OM-10 Section 4.2.2.3(a). With the issuance of Reg. Guide 1.163 "Performance-Based Containment Leak-Test Program" that approved NEI 94-01 "Industry Guideline For Implementing Performance-Based Option of 10CFR50, Appendix J," the periodicity of testing containment isolation valves could be extended beyond two years based on past performance.
>
> Detroit Edison has implemented a performance based containment leak rate testing program which extends Containment Isolation Valves test intervals up to 60 months, according to Reg. Guide 1.163. VRR-007 requests relief to provide for application of this testing methodology for this second ten year interval.
>
> The relaxation of the testing periodicity is based on NUREG-1493 "Performance-Based Containment Leak-Test Program." NUREG-1493 found that performance based alternatives to local leakage rate testing requirements are feasible without significant risk impacts. Additionally it concluded that although extended testing intervals led to minor increases in potential off-site dose consequences, the actual decrease in on-site (worker) dose exceeded (by at least an order of magnitude) the potential off-site dose increase.
>
> In summary NUREG-1493 concluded that the impact on the public health and safety due to extended intervals is negligible.

2.1.2 Alternative Testing

The licensee proposes:

> Bypass Leakage Valves, that are a subset of, Containment Isolation Valves that are listed above will be leak rate tested at frequencies specified in accordance with Reg. Guide 1.163, but at intervals no greater than 60 months (three refuels).

2.1.3 Evaluation

The 37 valves for which the licensee requests relief are in systems which penetrate both primary and secondary containment. The valves perform a containment isolation function, as defined in 10 CFR Part 50, Appendix J, as well as a bypass leakage isolation function, as defined in the updated final safety analysis report (UFSAR), section 6.2.1.2.2.3. Two of the valves, E4150F006 and E5150F013, are also pressure isolation valves. OM-10, paragraph 4.2.2.2, states that valves with a function to perform containment isolation shall be tested in accordance with Appendix J. If the valves are also pressure isolation valves, then the requirements of paragraph 4.2.2.3 apply as well. Paragraph 4.2.2.3(a) states that valves which perform a function other than containment isolation shall be seat leakage tested once every two years.

The licensee has implemented a performance-based containment leak rate testing program in accordance with Option B and Regulatory Guide (RG) 1.163. The licensee has requested relief from the requirements of OM-10, paragraph 4.2.2.3(a), in order to extend the interval for the Code-required leak rate testing to coincide with the testing frequencies specified in RG 1.163. However, relief is not required to implement leak rate testing of containment isolation valves (which are also bypass leakage valves) in accordance with Option B. OM-10, paragraph 4.2.2.2, states that valves with a function to perform containment isolation shall be tested in accordance with Appendix J.

Valves E4150F006 and E5150F013, which also perform a pressure isolation function, require relief from paragraph 4.2.2.3(a) to implement leak rate testing in accordance with Option B. However, the licensee has not provided sufficient justification to warrant authorizing relief from the 2-year leak rate testing frequency. Therefore, relief is denied for these valves.

2.1.4 Conclusion

The alternative proposed in VRR-001 is denied for pressure isolation valves E4150F006 and E5150F013 since the licensee has not shown that relief is warranted pursuant to 10 CFR 50.55a(f)(6)(i), or otherwise proposed an acceptable alternative pursuant to 10 CFR 50.55a(a)(3)(i) or (a)(3)(ii).

Relief is not needed from the requirements of OM-10, paragraph 4.2.2.3(a), for the licensee to implement the proposed alternative for the remaining valves listed in VRR-001 (containment isolation valves that also serve as bypass leakage valves) because paragraph 4.2.2.3(a) does not apply to these valves.

2.2 <u>Relief Request Number VRR-002</u>

The licensee has requested relief from the power-operated valve stroke time test requirements of OM-10, paragraphs 3.3, 4.2.1.4(a), and 4.2.1.8, for the eight emergency diesel generator (EDG) air start system solenoid valves listed below. The licensee has proposed to verify the necessary valve movement by observing an appropriate indicator which signals the required change of disc position. The valves will not be stroke timed. Relief from these Code requirements for the first 10-year IST interval was granted in the staff's safety evaluation (SE) dated January 8, 1998.

R30FA04A	R30FA04B	R30FA04C	R30FA04D
R30FA05A	R30FA05B	R30FA05C	R30FA05D

2.2.1 <u>Licensee's Basis for Requesting Relief</u>

The licensee states:

> It is impractical to apply the requirements of OM-10 for establishing and monitoring stroke times for the diesel generator air start solenoid valves for the following reasons:
>
> - These are solenoid valves and have very short stroke times, i.e., less than 2 seconds. Solenoid valves typically have full stroke times under one second. For these short stroke times valves, variances of 50 percent or more can occur in the measured times for reasons that are in no way related to valve performance; for example, operator reaction times. In this case verifying that the valve's stroke time satisfies system operating requirements and verifying change of state is sufficient to evaluate valve performance.
>
> - There is no position indication, remote or local, on these valves to observe.
>
> - Stroking of the valves in a fast start causes excessive wear and tear on the EDGs.
>
> Since there is no direct indication of valve position, alternatives are to be used to indicate that the solenoids have stroked. During the six month fast start, the valves will use the time to achieve a speed of 900 rpm and 60 Hz, electrical, as the equivalent to stroke time. Since these tests are only required every six months per Technical Specifications, the slow start and/or fast start test, will be evaluated at least quarterly in such a manner to assure that the valve has stroked as required.
>
> Compliance with the Code in this case would result in unusual difficulty with no compensating increase in the level of safety and quality. The verification of both functional performance of each solenoid and EDG response time combined adequately demonstrate operability of the solenoids.

2.2.2 Alternative Testing

The licensee proposes:

> There are two start tests that are performed on the EDGs, a fast start and load from ambient conditions and a manual slow start and load test. The manual start and load test verifies the capability of the EDGs to be manually started and loaded. The fast start and load test verifies the capability of the EDGs to achieve rated speed and voltage within Technical Specifications time limits and the capability of the EDGs to be loaded.
>
> The slow start is accomplished on a monthly (31 day) test frequency. The fast start is accomplished on a 6 month (184 day) test frequency. Alternate testing of the air start solenoids will be accomplished differently for each test as follows:
>
> 1. Manual Slow Start and Load
>
> During the manual slow start, the diesel is only allowed to accelerate to 500 to 700 rpm, after which speed is manually increased to achieve the desired speed of 900 rpm (60 Hz). Therefore, time to rated conditions is meaningless for the slow start. An alternate test will be performed which verifies that each of the two solenoids functions. The test frequency shall be at least once every calendar quarter (92 days).
>
> This verification is achieved by visually verifying that the air start line vents after diesel startup. A wiping cloth placed over the solenoid valve vent port will be rapidly moved as the lines vent. This latter test provides positive indication that both solenoids have performed their safety function of opening to start the diesel generator.
>
> Each EDG has two air start headers and each header has its own 3-way solenoid. In the closed position the air start headers are vented to the atmosphere. Upon receiving a start signal each valve lines up to the starting air supply and closes off the vent, thus supplying starting air pressure to the headers. When the diesel reaches a set speed, the solenoid valves are de-energized and the starting air supply is isolated from the headers and the headers [are] vented as the vent ports open. As the header is vented, its pressure is reduced to atmospheric pressure through the vent port. A wiping cloth placed loosely over the vent port will be propelled away from the valve as the headers vent (Puff Test). Movement of the cloth is sufficient to show that the valves cycled open and then returned to the de-energized position.
>
> 2. Fast Start and Load from Ambient Conditions
>
> For the subject valves, a successful start of the diesel generator within the required Technical Specifications requirement of achieving speed and voltage level (refer to Technical Specification Surveillance Requirement 3.8.1.7) within 10 seconds, shall be sufficient to demonstrate that the 3-way solenoid valves have opened in the required time. The actual start times are measured with a Visicorder and are extremely consistent. Slow response time of the solenoids will be reflected in increased start times.

In addition, for the subject valves, visible evidence that each air start header was pressurized and then vented would show that each valve opened on start demand and then shut when the start signal was removed. Verification of this will be per the “Puff Test” method described in 1, above. Thus, during fast starts, verification that each valve functioned, combined with an acceptable Diesel Generator response time, indicates that both solenoids operated satisfactorily.

2.2.3 Evaluation

The valves for which the licensee requests relief are normally closed 1½-inch, three-way solenoid valves. These valves open to supply air to the air start system of the diesel generator. OM-10, paragraphs 3.3, 4.2.1.4(a), and 4.2.1.8, require that stroke time reference values be established, limiting values of full-stroke times be specified, and test results be compared to the initial reference values. The licensee has proposed to verify the necessary valve movement by observing an appropriate indicator which signals the required change of disc position. Relief from these Code requirements for the first 10-year IST interval was granted in the staff’s SE dated January 8, 1998.

These valves have a stroke time of less than 2 seconds and are fully enclosed with no means to observe the position of the valve stem. Since these valves cannot be stroke timed by observation of valve position, either remotely or locally, it is impractical to measure the valve stroke times by conventional means. It would be an undue burden for the licensee to meet the Code requirements because the valves would have to be either modified or replaced. Thus, direct measurement of valve stroke times is impractical.

As stated in NUREG-1482, Section 4.2.8, if the licensee cannot time the stroke of a solenoid-operated valve by the conventional method using position indication, the Code would require that it propose a method to time the stroke of the valve or otherwise monitor for degrading conditions to give adequate assurance of operational readiness. The licensee has proposed to verify that the air start line vents after the diesel starts which verifies the valve has moved to its safety position. This will be performed at least quarterly during the monthly diesel manual slow start and load test. During the diesel fast start test every 6 months, the licensee states that a successful start of the EDG within the 10-second time limit specified by the technical specifications will verify that the valves are stroking within their 2-second time limit (Note: the 2-second time limit is provided as guidance in GL 89-04, Guidance on Developing Acceptable Inservice Testing Programs, Position 6). The quarterly verification, while not measuring stroke time or monitoring for degradation, does provide an indication that each solenoid valve is moving to its safety position by verifying actual disc movement. The diesel fast start test every 6 months provides definitive acceptance criteria that all associated diesel air start solenoid valves are stroking within their required time limit. On this basis, the staff finds the licensee’s proposed alternative to be acceptable.

2.2.4 Conclusion

Relief from the requirements of OM-10, paragraphs 3.3, 4.2.1.4(a), and 4.2.1.8, for the EDG air-start solenoid valves is granted pursuant to 10 CFR 50.55a(f)(6)(i). The alternative testing method provides reasonable assurance of the valves’ operational readiness. Based on the impracticality of complying with the Code and the burden on the licensee if those requirements were imposed, relief is granted for the second 10-year interval.

2.3 Relief Request Number VRR-003

The licensee has requested relief from the check valve disassembly and inspection requirements of OM-10, paragraph 4.3.2.4(c), for the emergency equipment cooling water check valves. The licensee has proposed to use the guidance provided in GL 89-04, Position 2, with the exception that one valve in the group will not be of identical size.

2.3.1 Licensee's Basis for Requesting Relief

The licensee states:

> OM-10, paragraphs 4.3.2.2(f) and 4.3.2.4(c) allow deferral of check valve exercising to refueling outages and obturator movement verification by disassembly, respectively. The NRC has further allowed for grouping of similar valves as described in NUREG-1482, Appendix A, Position 2, "Alternative to Full-Flow Testing of Check Valves." In groups of similar valves, one valve of a group may be disassembled each outage and, if found acceptable, satisfy the testing requirements for the entire group. This Relief Request seeks approval to deviate slightly from the definition of "similar" given in Position 2. Similar is defined as follows for check valves:
>
> - Same Design (manufacturer, size, model number, and materials of construction), and
>
> - Same service conditions, including valve orientation.
>
> Valves P4400F051, P4400F116A, and P4400F165 are 6 inch valves, while valve P4400F116B is an 8 inch valve. All four valves meet all other parts of the definition. These valves are Powell model 3061 AWE swing check valves and are horizontally oriented. The service conditions are identical. The 8 inch valve is to be considered similar to the three 6 inch valves even though it is slightly larger than the other three.
>
> BASIS FOR RELIEF
>
> It is burdensome to disassemble a single check valve, such as th[e] P4400F116B, each outage. These check valves are all located in a system where service conditions are very mild and, as a result, corrosion and erosion are not a problem.
>
> These four valves had been inspected together in a group of 4 prior to Refueling Outage RF05. No failures or significant degradation had ever been identified during these inspections. Similar results were observed in RF05 and RF06 when the P4400F116B and one of the other three, 6 inch check valves, were disassembled and inspected. Typical inspection entries for these valves are "...valve in good condition, light black oxide coating, showing very little wear." The light black oxide coating is typical for components in both EECW Divisions since both divisional expansion tanks are pressurized with an N_2 blanket.
>
> Inspections over the first interval have shown these check valves to be very reliable and resistant to wear. More damage is done to the valves through repetitive disassembly and reassembly, particularly to bolting material, than through service induced wear.

> Including this 8 inch valve with the three other 6 inch valves will minimize the degradation of the bolting material, reduce radiation exposure, and increase system availability, by extending the disassembly to once every four outages.

2.3.2 Alternative Testing

The licensee proposes:

> These four valves will be grouped for disassembly and inspection per NUREG-1482, Appendix A, Position 2. One of the valves will be disassembled and inspected each outage to complete all four in 4 successive outages. If the disassembled valve is not capable of being full-stroke exercised or there is binding or failure of valve internals, the remaining valves in that group will be disassembled, inspected, and manually full stroke exercised during the same outage.

2.3.3 Evaluation

Of the valves for which relief is requested, P4400F051, P4400F116A, and P4400F165, are 6-inch swing check valves in the emergency equipment cooling water system and P4400F116B is an 8-inch swing check valve in the same system. These valves are designed to close to prevent backflow in the emergency equipment cooling water system. OM-10, paragraph 4.3.2, requires that these check valves be exercised nominally every 3 months. As an alternative to demonstrating valve obturator movement, the Code allows disassembly every refueling outage to determine operability of the valves (OM-10, paragraph 4.3.2.4(c)). The licensee proposes to disassemble and inspect one of the four valves every refueling outage. The licensee will test alternate valves every refueling outage.

The staff Position 2 of GL 89-04 allows for the employment of a sample disassembly and inspection plan for groups of identical valves in similar applications. The sample disassembly and inspection plan involves grouping similar valves and testing one valve in each group during each refueling outage. Guidelines for this plan are stated in Appendix A of NUREG-1482. The sampling technique requires that each valve in the group be the same design and have the same service conditions, including valve orientation. Additionally, at each disassembly, the licensee must verify that the disassembled valve is capable of full-stroking and that the internals of the valve are structurally sound. Also, if the disassembly is to verify the full-stroke capability of the valve, the disc should be manually exercised.

A different valve of each group is required to be disassembled, inspected, and manually full-stroke exercised at each successive refueling outage until the entire group has been tested. If the disassembled valve is not capable of being full-stroke exercised or there is binding or failure of the valve internals, the remaining valves in that group must also be disassembled, inspected, and manually full-stroke exercised during the same outage. Once this is complete, the sequence of disassembly must be repeated.

The licensee’s proposed alternative deviates from the guidance of Position 2 in that the valves are not all of identical size. One is an 8-inch valve, while the other three are 6-inch valves. The valves meet all other parts of the definition.

In refueling outages RF05 and RF06, the three 6-inch valves were placed together in a sample group with one of them being disassembled and inspected along with the 8-inch valve. The licensee states that no failures or significant degradation has ever been identified during these inspections or during inspections prior to RF05. The licensee also states that inspections conducted during the first 10-year IST interval have shown these check valves to be very reliable and resistant to wear.

The 1995 ASME OM Code, paragraph ISTC 4.5.4(c), allows a sample disassembly examination program to be used to verify valve obturator movement. The Code requires that grouping of check valves for the sample disassembly examination program be technically justified and consider, as a minimum, valve manufacturer, design, service, size, materials of construction, and orientation. However, valves in a group may be of different sizes with appropriate technical justification. For the four check valves that are the subject of this relief request, the staff concludes that the similarity between the valves justifies grouping them. Therefore, the licensee's proposed alternative meets the requirements of the 1995 ASME OM Code, which has been incorporated by reference into 10 CFR 50.55a (64 FR 51370), and therefore, provides an acceptable level of quality and safety. The regulation at 10 CFR 50.55a(f)(4)(iv) allows the use of requirements in subsequent editions of the Code (i.e., for the Fermi 2 second 10-year interval, editions after the 1989 edition of the Code) that have been incorporated by reference into 10 CFR 50.55a, with NRC staff approval. Although submitted in the form of a relief request, this request does not technically involve relief from the Code.

2.3.4 Conclusion

The proposed alternative to the requirements of OM-10, paragraph 4.3.2.4(c), is approved pursuant to 10 CFR 50.55a(f)(4)(iv). This alternative meets the requirements of the 1995 OM Code paragraph ISTC 4.5.4(c), which has been incorporated by reference into 10 CFR 50.55a (64 FR 51370).

2.4 Relief Request VRR-004

The licensee requests relief from the testing requirements of OM-10, paragraph 4.3.2.4(c). The Code requires that each check valve be disassembled every refueling outage. The licensee proposes a sample disassembly and inspection program for check valves in the core spray and residual heat removal (RHR) systems. The groupings of the valves are described in Refueling Outage Justifications (ROJ) ROJ-004, ROJ-011, ROJ-014, and ROJ-016.

2.4.1 Licensee's Basis for Requesting Relief

The licensee states:

> OM-10, paragraphs 4.3.2.2(f) and 4.3.2.4(c) allow deferral of check valve exercising to refueling outages and obturator movement verification by disassembly, respectively. The NRC has further allowed for grouping of similar valves as described in NUREG-1482, Appendix A, Position 2, "Alternative to Full-Flow Testing of Check Valves." In groups of similar valves, one valve of a group may be disassembled each outage and, if found acceptable, satisfies, the testing requirements for the entire group. This Relief Request seeks approval to implement this grouping methodology for the

valves which are deferred to refuel outages for disassembly and are similar as defined in Position 2.

BASIS FOR RELIEF

It is burdensome to disassemble all check valves in a group during a single outage. Divisional constraints normally restrict the time a division may be out of service during an outage. Additionally, repetitive disassembly and re-assembly can be damaging to the valve, particularly bolting material. The NRC has already approved grouping the check valves into groups of similar valves in NUREG-1482, Appendix A, Position 2. Similar is defined as follows for check valves:

- Same Design (manufacturer, size, model number, and materials of construction) and

- Same service conditions, including valve orientation.

However, because this is a deviation from the OMa Code as written, this relief request serves to officially adopt this methodology into the IST Program.

2.4.2 Alternative Testing

The licensee proposes:

Similar valves will be grouped for disassembly and inspection on a one valve per group per outage basis as described in Position 2 of Appendix A of NUREG-1482. Valve group sizes will not exceed 4 valves and extension of the disassembly/inspection interval beyond one per refuel outage will not be allowed.

2.4.3 Evaluation

With this relief request, the licensee proposes a sample disassembly and inspection program for the groups of check valves described in ROJ-004, ROJ-011, ROJ-014, and ROJ-016. The valves are in the core spray and the RHR systems. The four groups consist of the following valves:

ROJ-004
E2100F006A
E2100F006B

ROJ-011
E2100F038A
E2100F038B
E2100F038C
E2100F038D

ROJ-014
E2100F003A
E2100F003B
E2100F003C
E2100F003D

ROJ-016
E1100F046A
E1100F046A
E1100F046C
E1100F046D

OM-10, paragraph 4.3.2, requires that the check valves be exercised nominally every 3 months. As an alternative to demonstrating valve obturator movement, the Code allows disassembly every refueling outage to determine operability of the valves (OM-10, paragraph 4.3.2.4(c)). The licensee proposes to disassemble and inspect one valve in each of the four groups every refueling outage. The licensee will test alternate valves in each group every refueling outage.

The staff Position 2 of GL 89-04 allows for the employment of a sample disassembly and inspection plan for groups of identical valves in similar applications. The sample disassembly and inspection plan involves grouping similar valves and testing one valve in each group during each refueling outage. Guidelines for this plan are stated in Appendix A of NUREG-1482. The sampling technique requires that each valve in the group be the same design and have the same service conditions including valve orientation. Additionally, at each disassembly, the licensee must verify that the disassembled valve is capable of full-stroking and that the internals of the valve are structurally sound. Also, if the disassembly is to verify the full-stroke capability of the valve, the disc should be manually exercised.

A different valve of each group is required to be disassembled, inspected, and manually full-stroke exercised at each successive refueling outage, until the entire group has been tested. If the disassembled valve is not capable of being full-stroke exercised or there is binding or failure of valve internals, the remaining valves in that group must also be disassembled, inspected, and manually full-stroke exercised during the same outage. Once this is complete, the sequence of disassembly must be repeated.

The 1995 ASME OM Code, paragraph ISTC 4.5.4(c), allows for a sample disassembly examination program to be used to verify valve obturator movement. The sample disassembly examination program shall group check valves of similar design, application, and service condition and require a periodic examination of one valve from each group.

The licensee’s proposed alternative is consistent with Position 2 of GL 89-04 and paragraph ISTC 4.5.4(c) of the 1995 ASME OM Code, which has been incorporated by reference into 10 CFR 50.55a (64 FR 51370), and therefore, provides an acceptable level of quality and safety. The regulation at 10 CFR 50.55a(f)(4)(iv) allows the use of requirements in subsequent editions of the Code (i.e., for the Fermi 2 second 10-year interval, editions after the 1989 edition of the Code) that have been incorporated by reference into 10 CFR 50.55a, with NRC staff approval. Although submitted in the form of a relief request, this request does not technically involve relief from the Code.

2.4.4 Conclusion

The proposed alternative to the requirements of OM-10, paragraph 4.3.2.4(c), is approved pursuant to 10 CFR 50.55a(f)(4)(iv). This alternative meets the requirements of the 1995 OM Code, paragraph ISTC 4.5.4(c), which has been incorporated by reference into 10 CFR 50.55a (64 FR 51370).

2.5 Relief Request VRR-005

Relief is requested from the requirements of OM-10, paragraph 4.3.2.2(a), which state that each check valve shall be exercised in a way which verifies obturator travel to its required position. An alternative is proposed for the core spray keep-fill line check valves which would verify closure of the valves by performing a reverse-flow test on the series combination of valves.

2.5.1 Licensee's Basis for Requesting Relief

The licensee states:

> The E2100F029A and E2100F030A valves are in series on Division 1 as are E2100F029B and E2100F030B valves on Division 2. There are no vent or drain taps between these valves and no external indication or manual levers on these valves to verify the valves' disc position. The only way to verify valve closure is to check for reverse flow leakage past the valve discs, which will confirm that one of the two valves are closed. Since these valves are two pairs of series valves, verifying closure of each pair of valves will demonstrate that the intended safety function of preventing reverse flow from the Core Spray system to the Keep Fill system is being met.
>
> This is in agreement with NUREG-1482 Section 4.1.1 which states that check valves in series, without intermediate test connections, are required to close to perform their safety function can be tested as a pair. This will verify that at least one of the two valves in the pair is closed and the safety function has been met.

2.5.2 Alternative Testing

The licensee proposes:

> During the quarterly surveillance testing of each division, the intended safety function to prevent back flow, will be demonstrated by verifying one of the two valves are closed by the absence of reverse flow.

2.5.3 Evaluation

The valves for which the licensee requests relief are the core spray keep-fill line upstream and downstream check valves (E2100F029A, E2100F030A, E2100F029B, and E2100F030B). By closing, these valves prevent back flow into the keep-fill system when the system pumps are started. OM-10, paragraph 4.3.2.2(a), requires that during plant operation, each check valve be exercised or examined in a manner which verifies obturator travel to the closed, full-open, or partially open position required to fulfill its function. However, these check valves are in series and the licensee has no practical means for verifying the ability of each valve in the series to close. There are no vent or drain taps between the valves and no external indication on these valves to verify the disc position.

A reverse-flow test on the series combination of valves is proposed as an alternative to the Code. Because only one of the valves in series needs to close to perform its safety function, verification that the pair of valves is capable of closing is acceptable for IST (NUREG-1482, Section 4.1.1). Performing a reverse flow test on the series combination of valves at a quarterly frequency provides reasonable assurance of the valves' operational readiness.

2.5.4 Conclusion

Relief is granted from the requirements of OM-10, paragraph 4.3.2.2(a), for E2100F029A, E2100F030A, E2100F029B, and E2100F030B pursuant to 10 CFR 50.55a(f)(6)(i). The alternative method of reverse flow testing the series combination of check valves provides reasonable assurance of operational readiness. Based on the impracticality of complying with the Code and the burden on the licensee if those requirements were imposed, relief is granted.

2.6 Relief Request VRR-006

Relief is requested from the requirements of OM-10, paragraph 4.3.2.2(a), which state that each check valve shall be exercised in a way which verifies obturator travel to its required position. An alternative is proposed for the RHR keep-fill line check valves which would verify closure of the valves by performing a reverse-flow test on the series combination of valves.

2.6.1 Licensee's Basis for Requesting Relief

The licensee states:

> The E1100F089 and E1100F090 valves are in series on Division 2 as are E1100F184 and E1100F185 valves on Division 1. There are no vent or drain taps between these valves and no external indication or manual levers on these valves to verify the valves disc position. The only way to verify valve closure is to check for reverse flow leakage past the valve disc, which will confirm that one of the two valves are closed. Since these valves are two pairs of series valves, verifying closure of each pair of valves will demonstrate that the intended safety function of preventing reverse flow from the Residual Heat Removal system to the Keep Fill system is being met.
>
> This is in agreement with NUREG-1482 Section 4.1.1 which states that check valves in series, without intermediate test connections, and which are required to close to perform their safety function, can be tested as a pair. This will verify that at least one of the two valves in the pair has closed and the safety function has been met.

2.6.2 Alternative Testing

The licensee proposes:

> During the quarterly surveillance testing of each division, the intended safety function to prevent back flow, will be demonstrated by verifying one of the two valves are closed by the absence of reverse flow.

2.6.3 Evaluation

The valves for which the licensee requests relief are the RHR keep-fill line upstream and downstream check valves (E1100F089, E1100F090, E1100F184, and E1100F185). By closing, these valves prevent back flow into the keep-fill system when the system pumps are started. OM-10, paragraph 4.3.2.2(a), requires that during plant operation, each check valve be exercised or examined in a manner which verifies obturator travel to the closed, full-open, or partially-open position required to fulfill its function. However, these check valves are in series and the licensee has no practical means for verifying the ability of each valve in the series to close. There are no vent or drain taps between the valves and no external indication on these valves to verify the disc position.

A reverse-flow test on the series combination of valves is proposed as an alternative to the Code. Because only one of the valves in series needs to close to perform its safety function, verification that the pair of valves is capable of closing is acceptable for IST (NUREG-1482, section 4.1.1). Performing a reverse flow test on the series combination of valves at a quarterly frequency provides reasonable assurance of the valves' operational readiness.

2.6.4 Conclusion

Relief is granted from the requirements of OM-10, paragraph 4.3.2.2(a), for E1100F089, E1100F090, E1100F184, and E1100F185 pursuant to 10 CFR 50.55a(f)(6)(i). The alternative method of reverse flow testing the series combination of check valves provides reasonable assurance of operational readiness. Based on the impracticality of complying with the Code and the burden on the licensee if those requirements were imposed, relief is granted.

2.7 Relief Request VRR-007

Relief is requested from the test frequency requirements of OM-10, paragraph 4.2.2.3(a), for 187 primary containment isolation valves. The licensee proposes to test the valves at a frequency based on 10 CFR Part 50, Appendix J, Option B, but not exceeding 60 months.

2.7.1 Licensee's Basis for Requesting Relief

The licensee states:

> 10CFR50, Appendix J has been revised to allow licensees to implement performance-based containment leak rate test intervals in accordance with Regulatory Guide 1.163, dated September 1995. RG 1.163 endorsed, with specific exceptions, NEI 94-01, Industry Guideline for Implementing Performance Based Option of 10CFR50, Appendix J, Dated July 26, 1995. Under certain conditions, the base test

intervals for containment isolation valve leak rate testing may be as long as 60 months. The basis for the request is that the proposed alternative provides an acceptable level of quality and safety. This acceptable level of quality and safety has been demonstrated by the NRC at the industry-wide level as the basis for revising 10CFR Part 50, Appendix J to include Option B. Fermi 2 has implemented Option B under Technical Specification Amendment 108.

2.7.2 Alternative Testing

The licensee proposes that the containment isolation valves listed in VRR-007 will be leak rate tested at frequencies specified in accordance with RG 1.163, but at base intervals no greater than 60 months.

2.7.3 Evaluation

The 187 valves for which the licensee requests relief are in systems which penetrate primary containment and the valves perform a containment isolation function. OM-10, paragraph 4.2.2.2, requires that containment isolation valves be tested in accordance with 10 CFR Part 50, Appendix J, requirements. The licensee has implemented a performance-based containment leak rate testing program in accordance with Option B and RG 1.163.

The licensee has requested relief from the requirements of OM-10, paragraph 4.2.2.3(a), in order to extend the interval for the Code-required leak rate testing to coincide with the testing frequencies specified in RG 1.163. Paragraph 4.2.2.3(a) states that valves which perform a function other than containment isolation (e.g., pressure isolation valves) shall be seat-leakage tested once every two years. Relief is not required to implement leak rate testing in accordance with Option B. OM-10, paragraph 4.2.2.2, states that valves with a function to perform containment isolation shall be tested in accordance with 10 CFR Part 50, Appendix J. If the valves perform a function other than containment isolation (e.g., pressure isolation valves), then the requirements of paragraph 4.2.2.3 apply as well. None of the valves for which the licensee requests relief are pressure isolation valves, so the requirements of paragraph 4.2.2.3 do not apply and relief is not needed.

2.7.4 Conclusion

Relief is not needed from the requirements of OM-10, paragraph 4.2.2.3(a), for the licensee to implement the proposed alternative. Therefore, Relief Request VRR-007 is denied.

2.8 Relief Request VRR-008

The licensee requests relief from the testing sequence specified in OM-1, paragraph 3.3.1.1, for the nuclear boiler system safety relief valves (SRVs). The licensee proposes to remove the SRV pilot assemblies and transport them to a remote location for performance of certain Code-required tests. Because of this, strict adherence to the testing sequence specified in the Code cannot be satisfied.

2.8.1 Licensee's Basis for Requesting Relief

The licensee states:

> Currently, during refueling outages, the SRV pilot assemblies are removed and transported to be tested at a remote location, which may be on or off site, for the performance of the following tests: setpoint (lift pressure), reset (reclosing pressure), and pilot stage seat tightness. A slave base/body assembly is normally used to test each pilot. ANSI/ASME OM-1 states, "No maintenance, adjustment, disassembly, or other activities which could affect as found set pressure or seat tightness data is permitted prior to testing." Since SRV leakage is monitored continuously during plant operation for all 15 SRV's, the total seat tightness, i.e., the pilot cartridge seats and the main body seats together, as found determination is satisfied prior to the pilot assembly removal.
>
> ANSI/ASME OM-1 also states, "Tests prior to maintenance or set pressure adjustment, or both, shall be performed in the following sequence: (a) visual examination; (b) seat tightness determination; (c) set pressure determination; (d) determination of compliance with the Owner's seat tightness criteria; (e) determination of electrical characteristics and pressure integrity of solenoid valves; (f) determination of pressure integrity and stroke capability of air actuator; (g) determination of operation and electrical characteristics of position indicators; (h) determination of operation and electrical characteristics of bellows alarm switch; and (i) determination of actuating pressure of auxiliary actuating device sensing element, where applicable, and electrical continuity."
>
> Strict adherence to the sequence cannot be satisfied by testing the pilot assembly only. Currently, the plant's test practices ensure that applicable tests specified in ANSI/ASME OM-1 Section 3.3.1.1, Main Steam Pressure Relief Valves with Auxiliary Devices, are performed and the entire valve operability is verified in accordance with Technical Specifications, but not in the order specified by OM-1 Section 3.3.1.1.

2.8.2 Alternative Testing

The licensee proposes:

> SRV's that have been identified as leaking during power operation will have the entire valve (both pilot and main body assemblies) removed and tested. For non-leaking SRVs, only the pilot assemblies will be tested using a slave main body to comply with ANSI/ASME OM-1, Periodic Testing requirements.

2.8.3 Evaluation

The 15 SRVs in the nuclear boiler system open to relieve reactor pressure during an accident or transient condition. OM-1, paragraph 3.3.1.1, requires that prior to maintenance or set pressure adjustments, tests be performed in a prescribed sequence. However, the licensee does not test its SRVs using one complete test sequence. Rather, the licensee normally (i.e., if the main valve is not leaking) removes the SRV pilot assemblies and transports them to a remote location for performance of certain Code-required tests. As a result, strict adherence to the sequence specified in the Code cannot be satisfied.

The licensee states in its basis for relief that its test practices ensure that all of the applicable tests specified in OM-1, paragraph 3.3.1.1, are performed. The entire valve operability is verified in accordance with the Technical Specifications (TSs), but not in the sequence specified by the Code. Completion of all of the Code-required tests in this manner continues to ensure that the SRVs are operable.

Removal of the entire valve assembly for testing would create hardship on the licensee by extending plant outages for the removal and installation process and also delays associated with decontamination. Such hardships are without a compensating increase in the level of quality and safety since the proposed alternative provides assurance of valve operability.

2.8.4 Conclusion

The proposed alternative to the requirements of OM-1, paragraph 3.3.1.1, is authorized pursuant to 10 CFR 50.55a(a)(3)(ii). Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.9 Relief Request VRR-009

The licensee requests relief from the exercise frequency and stroke time requirements of OM-10, paragraphs 4.3.2.1, 4.2.1.4(a), and 4.2.1.8, for valves (C1103F114, C1103F126, and C1103F127) in the control rod drive system. The licensee proposes that proper operation of the valves be demonstrated during TS scram time testing.

2.9.1 Licensee's Basis for Requesting Relief

The licensee states:

> The proper operation of each of these valves is demonstrated during scram time testing. During scram time testing, each drive's scram insertion time is measured and a fail-safe actuator test is performed. Fermi 2's Technical Specifications provide a specific time for individual CRD scram insertion. If a particular CRD's scram insertion time is less than the specified time, the above valves are functioning properly.
>
> - Fermi 2 Improved Technical Specification section 3.1.4.1 requires "Verify each control rod scram time is within the limits of Table 3.1.4-1 with reactor steam dome pressure≥ 800 psig". At a frequency "Prior to exceeding 40% RTP after each reactor shutdown > 120 days".
>
> - Fermi 2 Improved Technical Specification section 3.1.4.2 requires "Verify, for a representative sample, each tested control rod scram time is within the limits of table 3.1.4-1 with reactor steam dome pressure ≥ 800 psig". At a frequency of "120 days cumulative operation in MODE 1".
>
> - Fermi 2 Improved Technical Specification section 3.1.4.4 requires "Verify each affected control rod scram time is within the limits of Table 3.1.4-1 with reactor steam dome pressure ≥ 800 psig". At a frequency "Prior to exceeding 40% RTP

> after work on control rod or CRD System that could affect scram time AND prior to exceeding 40% RTP after fuel movement within the associated core cell".

It is highly probably that every control rod will be scram time tested at the completion of each and every refueling outage. During any normal fuel reload, during a refuel outage, every control rod would likely have an associated core cell moved, and as a result, all the control rods would be stroked and timed.

2.9.2 Alternative Testing

The licensee proposes:

> The proper operation of each of these valves is demonstrated during scram time testing. During scram time testing, each drive's scram insertion time is measured and a fail-safe actuator test is performed. Fermi 2's Technical Specifications provide a specific time for individual CRD scram insertion. If a particular CRD's scram insertion time is less than the specified time, the above valves are functioning properly.
>
> Category B valves will be stroked time tested during the scram time testing of each drive. The successful scram time of a control rod drive will also represent the successful stroke time of the valves.
>
> Category C valves will also be full stroke tested during the control rod scram time testing. The successful scram time of a control rod drive will also represent the successful full stroke testing of these check valves.

2.9.3 Evaluation

Valves C1103F114, C1103F126, and C1103F127 are located on each control rod drive (CRD) hydraulic control unit. For a scram to occur, check valve C1103F114 must open, as well as air-operated valves C1103F126 and C1103F127. OM-10, paragraph 4.3.2.1, requires that check valves be exercised every 3 months to verify that they fulfill their safety function. OM-10, paragraph 4.2.1.4(a), also requires that limiting values of full-stroke times for power operated valves be specified, and test results be compared to the initial reference values (OM-10, paragraph 4.2.1.8). The licensee proposes to demonstrate the proper operation of each valve during the TS-required scram time testing.

GL 89-04, Position 7, discusses the testing of individual scram valves for control rods in boiling water reactors. Exercising the hydraulic control unit valves quarterly during power operations could result in the rapid insertion of one or more control rods. The scram time test frequency identified in the TS is adequate for use as the valve testing frequency. This minimizes rapid reactivity transients and wear of the control rod drive mechanisms. Verifying that the associated control rod meets the scram insertion time limits defined in the TS is an acceptable alternative method of detecting degradation of the valves. Trending the stroke times of the valves is unnecessary since they are indirectly stroke timed and no meaningful correlation between scram time and valve stroke time can be obtained.

The licensee's alternative testing is consistent with GL 89-04, Position 7, and therefore provides an acceptable level of quality and safety.

2.9.4 Conclusion

The proposed alternative from the exercise frequency and stroke-time requirements of OM-10, paragraphs 4.3.2.1, 4.2.1.4(a), and 4.2.1.8, for the set of valves located on each CRD hydraulic control unit is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety.

2.10 Relief Request VRR-010

The licensee requests relief from the operability testing requirement of OM-1, paragraph 1.3.4.3(a), for the torus-to-drywell vacuum breakers. Instead of stroke testing the valves every 6 months, the licensee proposes to perform the testing in accordance with the TS during cold shutdowns. The TS amendment was approved in the staff's SE dated January 4, 1994. Note that OM-1 does not contain the provision in OM-10 that allows the use of cold shutdown justifications without the need for a relief request. Therefore, relief, if justified, from this OM-1 requirement must be granted by the NRC staff.

2.10.1 Licensee's Basis for Requesting Relief

The licensee states:

> Operability testing (Opening, CT-O, and Closing, CT-C, Strokes) for the Drywell Vacuum Breakers was changed from a Monthly Surveillance to a Cold Shutdown Surveillance by Amendment 96 to the Fermi 2 Technical Specifications. This amendment was approved by the NRC in their letter to D. R. Gipson dated January 4, 1994. This letter states that a "cold shutdown justification" will be used to document the testing frequency in the IST Program. Cold Shutdown Justification CSJ-013 in the Second Ten Year Interval IST Program continues this commitment from the First Ten Year Interval Program.

2.10.2 Alternative Testing

The licensee proposes:

> Torus to Drywell Vacuum Breaker stroke testing will be performed in accordance with the Fermi 2 Technical Specifications during Cold Shutdowns.

2.10.3 Evaluation

Primary containment vacuum breakers open to prevent a positive differential pressure buildup from the torus to the drywell. Additionally, the valves must close when the drywell pressure becomes greater than the torus pressure to prevent bypass of the drywell atmosphere directly into the torus air volume. OM-1, paragraph 1.3.4.3(a), requires that within every 6-month period operability tests be performed unless historical data indicates more frequent testing is necessary. The licensee proposes to test the vacuum breakers during cold shutdown in accordance with TS.

By letter dated March 23, 1993, the license requested an amendment to the TS to revise the surveillance requirement for the torus-to-drywell vacuum breakers. The staff's SE dated January 4, 1994, approved the revised surveillance frequency for periodic cycling of the vacuum breakers from once per 31 days to once per cold shutdown. The licensee stated that the nitrogen-actuated stroking devices used to test the vacuum breakers are prone to failure in a manner that can cause the vacuum breakers to fail open. An open vacuum breaker renders the suppression chamber inoperable due to the creation of a suppression pool bypass pathway. The technical basis for justifying the extended surveillance interval included the inert environment where the vacuum breakers are located, the redundant safety-grade position indicators on each vacuum breaker, and the triple failure redundancy of the drywell vacuum relief system. In its SE, the staff determined that exercising the vacuum breakers during power operations is impractical and that the licensee’s proposed alternative provides an adequate means to assess the operational readiness of the vacuum breakers.

2.10.4 Conclusion

Relief from the requirements of OM-1, paragraph 1.3.4.3(a), for the torus-to-drywell vacuum breakers is granted pursuant to 10 CFR 50.55a(f)(6)(i). The alternative testing method provides reasonable assurance of the valves’ operational readiness. Based on the impracticality of complying with the Code and the burden on the licensee if those requirements were imposed, relief is granted for the second 10-year interval.

3.0 PUMP RELIEF REQUESTS

3.1 Relief Request PRR-001

The licensee has requested relief from the differential pressure measurement requirements of OM-6, paragraph 4.6.2.2, for the pumps listed below. The licensee has proposed that, in lieu of measuring inlet pressure, a calculation method be used.

E1151C001A	E1151C001B	E1151C001C	E1151C001D
R3001C005	R3001C006	R3001C007	R3001C008
P4500C002A	P4500C002B		

3.1.1 Licensee’s Basis for Requesting Relief

The licensee states:

> The above Service Water pumps are all vertical line shaft pumps (deep draft pumps) and take their suction from the Residual Heat Removal Reservoir. These pumps have no installed suction pressure gauges nor is it practical to install temporary instrumentation as there are no tap connections and, if there were, they would be located under the floor slab and would be inaccessible. For vertical line shaft pumps, the Code methodology does not provide a pump differential pressure that can be compared to manufacturer's pump performance curves.

3.1.2 Alternative Testing

The licensee proposes:

> For the above pumps, the pump differential pressure will be determined using standard calculation methods as defined in the Pump Handbook edited by Igor J. Karassik,

William C. Krutzsch, Warren H. Fraser, and Joseph P. Messina, Copyright © 1976 by McGraw-Hill, Inc.)

The following methodology is given in the Pump Handbook, Section 14.16, Head Measurement, for vertical suction pumps (deep draft pumps):

> "Measurement of Head on Vertical Suction Pumps in Sumps and Channels. Installations of vertical shaft pumps drawing water from large open sumps and having short inlet passages of a length not exceeding about three diameters of the inlet opening, such inlet pieces having been furnished as part of the pump, the total head should be the reading of the discharge connection in feet plus the vertical distance from the gauge centerline to the free water level in the sump in feet."

Therefore, for the vertical line shaft pumps in the RHR Complex, pump differential pressure will be determined by the following equation:

$$\Delta P = Pd+Z$$

Where:
ΔP = Pump differential pressure, psi
Pd = Discharge pressure as measured at the discharge pressure gauge, psig
Z = pressure, psig, equivalent to the distance in feet from the discharge pressure gauge to the free water level in the RHR Reservoir

The acceptance criteria of OM-6, Table 3b, for vertical line shaft pumps will then be applied to the calculated differential pressure. All other requirements of OM-6 will be met.

3.1.3 Evaluation

These pumps are vertical line shaft pumps and take their suction from the RHR complex reservoir. The pumps are not furnished with suction pressure gauges. Since the pumps are in an open reservoir, the inlet pressure is a function of the height of the reservoir over each pump's inlet.

The Code requires that differential pressure be determined, either by a differential pressure transmitter that provides direct measurement or by calculating the difference in pressure between points on the discharge and inlet lines. Guidance provided in NUREG-1482, Section 5.5.3, states that it is acceptable to use the reservoir level to calculate the pump inlet pressure. The licensee has included an acceptable calculation method in their proposed alternative testing. Therefore, the proposed alternative provides an acceptable level of quality and safety.

3.1.4 Conclusion

The proposed alternative to the Code differential pressure measurement requirements of OM-6, paragraph 4.6.2.2, for the pumps listed above is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety.

3.2 Relief Request PRR-002

The licensee has requested relief for core spray pumps E2101C001A, E2101C001B, E2101C001C, and E2101C001D from the requirements of the following OM-6 paragraphs:

- 2.1 Reference Information: Detection of Change
- 4.3 Reference Values
- 4.4 Effect of Pump Replacement, Repair, and Maintenance on Reference Values
- 4.5 To Establish an Additional Set of Reference Values
- 6.1 Acceptance Criteria

The licensee has proposed to test each core spray pump in parallel with the other core spray pump train using one set of hydraulic acceptance criteria and will adjust the acceptance criteria to account for the potential masking of degradation inherent in this testing configuration. In addition, the hydraulic acceptance criteria will employ the use of a pump reference curve.

3.2.1 Licensee's Basis for Requesting Relief

The licensee states:

> Relief is requested to deviate from the Code in two areas:
>
> 1. To test both Core Spray Pumps in a Division in parallel. That is, both pumps are to be run together and treated as a single component. This implies that differential pressure and developed head reference values represent a combined pump flow characteristic. Vibration data will continue to be monitored on each pump. Since both pumps are run in parallel, acceptance criteria for flow rate and differential pressure have been established which are more restrictive than the criteria given in Table 3b for centrifugal pumps.
>
> 2. For flow rate and differential pressure, a flow reference curve, rather than a single fixed value of differential pressure and corresponding flow, will be utilized. This reference curve will be developed utilizing linear regression with four or more flow versus differential pressure data sets over a limited range of flow.
>
> Each Core Spray Division is designed to have two pumps operating in parallel in accordance with Technical Specifications. If one pump is determined to be inoperable, then the Division is declared inoperable. The system test line configuration was not designed to allow for single pump testing. It was designed only to accommodate the full flow testing required by Technical Specifications Surveillance Test requirements.
>
> It is not practical to run the Core Spray Pumps one at a time in the test lineup configuration. The test line flow control valves are throttled approximately 13% open

(Division 1) and 9% open (Division 2) to control two pump test flow (Pumps A and C are in Division 1, and Pumps B and D are in Division 2). The existing flow control valves are not capable of throttling low enough (less than 5% open) to accommodate single pump operation without experiencing unstable operation, cavitation, and severe vibration.

Significant system modifications would be required to enable testing of the Core Spray Pumps in accordance with Code requirements. System modifications would be costly, both in terms of resources and increased radiation exposures during installation. Since the system performs adequately, there is little benefit, other than compliance with the Code, for installing any of them.

The use of pump reference curves is also necessitated by the fact that the test line and flow control valves are oversized for single pump testing. The flow control valves are opened to a point in the span of travel in which small changes in valve position result in relatively large changes in flow rate. Thus, it presents an unnecessary challenge to both the equipment and the Plant Operators to attempt to return to a fixed reference value. The combined reference pump curves were developed using four to seven data points over a 600 gpm range of flows (approximately 4% of the operating range). The data was then fit to a differential pressure-flow curve using linear regression, which is a sensible method considering that the pump curve is essentially linear over this very small range.

A review of preservice test data and inservice test results obtained prior to establishing the reference curves confirmed that the pumps were in good operating condition when the curves were developed. A review of the test results obtained using the reference curves shows that the data is consistent and trendable. Additionally, the individual pump vibration data is extremely stable and indicates no signs of degradation on any of the Core Spray Pumps. If invalid data were used to generate the pump reference curves, or if the curve fit was poor, the test results would be erratic, and such is not the case in over 14 years of testing experience with these pumps, thus validating data credibility.

3.2.2 Alternative Testing

The licensee proposes:

As discussed above in the basis for relief section, it is extremely difficult to return to a specific set or sets of fixed reference points. Multiple points could be established per the Code; however, it would be impossible to obtain reference values at every possible point. An alternate to the fixed reference value(s) is a reference curve. Flow rate and differential pressure are measured during surveillance testing and compared to an established reference curve over a small increment of the flow characteristic curve.

The Core Spray System test line is not configured to allow for testing only a single pump in a Division. An alternate to single pump testing is to test the two pumps in a division in parallel. This treats the two Core Spray pumps as a single component. This is consistent with the Technical Specifications which consider a Core Spray Division inoperable if one of the pumps in a division is inoperable.

The following elements of NUREG-1482, section 5.2, are addressed as follows:

1. The Core Spray pumps were known to be operating acceptably when the test data was recorded. The curves developed in 1984 were determined to be too low such that some tests resulted in performance being in the Alert Range High. The Division 1 pump(s), A and C, reference curve was then revised based on data taken in November, 1993. Since the pumps performance would not improve through testing, the curve itself was suspect. The Division 2 pump(s), B and D, reference curve was developed based on preservice data taken in December, 1984 and has not been changed.

2. Flow and discharge pressure gauges meet the range and accuracy requirements of the Code. The suction pressure gauges utilized are highly accurate gauges (temporary, M&TE). Nominal test data for suction pressures used to develop the curves is 5 psig. The discharge pressure gauges are 0-600 psig, installed gauges and the nominal reading during testing is 280 psig.

3. The Division 1 curve is constructed with 7 points and the Division 2 curve with 4 points. The application of the curve, however, is limited to a 600 gpm range. This range is well within the accuracy limits of the respective linear equations as demonstrated by r values of> 0.99 in both cases.

4. The combined pump curve for each division is beyond the flat portion of that curve for all data.

5. The acceptance criteria is above the Technical Specifications minimum flow requirements and minimum discharge pressure required for each Core Spray division based on both pumps running.

6. Vibration levels for the four Core Spray Pumps have remained constant over 14 years of testing over the applicable flow ranges.

7. There have been no major repairs or replacements completed on the Core Spray pumps since preservice testing in 1984.

Because the Core Spray pumps in each Division are tested in parallel, the following additional limitations are being placed on the acceptance criteria to assure that any degradation in performance is detected and corrected in a timely manner:

1. In order to enhance the ability to detect the equivalent of one pump's degradation to the minimum acceptable level of performance per Table 3, the following acceptance criteria will be utilized, which are more stringent than the Code limits:

Acceptable Range	Alert Range	Required Action Range	
ΔP/ΔPr	Low Value	Low Value	High Value
0.965 to 1.10	0.95 to <0.965	<0.95	>1.10

2. If the hydraulic performance of a CS division enters the Alert Range Low or Required Action Low ranges for any reason other than instruments out of calibration, both pumps in that division will be individually evaluated to determine which pump(s) in the Division has degraded. Appropriate inspections, tests, and repairs will be completed prior to returning the Division to service.

3. Use of the provisions of Paragraph 4.3 that permits an analysis to be performed when the parameter being measured or determined can be significantly influenced by other conditions and Paragraph 4.5 to establish additional reference values will not be made.

4. New reference curves for the Core Spray pumps will be established only after both pumps in the Division have been repaired, replaced, or serviced as specified in Paragraph 4.4.

3.2.3 Evaluation

The Fermi UFSAR, Section 6.3.2.2.3, states that the core spray pumps have a safety function to protect the core in the event of a large break in the nuclear system if the feedwater pumps, the control rod drive pumps, the reactor core isolation cooling system, and the high pressure coolant injection system are unable to maintain the water level in the reactor pressure vessel. The core spray system at Fermi is a unique design which includes two divisions with two pumps in each division. If one of the two pumps in either division is declared inoperable, then that division is inoperable. There are no functions of the core spray system for single pump operation in either division. The core spray system also includes a test line that is used to test both pumps in each division simultaneously while the plant is at power. Both pumps are required to operate in order to achieve the TS flow rate specified in Surveillance Requirement 3.5.1.8 of at least 6350 gpm at a system head corresponding to a reactor pressure of ≥100 psig.

The Code requires in paragraphs 2.1, 4.3, 4.4, and 4.5 that safety-related pumps must be tested individually to detect a deviation in hydraulic and mechanical performance at points of operation readily duplicated during subsequent tests. These points of operation, referred to as reference values, are the baseline points from which the acceptance criteria are established. When maintenance on a pump has the potential to effect an individual reference value or a set of reference values, new reference values must be established. If the deviation in hydraulic performance of an individual centrifugal pump falls within the required action range, the pump is declared inoperable until the cause of the deviation determined and the condition corrected.

The core spray system at Fermi is of a unique design in that each train is capable of being tested at substantial flow conditions, but it is impractical to test each pump in the train individually because the test flow loop (specifically, the flow control valve) is sized to test both pumps simultaneously. In order to test a pump individually, the flow control valve would open approximately 5 percent of valve stem travel. The licensee states that operation at this valve setting would be accompanied by unstable operation, cavitation, and severe vibration. It would be an undue burden on the licensee if the system would have to be redesigned or major components replaced to perform single-pump testing if there was a method currently available to monitor the hydraulic degradation of the core spray pumps with the existing system configuration.

In addition to the impracticality associated with testing the core spray pumps individually, the licensee states that it is an unnecessary challenge, and therefore a hardship, to establish a hydraulic fixed reference value for each core spray train. Because of the design of the flow control valve, it is difficult to obtain a repeatable reference value in accordance with the Code requirements. As stated above, this would be an undue burden if there was a method currently available to monitor the hydraulic degradation of the core spray pumps with the existing system configuration.

The licensee has proposed to use parallel pump testing to satisfy the Code requirements. Hydraulic acceptance criteria would be established for each two-pump train using reference curves. The licensee's alternative includes adjusted alert and required action ranges acceptance criteria in order to detect degradation in one pump. Vibration acceptance criteria will continue to be established for each pump, as currently required by the Code. The licensee also: (1) stated that the Code analysis provisions to establish new reference values are suspended and (2) proposed that new reference curves for the core spray pumps will be established only after both pumps in the division have been repaired, replaced, or serviced.

With respect to granting relief to perform parallel pump testing in order to meet the Code requirements, the core spray system is not currently designed to either operate or be tested with only one pump running in either division. In order to test the pumps individually, significant modifications to the system would be required to allow controlling the flow for one pump. Therefore, the licensee has demonstrated that it is impractical to test these pumps individually.

The licensee's alternate hydraulic acceptance criteria is acceptable with the exception of the required action range high value. The value of >1.10 of the reference value, which is the current Code requirement, does not take into account the masking of pump hydraulic performance in a parallel pump configuration. The NRC staff notes that the previous Code edition had an alert range high value of 1.02 of the reference value and a required action value of 1.03. These values were judged to be sufficiently conservative for the two-pump system as the staff had recognized the issues with the high alert and required action range and was fully aware of the changes to the Code in later editions which relaxed this requirement. The current Code established a required action range high value of 1.10, recognizing that improved pump performance may be indicative of an instrumentation error and not necessarily a change in the condition of the pump. However, considering the unique testing arrangement for these pumps, the potential still exists for masking of pump performance by applying the acceptance criteria for an individual pump to a two-pump system. Therefore, the licensee shall adjust the required action range high acceptance criteria to >1.05. As a result, the acceptable range shall be 0.965 to 1.05. As stated by the licensee, upon entering the required action range, both pumps will be individually evaluated.

One aspect of the parallel pump relief request includes the establishment of new reference values. The licensee has proposed that new reference curves will be established only after both pumps in the division have been repaired, replaced, or serviced. This proposed provision would allow the licensee to completely replace one pump in the division and not establish new reference values. The NRC staff does not consider this provision acceptable. Therefore, the licensee shall either establish new reference curves or reverify the current curves after either pump in the division has been repaired, replaced, or serviced.

With respect to the proposed alternative to use reference curves, OM-6, paragraph 5.2(b), reuqires that the resistance of the system shall be varied until the flow rate equals the reference value. The licensee has demonstrated that it is a hardship to establish a repeatable reference value without a compensating increase in the level of quality and safety. The licensee's proposed alternative to establish a reference curve is consistent with the guidance in NUREG-1482, Section 5.2. Therefore, the proposed alternative provides a reasonable assurance of operational readiness.

3.2.4 Conclusion

Provisional relief is granted from the requirements of OM-6, paragraphs 2.1, 4.3, 4.4, 4.5, and 6.1, for parallel pump testing of core spray pumps E2101C001A, E2101C001B, E2101C001C, and E2101C001D, pursuant to 10 CFR 50.55a(f)(6)(i), based on the impracticality of performing testing in accordance with the Code requirements, and in consideration of the burden on the licensee if the Code requirements were imposed on the facility. The relief is granted provided that the licensee incorporates the following two items into this relief request:

1. The licensee shall adjust the required action range high acceptance criteria to >1.05. As a result, the acceptable range shall be 0.965 to 1.05.

2. The licensee shall either establish new reference curves or reverify the current curves after either pump in the division has been repaired, replaced, or serviced.

The NRC staff has determined that imposing these additional requirements is acceptable, having given due consideration to the burden associated with these requirements.

The proposed alternative to the requirements of OM-6, paragraph 5.2(b), for testing the core spray pumps using reference curves, is authorized pursuant to 10 CFR 50.55a(a)(3)(ii). Compliance with the specified requirements results in a hardship without a compensating increase in the level of quality and safety.

3.3 Relief Request PRR-003

The licensee has requested relief from the detection of change and reference value test requirements of OM-6, paragraphs 2.1 and 4.3, for emergency equipment cooling water (EECW) pumps P4400C001A and P4400C001B. The licensee has proposed to use reference curves to establish the reference conditions and the hydraulic acceptance criteria.

3.3.1 Licensee's Basis for Requesting Relief

The licensee states:

> Relief is requested to deviate from the Code requirement for a fixed reference value for flow and differential pressure. For flow rate and differential pressure, a flow reference curve, rather than a single fixed value of differential pressure and corresponding flow, will be utilized. This reference curve will be developed utilizing linear regression with four or more flow and differential pressure data sets over a limited range of flow.

The use of pump reference curves is necessitated by the difficulty in adjusting system test flow to the required value using the installed manual gate valve. The ability to control flow using the installed manual gate valve is very limited, and it is difficult to always return to a precise flow value (i.e., not repeatable). Requiring Plant Operations to test the system at such a fixed flow rate represents an undue burden on the Operators and an unnecessary challenge to the EECW system, since it requires the system to remain in an abnormal lineup for a longer period of time. The significance of this is the diminished supply of cooling water available when compared to the normal line up. Using the pump curves also reduces the time that the system is inoperable during the surveillance.

A review of inservice test results obtained using the reference curves shows that the data is consistent and trendable. Additionally, the individual pump vibration data is extremely stable and indicates that pump performance has not degraded for either of the EECW Pumps. Had invalid data been used to generate the pump reference curves, or if the curve fit was poor, test results would be erratic, and this has not been the experience for these pumps.

3.3.2 <u>Alternative Testing</u>

The licensee proposes:

As discussed above in the basis for relief section, it is extremely difficult to return to a specific set or sets of fixed reference points. Multiple points could be established per the Code; however, it would still be impossible to obtain reference values at every possible point. An alternate to the fixed reference value(s) is a reference curve. Flow rate and differential pressure are measured during surveillance testing and compared to an established reference curve over a small increment of the flow characteristic curve.

The following elements of NUREG-1482, section 5.2, are addressed as follows:

1. The EECW pumps were known to be operating acceptably when the test data was recorded. The Division 1 and 2 pump curves were developed based on data taken in February, 1993. The initial curves developed in 1985 were determined to be inadequate since the test loop was so small. The test loop consisted of only the pump, the heat exchanger, and the EECW differential pressure control valve. This short test loop resulted in cavitation at the control valve with resultant void formation. These voids caused the installed ultrasonic flow meters to be unreliable. The new test loops use the entire EECW flow network.

2. Flow instrumentation and the suction pressure and discharge pressure gauges meet the range and accuracy requirements of the Code.

3. The Division 1 curve is constructed with 12 points and the Division 1 curve with 9 points. The application of the curves is limited to a 160 gpm range and 150 gpm range for Divisions 1 and 2 respectively. This range is well within the accuracy limits of the respective linear equations.

4. The pump curve for each division is beyond the flat portion of that curve for all data.

5. The acceptance criteria is above the minimum acceptable flow limits as determined by Plant Support Engineering Calculations

6. There have been no major repairs or replacements completed on the EECW pumps since preservice testing in 1984.

3.3.3 Evaluation

The Code requires that reference values be taken at points of operation that are repeatable. The licensee states that it is difficult to obtain consistently repeatable reference values because the flow must be established with the installed manual gate valve. Gate valves are not typically designed to provide precise flow control. In addition to the issue of repeatability, the hardship may be magnified by the fact that this particular valve would have to be operated manually during each inservice test, as it has no power actuator. Therefore, compliance with the Code requirements would be a hardship.

With respect to the proposed alternative to use reference curves, OM-6, paragraph 5.2(b), requires that the resistance of the system shall be varied until the flow rate equals the reference value. The licensee has demonstrated that it is a hardship to establish a repeatable reference value without a compensating increase in the level of quality and safety. The licensee's proposed alternative to establish a reference curve is consistent with the guidance in NUREG-1482, Section 5.2, with the exception of the guidance concerning validation or establishing a new reference curve, which was not included in the discussion in the licensee's proposed alternate testing. In a phone conversation between the NRC staff and the licensee on November 9, 1999, the licensee stated that their philosophy concerning validation and new reference curves for the EECW pumps was identical to the reference curve methodology discussed in their proposed alternative for the core spray pumps and that after pump replacement or repair, Fermi would either validate the current curve or establish a new curve. With this information, all of the items in NUREG-1482, Section 5.2, are addressed consistent with the guidance in the NUREG. Therefore, the proposed alternative provides a reasonable assurance of operational readiness.

3.3.4 Conclusion

The proposed alternative to the requirements of OM-6, paragraph 5.2(b), for testing the EECW pumps using reference curves is authorized pursuant to 10 CFR 50.55a(a)(3)(ii), based on the determination that compliance with the specified requirements results in a hardship without a compensating increase in the level of quality and safety.

3.4 Relief Request PRR-004

The licensee is requesting relief from the alert range acceptance criteria of 0.325 inches per second (in./sec.) specified in Table 3 of OM-6 for RHR pumps E1102C002A, E1102C002B, E1102C002C, and E1102C002D. The licensee has proposed to adjust the alert range in specific measurement directions on all four pumps. The required action range would remain at 0.700 in./sec..

3.4.1 Licensee's Basis for Requesting Relief

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

The licensee states:

> Relief is requested from OM-6, Table 3 requirements to run the pump on an increased periodicity due to vibration level exceeding the OM-6 Alert Range absolute limit. This is based on analysis of the vibration data indicating that no pump degradation is taking place. Detroit Edison is proposing to use alternative vibration Alert Range Limits based on historical vibration data and analysis of that data. This provides an alternative method that still meets the intended function of monitoring the pump for degradation over time while keeping the Required Action level unchanged.
>
> Since the initial IST data was taken at the upper motor bearing on all RHR pumps, the overall vibration limits have periodically exceeded the 0.325 in./sec Alert Range limit on some pumps and been very close on others. Vibration spectral analysis has shown that the RHR pumps have a running speed peak of 0.2 -0.25 in./sec. and this is well below the Alert Range. The vibration spectral data also indicates a resonant frequency between 9-14 Hz on all the RHR pumps. Both these items were identified in the initial vibration Engineering Research Report 85D15-5, Rev 1, dated 1984. Updating the test program to OM-6 causes the required frequency range of ½ running speed (14 Hz) to 1000Hz to be increased to 1/3 running speed (9.5 Hz) to 1000 Hz. This range now includes the resonant frequency. The combination of the running speed peak and the resonance frequency will occasionally result in the overall vibration velocity exceeding the Alert Range limit of 0.325 in./sec. The running speed peak is the best vibration indicator for actual pump condition and this peak has remained unchanged. No bearing peaks have been identified in the vibration spectrum and all other indicators: flow, oil analysis, and pressures, indicate that the RHR pumps are operating in a satisfactory fashion.
>
> ASME/ANSI Operation and Maintenance Code, OMa-1988, Part 6, footnote to Section 4.3, 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 on the RHR pumps. The data for RHR Pump C has been extensively analyzed in IST Evaluation 97-042 by our on-site Level 3 Vibration Expert. Additionally, Engineering Research Report 85D15-5, Rev 1, identifies these 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 in./sec. Alert Range limit. Each structure has it's 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 broad band forcing frequency that varies slightly during each run.

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 1) program. This program did not indicate any problems in either the pump or motor. FIGURE 2 is a high-resolution vibration spectrum which shows the structural resonance and running speed peaks. TRENDS 1 and 2 indicate that the running speed spectral peaks have remained unchanged while the resonant peak can change with each run. With the resonant frequency being the cause for 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.

The required monitoring range from 1/3 running speed to 1000 Hz will increase vibration levels from historical values (see attached TREND PLOT REPORT), since it will now include the resonant peak and will put the pumps into the OM-6 Alert Range periodically. Periodic excursions into the Alert Range will require placing the pump on an increased testing frequency. This would result in a hardship (increased testing and manpower requirements) with no compensating increase in safety, since the cause is well known and hasn't degraded or changed since 1984.

Given that the RHR Pumps are currently operating acceptably at vibration velocities at or slightly above or below the OM-6 Alert Range level with no change in running speed peak from the initial data taken in 1984, a new Alert Range vibration velocity level has been developed. This new velocity vibration Alert Range limit will allow for early detection of pump degradation prior to component failure, while the Required Action level (0.7 in./sec.) will remain unchanged.

Per NUREG/CP-0152 four key components should be considered for relief. These four components are stated below with the corresponding basis:

> Spectral analysis - Spectral data indicates that the overall vibration levels are primarily made up of two basic frequencies, running speed and a 9-14 Hz resonance. Spectral data does not indicate any problem with bearings or the rotating elements such as imbalance or misalignment.
>
> Historical data - Vibration data from 1984 indicated that the frequencies described in the spectral analysis are not new and have been observed since this pumps

were first installed. The only spectral frequency that periodically changes in amplitude is the resonance frequency when it is excited by flow noise.

Attempts to correct - When the equipment was first installed in 1984, stiffeners were installed to reduce the vibration. These attempts only increased the piping vibration levels and were subsequently removed. 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 (which had been found to be a problem on a Core Spray pump) were 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 1) program. This program did not indicate any problems in either the pump or motor.

Have data evaluated by manufacturer or vibration expert - All of the historical and recent vibration data has been reviewed by the Principle [sic] Reliability Engineer, a Level 3 Vibration Analyst. The conclusion reached is that the primary cause of the periodically high overall vibration level is changes in the resonant frequency. No problems or degrading trends are observed in the vibration data, this included phase, impact testing and modal analysis. Attempting to balance or align these pumps will have very little impact on changing the resonant vibration levels and therefore have little effect on overall vibration levels.

3.4.2 Alternative Testing

The licensee proposes:

Pump vibration overall velocity will be measured for the RHR pumps accessible bearing in accordance with OM-6, Paragraph 4.6.4(a). The acceptance criteria of OM-6, Table 3a will be used for the pump bearing:

	Overall Velocity (in/sec Peak)
Acceptable Range:	<0.325 in/sec
Alert Range:	>0.325 in/sec to 0.700 in/sec
Required Action Range:	>0.700 in/sec

For the RHR pumps the upper motor bearing, pump thrust bearing, Table 3a limits will be modified to increase the Alert Range from> 0.325 in/sec to> 0.400 in/sec.

Vibration Acceptance Criteria

Vibration Parameter	Acceptable Range	Alert Range	Required Action Range
Overall Velocity (OVVEA1) Horizontal Inline Top of Motor	<0.400 in./sec. pk.	>0.400 in./sec. pk. to 0.700 in./sec. pk.	>0.700 in./sec. pk.

Vibration Parameter	Acceptable Range	Alert Range	Required Action Range
Overall Velocity (OVVEA2) Horizontal 90° Top of Motor	<0.400 in./sec. pk.	>0.400 in./sec. pk. to 0.700 in./sec. pk.	>0.700 in./sec. pk.
Overall Velocity (OVVEA3) Vertical Top of Motor	<0.400 in./sec. pk.	>0.400 in./sec. pk. to 0.700 in./sec. pk.	>0.700 in/sec. pk.
Overall Velocity (OVVEC1) Horizontal Inline Pump Bearing	<0.325 in./sec. pk.	>0.325 in./sec. pk. to 0.700 in./sec. pk.	>0.700 in./sec. pk.
Overall Velocity (OVVEC2) Horizontal 90° Pump Bearing	<0.325 in./sec. pk.	>0.325 in./sec. pk. to 0.700 in./sec. pk.	>0.700 in./sec. pk.

3.4.3 Evaluation

The Code requires that when the overall pump vibration measurement in any one measured direction exceeds 0.325 in./sec., 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 to 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 yet 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.

The licensee stated in its basis that the four RHR pumps at Fermi have a resonant frequency between 9-14 hertz that is excited by flow noise which will occasionally result in increased vibration levels above the alert range. This condition was identified during plant startup and attempts were made to stiffen the pump structure, the results of which were not satisfactory. The licensee’s current efforts to assess the vibration levels include, in addition to a review of the vibration history and efforts to reduce the vibration, spectral examination and assessment of the vibration by a vibration expert. From this evaluation, it was determined that the peak vibration levels occur at running speed and the 9-14 hertz resonant point. It was concluded that no adverse trends were observed in the data. Therefore, compliance with the Code requirements would be a hardship if there was an alternate method of testing.

The licensee has proposed to raise the vibration alert range for all four RHR pumps in three directions: motor horizontal inline, motor horizontal 90°, and motor vertical (note that the RHR pumps are vertical centrifugal pumps at Fermi where the pump and driver form an integral unit and the pump bearings are in the driver). The staff reviewed the historical vibration information for the four RHR pumps and noted that the vibration parameters cited in the relief request of pumps B and C do exceed the 0.325 in./sec. alert limit. The analysis and evaluation that the licensee has performed provides reasonable assurance of operational readiness because the proposed alternative interval limit of 0.400 in./sec. is below the required action limit of 0.700 in./sec. and the licensee has demonstrated that these pumps have a normal operational history at this vibration level with no adverse consequences.

The staff noted in its review of the historical vibration data provided for all four pumps that RHR pumps A and D did not enter the alert range for any of the directions listed in the proposed alternative. The data provided indicates that RHR pumps A and D have adequate and consistent performance and do not warrant additional margin to account for the resonant frequency. This finding was discussed in a phone call on November 9, 1999, between the NRC staff and the licensee. The licensee was asked to provide additional information to support the proposed alternative. The staff had a second call with the licensee on November 19, 1999, and the licensee stated that it was their intention to have consistency in their vibration measurement criteria. The licensee also stated that, after a review of historical information since startup, it could not justify the proposed alternative for the A and D pumps. The staff concurred with this assessment. Therefore, relief is denied for the A and D pumps.

3.4.4 Conclusion

The alternative to the OM-6 Code requirements for vibration alert range acceptance criteria of 0.325 in./sec. specified in Table 3 of RHR pumps B and C in directions motor horizontal inline, motor horizontal 90°, and motor vertical, is authorized pursuant to 10 CFR 50.55a(a)(3)(ii). Compliance with the specified requirements results in a hardship without a compensating increase in the level of quality and safety.

The alternative for the OM-6 Code requirements referenced above for RHR pumps A and D is not authorized because the data provided indicates that RHR pumps A and D have adequate and consistent performance and do not to warrant additional margin to account for the resonant frequency.

4.0 CONCLUSION

Relief is granted for VRR-002, VRR-005, VRR-006, and VRR-010 for the second 10-year interval pursuant to 10 CFR 50.55a(f)(6)(i). In making this determination, the staff has considered the impracticality of performing the required testing and the burden on the licensee if the requirements were imposed.

The proposed alternatives to the Code requirements described in VRR-009 and PRR-001 are authorized, pursuant to 10 CFR 50.55a(a)(3)(i), based on the alternatives providing an acceptable level of quality and safety. The alternatives are authorized for the second 10-year interval.

The proposed alternatives to the Code requirements described in VRR-008 and PRR-003 are authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the second 10-year interval. Compliance with the specified requirements of these sections would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The proposed alternatives to the Code requirements described in VRR-003 and VRR-004 are approved pursuant to 10 CFR 50.55a(f)(4)(iv). These alternatives meet the requirements of the

1995 OM Code, paragraph ISTC 4.5.4(c), which has been incorporated by reference into 10 CFR 50.55a (64 FR 51370).

The alternative proposed in VRR-001 is denied for pressure isolation valves E4150F006 and E5150F013 since the licensee has not shown that relief is warranted pursuant to 10 CFR 50.55a(f)(6)(i), or otherwise proposed an acceptable alternative pursuant to 10 CFR 50.55a(a)(3)(i) or (a)(3)(ii). Relief is not needed from the requirements of OM-10, paragraph 4.2.2.3(a), to implement the proposed alternative for the remaining bypass leakage valves that also serve as primary containment isolation valves because paragraph 4.2.2.3(a) does not apply to these valves. Likewise, the alternative proposed in VRR-007 does not require relief from OM-10, paragraph 4.2.2.3(a).

Provisional relief is granted for the parallel pump testing described in PRR-002, pursuant to 10 CFR 50.55a(f)(6)(i), based on the impracticality of performing testing in accordance with the Code requirements, and in consideration of the burden on the licensee if the Code requirements were imposed on the facility. The relief is granted for the second 10-year interval provided that the licensee incorporates the following two items into this relief request:

- The licensee shall adjust the required action range high acceptance criteria to >1.05. As a result, the acceptable range shall be 0.965 to 1.05.

- The licensee shall either establish new reference curves or reverify the current curves after either pump in the division has been repaired, replaced, or serviced.

The NRC staff has determined that imposing these additional requirements is acceptable, having given due consideration to the burden associated with these requirements.

The proposed alternative for testing the core spray pumps using reference curves, also described in PRR-002, is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) based on the determination that compliance with the specified requirements results in a hardship without a compensating increase in the level of quality and safety. This alternative is authorized for the second 10-year interval.

The alternative described in PRR-004 is authorized for RHR pumps B and C in directions motor horizontal inline, motor horizontal 90°, and motor vertical. Relief is authorized for the second 10-year interval, pursuant to 10 CFR 50.55a(a)(3)(ii), based on the determination that compliance with the specified requirements results in a hardship without a compensating increase in the level of quality and safety. The alternative described in PRR-004 for RHR pumps A and D is not authorized because the data provided indicates that RHR pumps A and D have adequate and consistent performance and do not to warrant additional margin to account for the resonant frequency.

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