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August 11, 2016  
NRC-16-0049

U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, D.C. 20555-0001

- References: 1) Fermi 2  
NRC Docket No. 50-341  
NRC License No. NPF-43
- 2) DTE Electric Letter to NRC, "License Amendment Request to Revise Integrated Leak Rate Test (Type A) and Type C Test Intervals," NRC-16-0006, dated March 22, 2016 (ML16082A309)

Subject: Response to Request for Additional Information Regarding  
License Amendment Request to Revise Integrated Leak  
Rate Test – Type A and Type C Test Intervals

In Reference 2, DTE Electric Company (DTE) submitted a license amendment request (LAR) to revise the Integrated Leak Rate Test Type A and Type C test intervals at Fermi 2. In an email from Ms. Sujata Goetz to Mr. Jason Haas dated July 14, 2016, the NRC sent DTE a request for additional information (RAI) regarding this LAR. The response to the RAI is enclosed.

No new commitments are being made in this submittal.

Should you have any questions or require additional information, please contact Mr. Scott A. Maglio, Manager – Nuclear Licensing, at (734) 586-5076.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on August 11, 2016

Keith J. Polson  
Site Vice President

Enclosure: Response to Request for Additional Information

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cc: NRC Project Manager  
NRC Resident Office  
Reactor Projects Chief, Branch 5, Region III  
Regional Administrator, Region III  
Michigan Public Service Commission  
Regulated Energy Division (kindschl@michigan.gov)

**Enclosure to  
NRC-16-0049**

**Fermi 2 NRC Docket No. 50-341  
Operating License No. NPF-43**

**Response to Request for Additional Information**

## **Response to Request for Additional Information**

### **SBPB RAI-1**

*The staff notes that the Fermi 2 containment has been in service for approximately 35 years. Please provide a history of repairs and modifications made to the containment structure, so that the NRC staff can verify that Fermi is in compliance with Final safety evaluation for nuclear energy institute (NEI) Topical report (TR) 94-01, revision 2, "industry guideline for Implementing performance-based option of 10 CFR part 50, Appendix j" and electric power research institute (EPRI) Report no. 1009325, revision 2, august 2007, "risk impact Assessment of extended integrated leak rate testing intervals", Section 3.1.4, "Major and Minor Containment Repairs and Modifications" (ADAMS Accession No. ML081140105).*

### **RESPONSE**

DTE Electric Company (DTE) is currently committed to NEI 94-01, Revision 0. This License Amendment Request (LAR) will revise the Fermi 2 Technical Specifications (TS) to follow NEI 94-01, Revision 3-A. NEI 94-01, Revision 3-A, did not include the six conditions and limitations from Section 4.1 of the NRC's Safety Evaluation Report (SER) for Revision 2-A. Therefore, as discussed in Section 3.1 and Table 2 of Enclosure 1 to the original LAR, DTE is adopting NEI 94-01, Revision 3-A, with the six conditions and limitations from the NRC's SER for Revision 2-A.

Per Section 3.1.4 of the NRC's SER for NEI 94-01, Revision 2-A:

"The NRC staff considers the cutting of a large hole in the containment for replacement of steam generators or reactor vessel heads, replacement of large penetrations, as major repair or modifications to the containment structure."

There have been no repairs or modifications to the containment structure. The history of coating repairs and moisture seal replacement was provided in Section 3.3.1 of Enclosure 1 of the original LAR (pages 18-20 of Enclosure 1). The following excerpts describing conditions are provided with their corresponding page numbers from Enclosure 1 of the original LAR. The pits noted in the excerpts below are all well within design tolerances.

"During the examination of containment that was completed during the seventh refueling outage (RF07), in the spring of 2000, visual inspections identified a small (0.02 x 0.04 x 0.093 inch deep) pit at the interface of an I-beam with the containment steel liner. The corrosion was attributed to a screw and uncoated washer that were in contact with an uncoated portion of the drywell shell in a beam seat area. The screw and washer were removed and the drywell shell in the area of the pit was coated in 2003." (page 19)

"In RF07, during the first containment inspection interval, the moisture seal at the interface between the drywell concrete floor and the steel shell was removed.

This was done to perform a detailed inspection of the liner in the seal area, repair areas of degradation in the seal, and as a preventive maintenance task. The inspection found no degradation to the drywell shell. The area was repainted and a new moisture seal was installed. In accordance with ASME Section XI, 2001 Edition with 2003 Addenda, the moisture barrier is inspected 100 percent each inspection period.” (page 19)

“One 0.25 inch diameter pit has been identified in the torus wetted area during the history of the plant. The pit, a corrosion pit 0.0285 inches in depth, was identified under a coating blister in 2001. The depth of the pit left the remaining shell thickness well within design tolerances. The coating was repaired.” (page 20)

“Coating condition continues to be monitored during inspections. In RF15, broken blisters, mechanical damage, and pinpoint rust areas were identified and repaired in the wetted areas of the torus. In the vapor region, all flaking paint was removed from the torus ring header, torus vacuum breaker valves, nitrogen supply lines, monorail rail, and torus walkway and handrail” (not primary containment pressure boundary). “Flaking or cracked coating was removed and protective coating was re-applied to the torus shell. As stated above, no pitting of the torus was identified during the 2012 (RF15) inspections.” (page 20)

**SBPB RAI-2**

Your letter, dated March 22, 2016, provided the following table:

**Table 3: DTE Electric Company Type A Test Historical Results Since 1989**

| <i>Test Completion Date</i> | <i>Upper Confidence Limit Measured Leakage (%/day)</i> | <i>Correction for Type B and C Tests (%/day)</i> | <i>Total Leakage (%/day)</i> | <i>Acceptance Criteria (%/day)</i> |
|-----------------------------|--|--|------------------------------|------------------------------------|
| 11/29/1989                  | 0.285  | 0.033  | 0.318                        | 0.375                              |
| 11/01/1992                  | 0.212  | 0.032  | 0.244                        | 0.375                              |
| 11/10/2007                  | 0.1168   | 0.0964   | 0.2132                       | 0.375                              |

Fermi, Unit 2 Technical Specification (TS), Section, 5.5.12, “Primary Containment Leakage Rate Testing Program” (ADAMS Accession ML053060228) states:

- b. The peak calculated containment internal pressure for the design basis loss of coolant accident,  $P_a$ , is 56.5 psig.
- c. The maximum allowable containment leakage rate,  $L_a$  at  $P_a$ , shall be 0.5% of containment air weight per day.
- d. Leakage Rate acceptance criteria are:
  - 1. Containment leakage rate acceptance criteria is  $\leq 1.0 L_a$ . During the first unit startup following testing in accordance with this program, the leakage rate acceptance criteria are  $\leq 0.60 L_a$  for the required Type B and Type C tests and  $\leq 0.75 L_a$  for Type A tests.

The staff requests the test pressures used during the two most recent Type A tests, so that it can confirm that at least one of the actual test pressures bound the TS 5.5.12b  $P_a$  value of 56.5 psig. Please provide the Type A test pressure values in terms of absolute pressure along with the atmospheric pressure, since BN-TOP-1, Revision 1, “Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants”, Section 4.1, Parameters Monitored (ADAMS Accession No. ML083540173), states:

*During the primary containment leakage rate tests, measurements are made of ... absolute pressure.*

The licensee’s response must supply sufficient information to demonstrate compliance with NEI 94-01 Revision 0, “Industry Guideline for Implementing Performance –Based Option of 10 CFR Part 50, Appendix J”, (ADAMS Accession No. ML11327A025), Section 9.2.3 “Extended Test Intervals” and the test requirements of ANSI/ANS 56.8-1994, “American National Standard for Containment System Leakage Testing Requirements,” (Adams Accession No. ML11327A024), Section 3.2.11, “Type A Test Pressure.”

## RESPONSE

The test pressures used during the two most recent Type A tests are contained in the table below.

| Test Completion Date | Gauge Pressure (psig) | Absolute Pressure (psia) | Atmospheric Pressure (atm) |
|----------------------|-----------------------|--------------------------|----------------------------|
| 11/1/1992            | 57.51                 | 72.21                    | 14.70                      |
| 11/10/2007           | 57.025                | 71.552                   | 14.527                     |

NEI 94-01 Revision 0, "Industry Guideline for Implementing Performance-Based Option of 10 CFR 50, Appendix J," Section 9.2.3, "Extended Test Intervals," states that:

"Type A testing shall be performed during a period of reactor shutdown at a frequency of at least once per 10 years based on acceptable performance history. Acceptable performance history is defined as completion of two consecutive periodic Type A tests where the calculated performance leakage rate was less than 1.0 La."

It also states that:

"In the event where previous Type A tests were performed at reduced pressure, at least one of the two consecutive periodic Type A tests shall be performed at peak accident pressure ( $P_{ac}$ )."

The test requirements of ANSI/ANS 56.8-1994, "American National Standard for Containment System Leakage Testing Requirements," Section 3.2.11, "Type A Test Pressure," state that:

"The Type A test pressure shall not be less than  $0.96P_{ac}$  (psig) nor exceed  $P_d$ . For those plants with a  $P_{ac}$  of 25 psig or less,  $P_{ac}$  minus 1 psi shall be the minimum test pressure for the duration of the Type A test. The test pressure shall be established relative to the external pressure of the primary containment measured at the start of the Type A test."

Fermi 2  $P_{ac}$  (the calculated peak containment internal pressure related to the DBA) is 56.5 psig, and the  $P_d$  (the containment allowable design limit) is 62.0 psig. Therefore, as indicated by the results in the table above, all of the criteria discussed above were met.

### **SBPB RAI-3**

*In order for the staff to confirm that the Type A tests performed on November 10, 2007 and November 1, 1992 meet the criteria in NEI 94-01 Revision 3-A, "Industry Guideline for Implementing Performance – Based Option of 10 CFR Part 50, Appendix J" (ADAMS Accession No. ML12221A202), Section 9.2.3, "Extended Test Intervals," please provide the following information:*

- (a) Provide the as-left minimum pathway leakage rate (MNPLR) for all Type B and Type C pathways that were in service, isolated, or not lined up in their test position (i.e., drained and vented to containment atmosphere) prior to performing the Type A test,*
- (b) List all the pathways and the associated leakage rate that contribute to MNPLR in item (a), above.*
- (c) Provide the performance Leakage Rate (PLR) (= UCL+MNPLR) where UCL is the upper confidence limit,*
- (d) Determine if the "as-found" Type A test meet the performance criterion by showing if  $PLR \leq 1.0 L_a$*
- (e) Cite the calculation method for UCL, i.e. Mass Point method from ANSI/ANS-56.8-1994, Total Time, or Point-to-Point etc.*

### **RESPONSE**

- (a) The requested data for the 2007 and 1992 tests are provided on the following pages in Table 3-1 and Table 3-2, respectively.



**Table 3-1: 2007 ILRT**

| <b>Penetration Number</b> | <b>Description</b>             | <b>Leakage (SCFH)</b> | <b>Penalty (%/day)</b> |
|---------------------------|--------------------------------|-----------------------|------------------------|
| T2301-X100A               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X100B               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X100C               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X100E               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X100F               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X100G               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X101A               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X101B               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X101C               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X101D               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X101E               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X101F               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X102A               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X102B               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X102C               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X102D               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X103A               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X103B               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X104A               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X104B               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X104C               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X104D               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X104E               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X104F               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X105A               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X105D               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X106A               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2301-X106B               | Drywell Electrical Penetration | 0.05                  | 0.000084               |
| T2302-X209A               | Torus Electrical Penetration   | 0.05                  | 0.000084               |
| T2302-X209C               | Torus Electrical Penetration   | 0.05                  | 0.000084               |
| T2302-X228A               | Torus Electrical Penetration   | 0.05                  | 0.000084               |
| T2302-X228B               | Torus Electrical Penetration   | 0.06                  | 0.000101               |
| T2302-X228C               | Torus Electrical Penetration   | 0.06                  | 0.000101               |
| T2302-X228D               | Torus Electrical Penetration   | 0.05                  | 0.000084               |
| X-8                       | Main Steam Line Drains         | 0.05                  | 0.000084               |
| X-9A                      | FW, HPCI, Injection            | 0.12                  | 0.000202               |
| X-9B                      | FW, RCIC, RWCU, Injection      | 0.40                  | 0.000675               |
| X-10                      | RCIC Steam Supply              | 0.05                  | 0.000084               |
| X-11                      | HPCI Steam Supply              | 0.34                  | 0.000574               |
| X-17                      | RHR Head Spray                 | 0.09                  | 0.000152               |
| X-18                      | Floor Drain Sump               | 0.22                  | 0.000371               |

**Table 3-1: 2007 ILRT**

| <b>Penetration Number</b> | <b>Description</b>   | <b>Leakage (SCFH)</b> | <b>Penalty (%/day)</b> |
|---------------------------|--|-----------------------|------------------------|
| X-19                      | Equipment Drain Sump   | 0.05                  | 0.000084               |
| X-20                      | Demineralized Water  | 0.09                  | 0.000152               |
| X-22                      | Division 1 Drywell Nitrogen                                    | 0.05                  | 0.000084               |
| X-27b                     | PASS P34F404A & F403A  | 0.08                  | 0.000135               |
| X-28Cf                    | PASS Division 1  | 0.05                  | 0.000084               |
| X-29Aa                    | Vessel Sample  | 0.05                  | 0.000084               |
| X-35B                     | TIP  | 0.05                  | 0.000084               |
| X-35C                     | TIP  | 0.05                  | 0.000084               |
| X-35D                     | TIP  | 0.05                  | 0.000084               |
| X-35E                     | TIP  | 0.05                  | 0.000084               |
| X-35F                     | TIP  | 0.05                  | 0.000084               |
| X-36                      | Division 2 Drywell Nitrogen                                    | 0.05                  | 0.000084               |
| X-39B                     | RHR Flange   | 0.05                  | 0.000084               |
| X-40Dd                    | PASS Division 2  | 0.05                  | 0.000084               |
| X-42                      | Standby Liquid Control   | 0.05                  | 0.000084               |
| X-43                      | RWCU Suction   | 0.33                  | 0.000557               |
| X-48a-e                   | Rad Monitor T50F450, T5000F456                                 | 0.05                  | 0.000084               |
| X-48f                     | PASS P34F403B & F404B  | 0.08                  | 0.000135               |
| X-49a                     | Recirc Seal B  | 0.05                  | 0.000084               |
| X-51a                     | Recirc Seal A  | 0.05                  | 0.000084               |
| X-214                     | HPCI Vacuum Breakers   | 1.18                  | 0.001991               |
| X-214                     | RCIC Vacuum Breakers   | 0.05                  | 0.000084               |
| X-215                     | PASS P34F408 & F410  | 0.05                  | 0.000084               |
| X-215                     | PCRM T50F451 & T5000F455                                       | 0.05                  | 0.000084               |
| X-230                     | PASS P34F405B & F406B  | 0.17                  | 0.000287               |
| X-231                     | PASS P34F405A & F406A  | 0.08                  | 0.000135               |
| X-23                      | Division 1 EECW Leakage<br>Division 1 Drywell Supply           | 0.05                  | 0.000084               |
| X-24                      | Division 1 EECW Leakage<br>Division 1 Drywell Return           | 0.17                  | 0.000287               |
| X-34A                     | Division 2 EECW Leakage<br>Division 2 Drywell Supply           | 0.05                  | 0.000084               |
| X-34B                     | Division 2 EECW Leakage<br>Division 2 Drywell Return           | 0.06                  | 0.000101               |
| X-12                      | RHR LPCI Suction   | 0.05                  | 0.000084               |
| X-16B                     | Core Spray Division 1  | 0.05                  | 0.000084               |
| X-39A                     | RHR Division 1 Containment Spray                               | 1.24                  | 0.002096               |
| X-211B                    | RHR Division 1 Torus Spray                                     | 2.23                  | 0.003769               |
| X-15<br>X-215<br>X-218    | Division 1 Post LOCA Thermal<br>Recombiner System Leakage Test | 0.05                  | 0.000084               |

**Table 3-1: 2007 ILRT**

| <b>Penetration Number</b> | <b>Description</b>   | <b>Leakage (SCFH)</b> | <b>Penalty (%/day)</b> |
|---------------------------|--|-----------------------|------------------------|
| X-44<br>X-218<br>X-219    | Division 2 Post LOCA Thermal Recombiner System Leakage Test          | 0.13                  | 0.000220               |
| X-48a-e<br>X-215<br>X-230 | Division 1 Primary Containment Monitoring System (PCMS) Leakage Test | 1.09                  | 0.001842               |
| X-27a-e<br>X-219<br>X-231 | Division 2 Primary Containment Monitoring System (PCMS) Leakage Test | 0.25                  | 0.000422               |
| X-37 & X-38               | Scram Discharge Volume (SDV) Vents                                   | 0.14                  | 0.000237               |
| X-37 & X-38               | Scram Discharge Volume (SDV) Drains                                  | 0.05                  | 0.000084               |

**Table 3-2: 1992 ILRT**

| <b>Penetration Number</b> | <b>Description</b>             | <b>Leakage (SCFH)</b> | <b>Penalty (%/day)</b> |
|---------------------------|--------------------------------|-----------------------|------------------------|
| T2301-X100A               | Drywell Electrical Penetration | 0.137                 | 0.0002329              |
| T2301-X100B               | Drywell Electrical Penetration | 0.28                  | 0.000476               |
| T2301-X100C               | Drywell Electrical Penetration | 0.047                 | 0.0000799              |
| T2301-X100E               | Drywell Electrical Penetration | 0.047                 | 0.0000799              |
| T2301-X100F               | Drywell Electrical Penetration | 0.138                 | 0.0002346              |
| T2301-X100G               | Drywell Electrical Penetration | 0.094                 | 0.0001598              |
| T2301-X101A               | Drywell Electrical Penetration | 0.047                 | 0.0000799              |
| T2301-X101B               | Drywell Electrical Penetration | 0.047                 | 0.0000799              |
| T2301-X101C               | Drywell Electrical Penetration | 0.047                 | 0.0000799              |
| T2301-X101D               | Drywell Electrical Penetration | 0.047                 | 0.0000799              |
| T2301-X101E               | Drywell Electrical Penetration | 0.047                 | 0.0000799              |
| T2301-X101F               | Drywell Electrical Penetration | 0.076                 | 0.0001292              |
| T2301-X102A               | Drywell Electrical Penetration | 0.15                  | 0.000255               |
| T2301-X102B               | Drywell Electrical Penetration | 0.047                 | 0.0000799              |
| T2301-X102C               | Drywell Electrical Penetration | 0.05                  | 0.000085               |
| T2301-X102D               | Drywell Electrical Penetration | 0.047                 | 0.0000799              |
| T2301-X103A               | Drywell Electrical Penetration | 0.151                 | 0.0002567              |
| T2301-X103B               | Drywell Electrical Penetration | 0.057                 | 0.0000969              |
| T2301-X104A               | Drywell Electrical Penetration | 0.049                 | 0.0000833              |
| T2301-X104B               | Drywell Electrical Penetration | 0.054                 | 0.0000918              |
| T2301-X104C               | Drywell Electrical Penetration | 0.0513                | 0.00008721             |
| T2301-X104D               | Drywell Electrical Penetration | 0.047                 | 0.0000799              |
| T2301-X104E               | Drywell Electrical Penetration | 0.047                 | 0.0000799              |
| T2301-X104F               | Drywell Electrical Penetration | 0.065                 | 0.0001105              |
| T2301-X105A               | Drywell Electrical Penetration | 0.054                 | 0.0000918              |

**Table 3-2: 1992 ILRT**

| <b>Penetration Number</b> | <b>Description</b>  | <b>Leakage (SCFH)</b> | <b>Penalty (%/day)</b> |
|---------------------------|---|-----------------------|------------------------|
| T2301-X105D               | Drywell Electrical Penetration  | 0.047                 | 0.0000799              |
| T2301-X106A               | Drywell Electrical Penetration  | 0.215                 | 0.0003655              |
| T2301-X106B               | Drywell Electrical Penetration  | 0.047                 | 0.0000799              |
| T2302-X209A               | Torus Electrical Penetration  | 0.047                 | 0.0000799              |
| T2302-X209C               | Torus Electrical Penetration  | 0.127                 | 0.0002159              |
| T2302-X228A               | Torus Electrical Penetration  | 0.047                 | 0.0000799              |
| T2302-X228B               | Torus Electrical Penetration  | 0.047                 | 0.0000799              |
| T2302-X228C               | Torus Electrical Penetration  | 0.047                 | 0.0000799              |
| T2302-X228D               | Torus Electrical Penetration  | 0.047                 | 0.0000799              |
| X-9A                      | FW, HPCI, Injection   | 0.26                  | 0.000442               |
| X-9B                      | FW, RCIC, RWCU, Injection   | 0.16                  | 0.000272               |
| X-18                      | Floor Drain Sump  | 0.57                  | 0.000969               |
| X-19                      | Equipment Drain Sump  | 0.047                 | 0.0000799              |
| X-43                      | RWCU Suction  | 0.047                 | 0.0000799              |
| X-23                      | Division 1 EECW Leakage<br>Division 1 Drywell Supply                    | 1.93                  | 0.003281               |
| X-24                      | Division 1 EECW Leakage<br>Division 1 Drywell Return                    | 0.047                 | 0.0000799              |
| X-39A                     | RHR Division 1 Containment Spray  | 0.557                 | 0.0009469              |
| X-13B                     | RHR Division 1 LPCI   | 0.18                  | 0.000306               |
| X-211B                    | RHR Division 1 Torus Spray  | 0.786                 | 0.0013362              |
| X-39B                     | RHR Division 2 Core Spray   | 1.29                  | 0.002193               |
| X-13A                     | RHR Division 3 LPCI   | 0.047                 | 0.0000799              |
| X-211A                    | RHR Division 2 Torus Spray  | 0.054                 | 0.0000918              |
| X-17                      | RHR Division 2 Head Spray   | 0.047                 | 0.0000799              |
| X-48a-e                   | Division 1 Primary Containment<br>Monitoring System (PCMS) Leakage Test | 0.427                 | 0.0007259              |
| X-215                     | Division 1 Primary Containment<br>Monitoring System (PCMS) Leakage Test | 0.459                 | 0.0007803              |
| X-230                     | Division 1 Primary Containment<br>Monitoring System (PCMS) Leakage Test | 0.11                  | 0.000187               |
| X-27a-e                   | Division 2 Primary Containment<br>Monitoring System (PCMS) Leakage Test | 0.67                  | 0.001139               |
| X-231                     | Division 2 Primary Containment<br>Monitoring System (PCMS) Leakage Test | 0.143                 | 0.0002431              |
| X-219                     | Division 2 Primary Containment<br>Monitoring System (PCMS) Leakage Test | 0.52                  | 0.000884               |
| X-37 & X-38               | Control Rod Drive Scram Discharge<br>Volume                             | 2.027                 | 0.0034459              |

- (b) The requested data for the 2007 and 1992 tests are provided below in Table 3-3 and Table 3-4, respectively.

**Table 3-3: 2007 ILRT**

|  | <b>Total Leakage<br/>(SCFH)</b> | <b>Penalty<br/>(%/day)</b> |
|--|---------------------------------|----------------------------|
| Electrical Penetrations                                    | 1.72                            | 0.002906                   |
| Mechanical Penetrations                                    | 4.23                            | 0.007148                   |
| EECW Penetrations  | 0.22                            | 0.000371                   |
| EECS Divisional Leakage                                    | 3.57                            | 0.006033                   |
| Post LOCA Thermal Recombiner<br>(TRS) System Div 2 Leakage | 0.13                            | 0.000220                   |
| Post LOCA Thermal Recombiner<br>(TRS) System Div 1 Leakage | 0.05                            | 0.000084                   |
| Primary Containment Monitoring<br>(PCMS) Division 1        | 1.09                            | 0.001842                   |
| Primary Containment Monitoring<br>(PCMS) Division 2        | 0.25                            | 0.000422                   |
| Control Rod Drive Scram<br>Discharge Volume                | 0.19                            | 0.000321                   |
| <b>Total Penalty Leakage</b>                               | <b>11.45</b>                    | <b>0.019351</b>            |

**Table 3-4: 1992 ILRT**

|   | <b>Total Leakage<br/>(SCFH)</b> | <b>Penalty<br/>(%/day)</b> |
|---|---------------------------------|----------------------------|
| Electrical Penetrations                             | 2.5943                          | 0.00441031                 |
| Mechanical Penetrations                             | 1.084                           | 0.0018428                  |
| EECW Penetrations                                   | 1.977                           | 0.0033609                  |
| EECS Division Leakage (Worst)                       | 2.961                           | 0.0050337                  |
| Primary Containment Monitoring<br>(PCMS) Division 1 | 0.996                           | 0.0016392                  |
| Primary Containment Monitoring<br>(PCMS) Division 2 | 1.333                           | 0.0022661                  |
| Control Rod Drive Scram<br>Discharge Volume         | 2.027                           | 0.0034459                  |
| <b>Total Penalty Leakage</b>                        | <b>12.9723</b>                  | <b>0.0220529</b>           |

- (c) In 2007, the performance leakage rate (PLR) (=UCL+MNPLR), where UCL is the upper confidence limit, was 0.213 (%/day). The BN-TOP-1 UCL was 0.1166 (%/day). The MNPLR was 0.0194 (%/day) for Type B and Type C penalty leakage, 0.029 (%/day) for Nitrogen In-Leakage correction, and the water level correction was 0.048 (%/day). All of these added together equaled 0.213 (%/day).

In 1992, the performance leakage rate (PLR) ( $=UCL+MNPLR$ ), where UCL is the upper confidence limit, was 0.244 (%/day). The BN-TOP-1 UCL was 0.2116 (%/day). The MNPLR was 0.0221 (%/day) for Type B and Type C penalty leakage, 0.0097 (%/day) for Nitrogen In-leakage correction, and the water level correction was 0.0 (%/day). All of these added together equaled 0.244 (%/day).

(d) NEI 94-01, Revision 3-A, Section 9.2.3, "Extended Test Intervals," states:

"For purposes of determining an extended test interval, the performance leakage rate is as defined in Section 5.0 and repeated here for completeness: The performance leakage rate is calculated as the sum of the Type A upper confidence limit (UCL) and as-left minimum pathway leakage rate (MNPLR) leakage rate for all Type B and Type C pathways that were in service, isolated, or not lined up in their test position (i.e., drained and vented to containment atmosphere) prior to performing the Type A test. In addition, leakage pathways that were isolated during performance of the test because of excessive leakage must be factored into the performance determination. If the pathway leakage can be determined by a local leakage rate test, the as-left MNPLR for that leakage path must also be added to the Type A UCL. If an excessively leaking containment penetration barrier pathway is discovered during the Type A test, and the pathway is neither a Type B or a Type C tested pathway, it shall still be tested to Type B or Type C test requirements after the Type A test and its as-left MNPLR added to the Type A test UCL. In this case the Type A test performance criterion is not met unless that pathway is subsequently added to the Type B or Type C test program. If the excessive leakage is from a source that can be tested only during a Type A test, the Type A test performance criterion is not met."

NEI 94-01, Revision 3-A, Section 5.0, "Definitions," states that:

"the performance leakage rate is calculated as the sum of the Type A upper confidence limit (UCL) and as-left minimum pathway leakage rate (MNPLR) leakage rate for all Type B and Type C pathways that were in service, isolated, or not lined up in their test position (i.e., drained and vented to containment atmosphere) prior to performing the Type A test. In addition, leakage pathways that were isolated during performance of the test because of excessive leakage must be factored into the performance determination. The performance criterion for Type A tests is a performance leak rate of less than 1.0La."

In 2007, the performance leakage rate (PLR) ( $=UCL+MNPLR$ ), where UCL is the upper confidence limit, was 0.213 (%/day), as discussed in the response to part (c) above. In 1992, the performance leakage rate (PLR) ( $=UCL+MNPLR$ ), where UCL is the upper confidence limit, was 0.244 (%/day), as discussed in the response to part (c) above. Based on the definition for PLR contained within NEI 94-01, Revision 3-A, the performance criterion for  $PLR \leq 1.0 La$  (0.5 %/day) has been met.

(e) The calculation method is the Total Time Method (BN-TOP-1).

#### **SBPB RAI-4**

*NEI 94-01, Revision 3-A, states that prior to determining and implementing extended test intervals for Type B and Type C components, an assessment of the plant's containment penetration and valve performance should be performed and documented. Factors that should be considered during the assessment include (but not limited to) past component performance, service, design, safety impact; and cause determination. In addition, Section 11.3.2, "Programmatic Controls," require additional considerations if the test interval is greater than 60 months such as "As-found tests," "schedule," and "review." Your letter dated March 22, 2016, does not address how these factors are incorporated into the current Fermi 2 plant specific 10 CFR 50, Appendix J, testing program.*

*The staff requests that the licensee provide a summary of how Fermi 2 incorporates these factors and considerations in its current 10 CFR 50, Appendix J, testing program and whether any significant program enhancements will be required after the staff's approval of the proposed amendment.*

#### **RESPONSE**

Fermi 2 assesses and documents the plant's containment penetrations and valve performance in a post-outage test report. The outage report contains the results of all Type B and Type C tests performed during the previous operating cycle and the results of Type B and Type C tests performed during the outage. The report includes evaluations that take into account the past test performance, service, frequency, design, and safety impact for Type B and Type C tested components that are evaluated for frequency extension. The evaluations include containment isolation valve failures, the failure cause and corrective actions, and valves that exceeded established repair guidelines.

Fermi 2 will continue to assess and document the plant's containment penetrations and valve performance in post-outage evaluations. Per NEI 94-01, Revision 3-A, Section 11.3.2, "Programmatic Controls," for extending "test intervals of greater than 60 months for a Type B or a Type C tested component," the post-outage report will also include "an estimate of the amount of understatement in the minimum pathway Type B & C summation," and "the reasoning and determination of the acceptability of the extension." Fermi 2 procedures will be enhanced to incorporate the amount of understatement in the minimum pathway Type B and Type C summation.

## **SBPB RAI-5**

*Per the guidance of NEI 94-01 Revision 0, Section 10.2.3.2 and subject to the four exemptions identified in NRC Regulatory Guide 1.163, (Draft was DG-1037) "Performance-Based Containment Leak-Rate Testing program," (ADAMS Accession No. ML11327A025), Fermi 2 is currently allowed to extend the test intervals for Type C containment isolation valves (CIVs) up to 60 months.*

*Section 10.2.3.2, "Extended Test Interval of NEI 94-01," of both Revision 0 and Revision 3-A states in part:*

*Test intervals for Type C valves may be increased based upon completion of two consecutive periodic As-found Type C tests where the result of each test is within a licensee's allowable administrative limits.*

*The staff requests that the licensee provide additional information regarding:*

- 1) The two most recent individual "As-Found" Type C test results, including administrative limits, for Fermi 2 containment isolation valves. Also provide a brief valve description and any required corrective actions.*

*Your letter, dated March 22, 2016, details repetitive Type C Local Leak Rate Test (LLRT) failures for valves associated with Penetrations X-42 and X-19. Please provide a summary about the causes of these failures and what long term corrective actions have been or will be implemented to prevent recurrence.*

- 2) Also in your March 22, 2016 letter, you indicate a valve seat condition failure for Penetration X-9B (i.e. Valve B2100F076B). Have there been other failures of LLRTs associated with Penetrations X-9A and X-9B since RF12 in 2007 that would suggest the corrective actions associated with LER 2007-001 may need further enhancement? (If there had been other failures, it would have been in this table. Also referencing an LER we are getting into inspection space.*

## **RESPONSE**

- 1) The two most recent test results are provided at the end of this response in Table 5-1 (and associated notes following the table) for the Type C air tests and Table 5-2 for the Type C water tests. In both tables, the most recent As-Found test result is in the far-right column (labeled as T<sub>1</sub>) and the next most recent As-Found test result is in the second column from the right (labeled as T<sub>2</sub>). Correction actions were discussed in Tables 4.1-1 and 4.1-2 of Enclosure 1 of the original LAR. Additional details regarding the corrective actions for penetrations X-42 and X-19 are provided as follows.*



The cause of the failures for penetration X-42 (C4100F006 “Standby Liquid Control Injection Line Outboard Check Valve” and C4100F007 “Standby Liquid Control Injection Line Inboard Check Valve”) was that the valve soft seats were degraded. The corrective actions for these components included the valves being disassembled, inspected, cleaned, and the valve soft seats were replaced. The Preventive Maintenance (PM) events were also reviewed for proper alignment. Based on the review, the frequencies of the PM events to disassemble the valve, inspect, clean, and replace soft seats for the C4100F006 and C4100F007 valves were changed from 9 years to 6 years. Currently, these valves are tested on a one refuel (1R) frequency.

In RF16, penetration X-19, (G1154F018 “Drywell Equipment Drain Sump Inboard Containment Isolation Valve” and G1100F019 “Drywell Equipment Drain Sump Outboard Containment Isolation Valve”) valves G1154F018 and G1100F019 were above their acceptance criteria. The acceptance criterion for both G1154F018 and G1100F019 is 2.0 SCFH. The measured As-Found leakage rates in RF16 were 5.75 SCFH for G1154F018 and 2.30 SCFH for G1100F019. The cause was determined to be seat degradation attributed to poor water quality. As part of the corrective actions, an evaluation was performed to document and accept the RF16 measured leakage rate of these components, as there was minimal impact to the overall primary containment leakage rate. Based on the minimal impact of the measured leakage rates, they were accepted for Cycle 17 and these components were required to be tested again in RF17. Contingent work orders were planned for maintenance in RF17 and a 1R test frequency was put into place based on the measured As-Found leakage rate.

In RF17, Penetration X-19, the As-Found measured leakage rates were 1.06 SCFH for G1154F018 and 7.32 SCFH for G1100F019. The cause of failure of G1100F019 was that the wedge had linear markings. The corrective actions taken included disassembly of the G1100F019 and the wedge was polished, as stated in Table 4.1-2 of the original LAR. The As-Left measured leakage for G1100F019 was 0.05 SCFH.

- 2) Since 2007 there have been no valve failures on penetration X-9A. There have been two valve failures on penetration X-9B. During RF13 (2009), B2100F010B was above the allowable leakage limit of 10.0 SCFH. The measured leakage rate was 55.20 SCFH. During RF16 (2014), B2100F076B was above the allowable leakage limit of 10.0 SCFH. The measured leakage rate was 11.66 SCFH. The corrective action to replace the soft seat every refuel on B2100F076A/B has been successful with only the one marginal failure. The inboard feedwater check valves (B2100F010A/B) had their soft seats removed and were hard seated in RF14 (2010). All subsequent as found tests have been successful. The hard seating was discussed in Section 3.2.2 of the original LAR. As required by NEI 94-01, these penetrations are tested every refuel outage.

**Table 5-1: Type C Air**

| <b>Penetration</b> | <b>PIS</b>  | <b>Description</b>   | <b>Allowable Leakage (SCFH)</b> | <b>T<sub>2</sub>* As-Found (SCFH)</b> | <b>T<sub>1</sub>* As-Found (SCFH)</b> |
|--------------------|-------------|--|---------------------------------|---------------------------------------|---------------------------------------|
| X-8                | B2103-F016  | Main Steam Line Inboard Drain Isolation Valve                  | 2.5                             | 0.05                                  | 0.05                                  |
|                    | B2130-F019  | Main Steam Line Outboard Drain Isolation Valve                 | 2                               | 0.05                                  | 0.05                                  |
| X-9A               | B2100-F010A | Feedwater Supply Line A Inboard Check Valve                    | 10                              | 0.05                                  | 0.05                                  |
|                    | B2100-F076A | Feedwater Supply Line A Outboard Check Valve                   | 10                              | 0.05                                  | 0.12                                  |
|                    | E4150-F006  | HPCI Main Pump Discharge Inboard Isolation Valve               |                                 |                                       |                                       |
| X-9B               | B2100-F010B | Feedwater Supply Line B Inboard Check Valve                    | 10                              | 0.07                                  | 0.05                                  |
|                    | B2100-F076B | Feedwater Supply Line B Outboard Check Valve                   | 10                              | 11.66                                 | 0.17                                  |
|                    | E5150-F013  | RCIC Discharge to FW Inboard Isolation Valve                   |                                 |                                       |                                       |
|                    | G3352-F220  | RWCU to FW Outboard Containment Isolation Valve                |                                 |                                       |                                       |
| X-10               | E5150-F007  | RCIC Turbine Steam Supply Inboard Containment Isolation Valve  | 3                               | 0.05                                  | 0.05                                  |
|                    | E5150-F008  | RCIC Turbine Steam Supply Outboard Containment Isolation Valve | 2                               | (See Note 1)                          | 0.05                                  |
| X-11               | E4150-F002  | HPCI Turbine Steam Supply Inboard Containment Isolation Valve  | 6.5                             | 0.05                                  | 0.05                                  |
|                    | E4150-F003  | HPCI Turbine Steam Supply Outboard Containment Isolation Valve | 5                               | 0.34                                  | 0.33                                  |
|                    | E4150-F600  | HPCI Turbine Steam Supply Outboard Isolation Bypass Valve      |                                 |                                       |                                       |
| X-12               | E1150-F009  | RHR Shutdown Cooling Inboard Suction Isolation Valve           | 20                              | 0.38                                  | 0.05                                  |
|                    | E1150-F608  | RHR Shutdown Cooling Inboard Suction Valve Bypass Valve        |                                 |                                       |                                       |
|                    | E1100-F408  | RHR Shutdown Cooling Suction Thermal Relief Line Check Valve   | 2                               | 0.05                                  | 0.05                                  |
|                    | E1150-F008  | RHR Shutdown Cooling Outboard Suction Isolation Valve          | 20                              | 0.98                                  | 1.2                                   |
| X-15               | T4804-F603A | Division 1 TRS Drywell Suction Inboard Isolation Valve         | 4                               | 0.14                                  | 0.52                                  |
|                    | T4804-F605A | Division 1 TRS Drywell Suction Outboard Isolation Valve        |                                 |                                       |                                       |
| X-16A              | E2150-F005B | Division 2 Core Spray Inboard Isolation Valve                  | 12                              | 0.29                                  | 0.08                                  |
|                    | E2100-F006B | Division 2 Core Spray Testable Check Valve                     | 12                              | 0.05                                  | 0.05                                  |
| X-16B              | E2150-F005A | Division 1 Core Spray Inboard Isolation Valve                  | 12                              | 0.05                                  | 0.16                                  |
|                    | E2100-F006A | Division 1 Core Spray Testable Check Valve                     | 12                              | 0.05                                  | 0.05                                  |

**Table 5-1: Type C Air**

| <b>Penetration</b> | <b>PIS</b>  | <b>Description</b>   | <b>Allowable Leakage (SCFH)</b> | <b>T<sub>2</sub>* As-Found (SCFH)</b> | <b>T<sub>1</sub>* As-Found (SCFH)</b> |
|--------------------|-------------|--|---------------------------------|---------------------------------------|---------------------------------------|
| X-17               | E1150-F022  | RHR RPV Head Spray Inboard Containment Isolation Valve                     | 6                               | 0.09                                  | 0.1                                   |
|                    | E1150-F023  | RHR RPV Head Spray Outboard Containment Isolation Valve                    | 6                               | 1.05                                  | 1.09                                  |
| X-18               | G1154-F600  | Drywell Floor Drain Sump Inboard Containment Isolation Valve               | 4.5                             | 0.05                                  | 10.69                                 |
|                    | G1100-D077  | Drywell Floor Drain Discharge Piping Rupture Disc                          | 0.5                             | 0.05                                  | 0.05                                  |
|                    | G1100-F003  | Drywell Floor Drain Sump Outboard Containment Isolation Valve              | 2                               | 0.15                                  | 15.55                                 |
| X-19               | G1154-F018  | Drywell Equipment Drain Sump Inboard Containment Isolation Valve           | 2                               | 5.75                                  | 1.06                                  |
|                    | G1100-D078  | Drywell Equipment Drain Discharge Piping Rupture Disc                      | 0.5                             | 0.05                                  | 0.05                                  |
|                    | G1100-F019  | Drywell Equipment Drain Sump Outboard Containment Isolation Valve          | 2                               | 2.3                                   | 7.32                                  |
| X-20               | P1100-F126  | CSAT Drywell Supply Header Inboard Isolation Valve                         | 6                               | 0.69                                  | 2.25                                  |
|                    | P1100-D013  | CSAT Demin Water Line to Drywell LLRT Spectacle Flange                     | 6                               | 0.07                                  | 0.05                                  |
| X-22               | T4901-F601  | Division 1 Drywell Pneumatics Supply Inboard Isolation Valve               | 3                               | 0.05                                  | 1.14                                  |
|                    | T4901-F465  | Division 1 Drywell Pneumatics Supply Outboard Isolation Valve              |                                 |                                       |                                       |
|                    | T4901-F007  | Division 1 Drywell Pneumatics Supply Outboard Isolation Valve Bypass Valve |                                 |                                       |                                       |
| X-23               | P4400-F282A | EECW Division 1 Supply to Drywell Check Valve                              | 3.5                             | 0.05                                  | 0.05                                  |
|                    | P4400-F606A | Division 1 EECW Drywell Outboard Supply Valve                              | 3                               | 0.05                                  | 0.2                                   |
| X-24               | P4400-F616  | Division 1 EECW Drywell Inboard Return Valve                               | 4                               | 3.46                                  | 0.05                                  |
|                    | P4400-F607A | Division 1 EECW Drywell Outboard Return Valve                              | 3                               | 0.6                                   | 0.17                                  |
| X-25               | T4803-F602  | CAC N2 Inerting Drywell Inboard Exhaust Isolation Valve                    | 14.87                           | 1.36                                  | Leakage off scale (See Note 2)        |
|                    | T4600-F402  | SGTS Drywell Purge Isolation Valve   |                                 |                                       |                                       |
|                    | T4600-F411  | SGTS Drywell Purge Line Isolation Bypass Valve                             |                                 |                                       |                                       |
| X-26               | T4803-F601  | CAC N2 Inerting Drywell Air Purge Inlet Supply Isolation Valve             | 14.87                           | 1.66                                  | 1.44 (See Note 2)                     |
|                    | T4800-F407  | CAC N2 Inerting Drywell Air Purge Inlet Supply Vent Valve                  |                                 |                                       |                                       |
|                    | T4800-F408  | CAC N2 Inerting Drywell N2 Supply Isolation Valve                          |                                 |                                       |                                       |

**Table 5-1: Type C Air**

| <b>Penetration</b> | <b>PIS</b>  | <b>Description</b>  | <b>Allowable Leakage (SCFH)</b> | <b>T<sub>2</sub>* As-Found (SCFH)</b> | <b>T<sub>1</sub>* As-Found (SCFH)</b> |
|--------------------|-------------|---|---------------------------------|---------------------------------------|---------------------------------------|
| X-27a-e            | T5000-F401B | PCAM T50L400B Containment Outboard Sample Valve                               | 2                               | 0.05                                  | 0.09                                  |
|                    | T5000-F403B | PCAM T50L402B Containment Outboard Sample Valve                               |                                 |                                       |                                       |
|                    | T5000-F404B | PCAM T50L403B Containment Outboard Sample Valve                               |                                 |                                       |                                       |
|                    | T5000-F405B | PCAM T50L404B Containment Outboard Sample Valve                               |                                 |                                       |                                       |
| X-27b              | T5000-F402B | PCAM T50L401B Containment Outboard Sample Valve                               | 1                               | 0.05                                  | 0.05                                  |
|                    | P34-F404A   | Division 2 PASS Drywell Atm Inboard Isolation Valve                           |                                 |                                       |                                       |
| X-27f              | T5000-F402B | PCAM T50L401B Containment Outboard Sample Valve                               | 1                               | 0.05                                  | 0.16                                  |
|                    | P34-F403A   | Division 2 PASS Drywell Atm Inboard Isolation Valve                           |                                 |                                       |                                       |
|                    | T50-F458    | Division 2 PCMS Level Instrument Isolation Valve                              | 2                               | 0.05                                  | 0.05                                  |
| X-28Cf             | P34-F401A   | Division 2 PASS Jet Pump #5 Reactor Water Sample Isolation Valve              | 1                               | 0.05                                  | 0.05                                  |
| X-29Aa             | B3100-F019  | Reactor Recirc Reactor Water Sample Line Inboard Containment Isolation Valve  | 2                               | 0.05                                  | 0.1                                   |
|                    | B3100-F020  | Reactor Recirc Reactor Water Sample Line Outboard Containment Isolation Valve | 2                               | 0.05                                  | 0.05                                  |
| X-29Bb             | E11-F412    | Division 2 RHR Drywell Pressure Isolation Valve                               | 2                               | 0.05                                  | 0.05                                  |
| X-29Bc             | E11-F413    | Division 2 RHR Drywell Press Isolation Valve                                  | 2                               | 0.05                                  | 0.09                                  |
| X-29Be             | T5000-F420B | PCAM PC Pressure Monitor T50L406B PT Outboard Sample Valve                    | 2                               | 0.05                                  | 0.05                                  |
| X-31B              | T4800-F453  | CAC N2 Inerting Drywell Pressure Control Vent Isolation Valve                 | 2                               | 0.05                                  | 0.7                                   |
|                    | T4800-F454  | CAC N2 Inerting Drywell N2 Makeup Outboard Isolation Valve                    |                                 |                                       |                                       |
|                    | T4800-F455  | CAC N2 Inerting Drywell N2 Makeup Inboard Isolation Valve                     |                                 |                                       |                                       |
| X-34A              | P4400-F282B | EECW Division 2 Supply to Drywell Equipment Check Valve                       | 3.5                             | 0.05                                  | 0.05                                  |
|                    | P4400-F606B | EECW Division 2 Supply to Drywell Equipment Outboard Isolation Valve          | 3                               | 0.05                                  | 0.12                                  |
| X-34B              | P4400-F615  | EECW Division 2 Drywell Equipment Inboard Return Isolation Valve              | 4                               | 1.7                                   | 0.05                                  |
|                    | P4400-F607B | EECW Division 2 Drywell Equipment Outboard Return Isolation Valve             | 3                               | 0.06                                  | 1.47                                  |

**Table 5-1: Type C Air**

| <b>Penetration</b> | <b>PIS</b>  | <b>Description</b>   | <b>Allowable Leakage (SCFH)</b> | <b>T<sub>2</sub>* As-Found (SCFH)</b> | <b>T<sub>1</sub>* As-Found (SCFH)</b> |
|--------------------|-------------|--|---------------------------------|---------------------------------------|---------------------------------------|
| X-35B              | C5100-F002B | Channel B TIP System Ball Valve  | 2                               | 0.05                                  | 0.05                                  |
| X-35C              | C5100-F002A | Channel A TIP System Ball Valve  | 2                               | 0.05                                  | 0.05                                  |
| X-35D              | C5100-F002C | Channel C TIP System Ball Valve  | 2                               | 0.05                                  | 0.05                                  |
| X-35E              | C5100-F002E | Channel E TIP System Ball Valve  | 2                               | 0.05                                  | 0.05                                  |
| X-35F              | C5100-F002D | Channel D TIP System Ball Valve  | 2                               | 0.05                                  | 0.05                                  |
| X-36               | T4901-F602  | Division 2 Drywell Pneumatics Supply Inboard Isolation Valve               | 3                               | 0.39                                  | 0.42                                  |
|                    | T4901-F468  | Division 2 Drywell Pneumatics Supply Outboard Isolation Valve              |                                 |                                       |                                       |
|                    | T4901-F016  | Division 2 Drywell Pneumatics Supply Outboard Isolation Valve Bypass Valve |                                 |                                       |                                       |
| X-37 & 38          | C1100-F010  | CRD Scram Discharge Volume Vent Valve                                      | 5.5                             | 0.1                                   | 0.13                                  |
|                    | C1100-F180  | CRD Scram Discharge Volume Vent Valve                                      | 5.5                             | 1.59                                  | 0.05                                  |
|                    | C1100-F011  | CRD Scram Discharge Headers Clean RW Drain Valve                           | 5.5                             | 3.58                                  | 0.94                                  |
|                    | C1100-F181  | CRD Scram Discharge Volume to Torus Room Sump D065 Drain Valve             | 5.5                             | 0.1                                   | 3.23                                  |
| X-39A              | E1150-F021A | RHR Division 1 Drywell Spray Inboard Isolation Valve                       | 12                              | 6.01                                  | 0.98                                  |
|                    | E1150-F016A | RHR Division 1 Drywell Spray Outboard Isolation Valve                      | 12                              | 1.44                                  | 1.72                                  |
| X-39B              | E1150-F021B | RHR Division 2 Drywell Spray Inboard Isolation Valve                       | 12                              | 0.21                                  | 0.08                                  |
|                    | E1150-F016B | RHR Division 2 Drywell Spray Outboard Isolation Valve                      | 12                              | 0.23                                  | 0.05                                  |
| X-40Dd             | P34-F401B   | Division 1 PASS Jet Pump #15 Reactor Water Sample Isolation Valve          | 1                               | 0.05                                  | 0.05                                  |
| X-42               | C4100-F007  | Standby Liquid Control Inboard Check Valve                                 | 3                               | Leakage off scale                     | 16.3                                  |
|                    | C4100-F006  | Standby Liquid Control Outboard Check Valve                                | 3                               | 0.05                                  | Leakage off scale                     |
| X-43               | G3352-F001  | Reactor Water Cleanup Inboard Containment Isolation Valve (MOV)            | 10                              | 5.81                                  | 6.03                                  |
|                    | G3352-F004  | Reactor Water Cleanup Outboard Containment Isolation Valve (MOV)           | 6                               | 0.33                                  | 0.27                                  |

**Table 5-1: Type C Air**

| <b>Penetration</b> | <b>PIS</b>  | <b>Description</b>   | <b>Allowable Leakage (SCFH)</b> | <b>T<sub>2</sub>* As-Found (SCFH)</b> | <b>T<sub>1</sub>* As-Found (SCFH)</b> |
|--------------------|-------------|--|---------------------------------|---------------------------------------|---------------------------------------|
| X-44               | T4804-F603B | CAC H2 Recombiner Division 2 Drywell Suction Inboard Isolation Valve (MOV)                         | 4                               | 0.1                                   | 0.14                                  |
|                    | T4804-F605B | CAC H2 Recombiner Division 2 Drywell Suction Outboard Isolation Valve (MOV)                        |                                 |                                       |                                       |
| X-47a              | E11-F414    | RHR Primary Containment Monitoring Division 1 (RHR Drywell Pressure Isolation Valve)               | 2                               | 0.05                                  | 0.08                                  |
| X-47b              | E11-F415    | RHR Primary Containment Monitoring Division 1 (RHR Drywell Pressure Isolation Valve)               | 2                               | 0.11                                  | 0.07                                  |
| X-47e              | T5000-F420A | PCAM PC Pressure Monitoring T50L406A Pressure Outboard Isolation Valve (AOV)                       | 2                               | 0.92                                  | 0.16                                  |
| X-48a-e            | T5000-F401A | PCAM T50L400A CT Outboard Sample (AOV)   | 2                               | 0.41                                  | 0.43                                  |
|                    | T5000-F402A | PCAM T50L401A CT Outboard Sample (AOV)   |                                 |                                       |                                       |
|                    | T5000-F403A | PCAM T50L402A CT Outboard Sample (AOV)   |                                 |                                       |                                       |
|                    | T5000-F404A | PCAM T50L403A CT Outboard Sample (AOV)   |                                 |                                       |                                       |
|                    | T5000-F405A | PCAM T50L404A CT Outboard Sample (AOV)   |                                 |                                       |                                       |
| X-48a-e            | T50-F450    | PCAM Primary Containment Radiation Monitoring System Inlet Outboard Isolation Valve (SOV)          | 2                               | 0.05                                  | 0.05                                  |
|                    | T5000-F456  | PCAM Primary Containment Radiation Monitoring System Inlet Inboard Isolation Valve (SOV)           | 2                               | 0.05                                  | 0.05                                  |
| X-48f              | P34-F403B   | Division 1 PASS Drywell ATM Inboard Isolation Valve (SOV)  | 1                               | 0.05                                  | 0.07                                  |
|                    | P34-F404B   | Division 1 PASS Drywell ATM Outboard Isolation Valve (SOV)   | 1                               | 0.17                                  | 0.14                                  |
| X-49a              | B3100-F016B | Reactor Recirc Supply to Division 2 Inboard Seal Cavity Outboard Containment Isolation Valve (AOV) | 2                               | 0.08                                  | 0.05                                  |
|                    | B3100-F014B | Reactor Recirc Supply to Division 2 Inboard Seal Cavity Inboard Containment Isolation Valve (AOV)  | 2                               | 0.16                                  | 0.05                                  |

**Table 5-1: Type C Air**

| <b>Penetration</b> | <b>PIS</b>  | <b>Description</b>   | <b>Allowable Leakage (SCFH)</b> | <b>T<sub>2</sub>* As-Found (SCFH)</b> | <b>T<sub>1</sub>* As-Found (SCFH)</b> |
|--------------------|-------------|--|---------------------------------|---------------------------------------|---------------------------------------|
| X-51a              | B3100-F016A | Reactor Recirc CRD Supply to Division 1 Inboard Seal Cavity Outboard Containment Isolation (AOV) | 2                               | 0.05                                  | 0.13                                  |
|                    | B3100-F014A | Reactor Recirc CRD Supply to Division 1 Inboard Seal Cavity Inboard Containment Isolation (AOV)  | 2                               | 0.05                                  | 0.07                                  |
| X-204A             | T4800-F416  | CAC N2 Inerting to Vacuum Breaker Valve T23-F400A N2 Supply Isolation Valve (AOV)                | 2                               | 0.05                                  | 0.05                                  |
| X-204B             | T4800-F417  | CAC N2 Inerting to Vacuum Breaker Valve T23-F400B N2 Supply Isolation Valve (AOV)                | 2                               | 0.05                                  | 0.05                                  |
| X-204C             | T4800-F418  | CAC N2 Inerting to Vacuum Breaker Valve T23-F400C N2 Supply Isolation Valve (AOV)                | 2                               | 0.52                                  | 0.19                                  |
| X-204D             | T4800-F419  | CAC N2 Inerting to Vacuum Breaker Valve T23-F400D N2 Supply Isolation Valve (AOV)                | 2                               | 0.05                                  | 0.05                                  |
| X-204E             | T4800-F420  | CAC N2 Inerting to Vacuum Breaker Valve T23-F400E N2 Supply Isolation Valve (AOV)                | 2                               | 0.05                                  | 0.07                                  |
| X-204F             | T4800-F421  | CAC N2 Inerting to Vacuum Breaker Valve T23-F400F N2 Supply Isolation Valve (AOV)                | 2                               | 0.05                                  | 0.05                                  |
| X-204G             | T4800-F422  | CAC N2 Inerting to Vacuum Breaker Valve T23-F400G N2 Supply Isolation Valve (AOV)                | 2                               | 0.15                                  | 0.11                                  |
| X-204H             | T4800-F423  | CAC N2 Inerting to Vacuum Breaker Valve T23-F400H N2 Supply Isolation Valve (AOV)                | 2                               | 0.62                                  | 0.09                                  |
| X-204J             | T4800-F424  | CAC N2 Inerting to Vacuum Breaker Valve T23-F400J N2 Supply Isolation Valve (AOV)                | 2                               | 0.05                                  | 0.11                                  |
| X-204K             | T4800-F425  | CAC N2 Inerting to Vacuum Breaker Valve T23-F400K N2 Supply Isolation Valve (AOV)                | 2                               | 0.05                                  | 0.53                                  |
| X-204L             | T4800-F426  | CAC N2 Inerting to Vacuum Breaker Valve T23-F400L N2 Supply Isolation Valve (AOV)                | 2                               | 0.05                                  | 0.05                                  |
| X-204M             | T4800-F427  | CAC N2 Inerting to Vacuum Breaker Valve T23-F400M N2 Supply Isolation Valve (AOV)                | 2                               | 0.05                                  | 0.05                                  |

**Table 5-1: Type C Air**

| <b>Penetration</b> | <b>PIS</b>  | <b>Description</b>  | <b>Allowable Leakage (SCFH)</b> | <b>T<sub>2</sub>* As-Found (SCFH)</b> | <b>T<sub>1</sub>* As-Found (SCFH)</b> |
|--------------------|-------------|---|---------------------------------|---------------------------------------|---------------------------------------|
| X-205A             | T2300-F450B | Primary Containment Suppression Chamber Reactor Building Vacuum Breaker Check Valve (AOV)         | 20                              | 11.52                                 | 13.69                                 |
|                    | T2300-F410  | Primary Containment Suppression Chamber Reactor Building Vacuum Breaker Isolation Valve (AOV)     |                                 |                                       |                                       |
| X-205B             | T2300-F450A | Primary Containment Suppression Chamber Reactor Building Vacuum Breaker Check Valve (AOV)         | 20                              | 2.4                                   | 32.03                                 |
|                    | T2300-F409  | Primary Containment Suppression Chamber Reactor Building Vacuum Breaker Isolation Valve (AOV)     |                                 |                                       |                                       |
| X-205C             | T4800-F404  | CAC N2 Inerting Suppression Pool N2 Supply Inlet Isolation (AOV)                                  | 14.87                           | 0.91                                  | 1.98<br>(See Note 2)                  |
|                    | T4800-F405  | CAC N2 Inerting Suppression Pool Vent Valve (AOV)   |                                 |                                       |                                       |
|                    | T4800-F409  | CAC N2 Inerting Suppression Pool N2 Supply Isolation AOV  |                                 |                                       |                                       |
| X-205D             | T4600-F400  | SGTS Suppression Chamber Purge Isolation Valve (AOV)  | 14.87                           | 6.35                                  | 3.79<br>(See Note 2)                  |
|                    | T4600-F401  | SGTS Suppression Chamber Purge Line Isolation Valve (AOV)   |                                 |                                       |                                       |
|                    | T4600-F412  | SGTS Suppression Chamber Purge Line Isolation Bypass Valve (AOV)                                  |                                 |                                       |                                       |
|                    | T4800-F410  | CAC N2 Inerting N2 Supply to Standby Gas Treatment (N2 Supply to Torus Exhaust Isolation Valve)   |                                 |                                       |                                       |
|                    | T4800-F456  | CAC N2 Inerting to SGTS N2 Supply Bypass (Torus Pressure Control N2 Supply) Isolation Valve (AOV) | 2                               | 0.05                                  | 0.05                                  |
|                    | T4800-F457  | CAC N2 Inerting to SGTS N2 Supply Bypass (Torus Pressure Control Inboard) Isolation Valve (AOV)   |                                 |                                       |                                       |
|                    | T4800-F458  | CAC N2 Inerting to SGTS N2 Supply Bypass (Torus Pressure Control Vent) Isolation Valve (AOV)      |                                 |                                       |                                       |
| X-206A             | E41-F402    | HPCI PCM Suppression Pool (Division 2 Torus Level Instrument Isolation Valve) (SOV)               | 2                               | 0.2                                   | 0.17                                  |
| X-206D             | E41-F400    | HPCI PCM Suppression Pool (Division 1 Torus Level Instrument Isolation Valve) (SOV)               | 2                               | 0.15                                  | 0.05                                  |



**Table 5-1: Type C Air**

| <b>Penetration</b> | <b>PIS</b>  | <b>Description</b>   | <b>Allowable Leakage (SCFH)</b> | <b>T<sub>2</sub>* As-Found (SCFH)</b> | <b>T<sub>1</sub>* As-Found (SCFH)</b> |
|--------------------|-------------|--|---------------------------------|---------------------------------------|---------------------------------------|
| X-211A             | E1150-F024B | RHR Division 2 Containment Cooling/Test (Division 2 RHR Torus Cooling) Isolation Valve (MOV)                             | 18                              | 0.05                                  | 0.05                                  |
|                    | E1150-F027B | RHR Division 2 Suppression Pool Containment Spray Inboard Containment (Division 2 RHR Torus Spray) Isolation Valve (MOV) |                                 |                                       |                                       |
|                    | E1150-F028B | RHR Division 2 Suppression Pool Containment Spray / Test (Division 2 RHR Torus) Isolation Valve (MOV)                    |                                 |                                       |                                       |
| X-211B             | E1150-F024A | RHR Division 1 Containment Cooling/Test (Division 1 RHR Cooling) Isolation Valve (MOV)                                   | 18                              | 3                                     | 3.57                                  |
|                    | E1150-F027A | RHR Division 1 Suppression Pool Containment Spray Inboard Containment (Division 1 RHR Torus Spray) Isolation Valve (MOV) |                                 |                                       |                                       |
|                    | E1150-F028A | RHR Division 1 Suppression Pool Containment Spray / Test (Division 1 RHR Torus) Isolation Valve (MOV)                    |                                 |                                       |                                       |
| X-214              | E5150-F062  | RCIC Turbine Exhaust Line Vacuum Breaker Outboard Isolation Valve (MOV)  | 4.5                             | 1.57                                  | 2.7                                   |
|                    | E5150-F084  | RCIC Turbine Exhaust Line Vacuum Breaker Inboard Isolation Valve (MOV)   | 4.5                             | 1.93                                  | 0.18                                  |
|                    | E4150-F075  | HPCI Turbine Exhaust Line Vacuum Breaker Outboard Isolation Valve (MOV)  | 4.5                             | 1.4                                   | 0.23                                  |
|                    | E4150-F079  | HPCI Turbine Exhaust Line Vacuum Breaker Inboard Isolation Valve (MOV)   | 4.5                             | 1.66                                  | 1.21                                  |

**Table 5-1: Type C Air**

| <b>Penetration</b> | <b>PIS</b>  | <b>Description</b>  | <b>Allowable Leakage (SCFH)</b> | <b>T<sub>2</sub>* As-Found (SCFH)</b> | <b>T<sub>1</sub>* As-Found (SCFH)</b> |
|--------------------|-------------|---|---------------------------------|---------------------------------------|---------------------------------------|
| X-215              | T4804-F602A | CAC H2 Recombiner Division 1 H2 Control Torus Suction Inboard Isolation Valve (MOV)   | 4                               | 0.1                                   | 0.19                                  |
|                    | T4804-F606A | CAC H2 Recombiner Division 1 Torus Outboard Suction Isolation Valve (MOV)             |                                 |                                       |                                       |
|                    | T5000-F408A | PCAM T50L411A CT Outboard Sample Return Valve (AOV)                                   | 2                               | 0.05                                  | 0.05                                  |
|                    | P34-F408    | Division 1 PASS Gaseous Sample Return Outboard Isolation Valve                        | 1                               | 0.18                                  | 0.22                                  |
|                    | P34-F410    | Division 1 PASS Gaseous Sample Inboard Isolation Valve                                | 1                               | 0.05                                  | 0.09                                  |
|                    | T50-F451    | PCMS Radiation Monitor Outlet Outboard Isolation Valve (SOV)                          | 2                               | 0.21                                  | 0.05                                  |
|                    | T5000-F455  | PCMS Radiation Monitor Outlet Inboard Isolation Valve (AOV)                           | 2                               | 0.05                                  | 0.05                                  |
| X-218              | T4804-F601A | CAC H2 Recombiner to Torus Division 1 H2 Control Return Inboard Isolation Valve (MOV) | 8                               | 0.1                                   | 0.05                                  |
|                    | T4804-F604A | CAC H2 Recombiner Division 1 H2 Control Return Outboard Isolation Valve (MOV)         |                                 |                                       |                                       |
|                    | T4804-F016A | CAC H2 Recombiner Return Line for Division 1 F601A and F604A Bypass Relief Valve      | 4                               | 0.05                                  | 0.33                                  |
|                    | T4804-F601B | CAC H2 Recombiner to Torus Division 2 H2 Control Return Inboard Isolation Valve (MOV) | 8                               | 0.52                                  | 0.21                                  |
|                    | T4804-F604B | CAC H2 Recombiner Division 2 H2 Control Return Outboard Isolation Valve (MOV)         |                                 |                                       |                                       |
|                    | T4804-F016B | CAC H2 Recombiner Return Line for Division 2 F601B and F604B Bypass Relief Valve      | 4                               | 0.09                                  | 0.19                                  |
| X-219              | T4804-F602B | CAC H2 Recombiner Division 2 H2 Control Torus Suction Inboard Isolation Valve (MOV)   | 4                               | 0.13                                  | 0.1                                   |
|                    | T4804-F606B | CAC H2 Recombiner Division 2 Torus Outboard Suction Isolation Valve (MOV)             |                                 |                                       |                                       |
|                    | T5000-F408B | PCAM T50L411B Containment Outboard Sample Return Valve (AOV)                          | 2                               | 0.05                                  | 0.05                                  |

**Table 5-1: Type C Air**

| <b>Penetration</b> | <b>PIS</b>  | <b>Description</b>   | <b>Allowable Leakage (SCFH)</b> | <b>T<sub>2</sub>* As-Found (SCFH)</b> | <b>T<sub>1</sub>* As-Found (SCFH)</b> |
|--------------------|-------------|--|---------------------------------|---------------------------------------|---------------------------------------|
| X-230              | T5000-F407A | PCAM T50L410A Containment Outboard Sample Valve (AOV) (Division 1 PCAM Torus Sample Valve) | 2                               | 0.05                                  | 0.05                                  |
|                    | P34-F405B   | Division 1 PASS Torus Atmosphere Inboard Isolation Valve (SOV)                             | 1                               | 0.12                                  | 0.14                                  |
|                    | P34-F406B   | Division 1 PASS Torus Atmosphere Outboard Isolation Valve (SOV)                            | 1                               | 0.1                                   | 0.15                                  |
| X-231              | T5000-F407B | PCAM T50L410B Containment Outboard Sample Valve (AOV) (Division 2 PCAM Torus Sample Valve) | 2                               | 0.06                                  | 0.05                                  |
|                    | P34-F405A   | Division 2 PASS Torus Atmosphere Inboard Isolation Valve (SOV)                             | 1.5                             | 0.18                                  | 0.68                                  |
|                    | P34-F406A   | Division 2 PASS Torus Atmosphere Outboard Isolation Valve (SOV)                            | 1                               | 0.61                                  | 0.49                                  |

\* T<sub>1</sub> is the most recent test and T<sub>2</sub> is the next most recent test.

Note 1: During the RF16 Reactor Pressure Vessel (RPV) Pressure Test, a leak was identified on E5150F008 “RCIC Turbine Steam Supply Outboard Containment Isolation Valve,” and a Corrective Action Resolution Document (CARD) was generated. Upon further investigation (via VT-3), a steam cut on the bonnet sealing surface that resulted in the leakage was identified, and another CARD was generated which recommended generating a work order to have the bonnet replaced. The bonnet was replaced and an As-Left test was performed. The As-Left leakage rate was measured at 0.05 SCFH versus a 2.0 SCFH total maximum leakage criteria per the Local Leakage Rate Testing (LLRT) procedure. At the time that this leak was identified, the E5150F008 was on a performance-based extended frequency and therefore, was not scheduled to be tested in RF16. An As-Found test was not completed on E5150F008 prior to maintenance. As a result of not performing the As-Found LLRT, the As-Found test was credited as a failure, and returned to its baseline testing frequency of every 30 months (or every refuel). This was in accordance with Fermi 2’s LLRT Conduct Manual, MES28 “Leakage Reduction and Primary Containment Leakage Rate Programs,” which states in Section 4.7.9, “If a pre-maintenance as-found test is not performed and the valve is on an extended test interval (i.e. > 30 months), the test interval must be returned to 30 months until acceptable performance is reestablished.” This valve was identified as a failure and has been returned to its base line testing frequency of every 30 months (or every refuel), until acceptable performance is re-established.

Note 2: The penetrations X-25 (T4803F602, T4600F402, T4600F411), X-26 (T4803F601, T4800F407, T4800F408), X-205C (T4800F404, T4800F405, T4800F409), and X-205D (T4600F400, T4600F401, T4600F412, T4800F410) were tested in January 2016, and the As-Found Results were as follows: X-25 (0.32 SCFH), X-26 (0.74 SCFH), X-205C (0.53 SCFH), and X-205D (0.39 SCFH).

**Table 5-2: Type C Water**

| <b>PIS</b> | <b>Description</b>   | <b>Acceptance<br/>(ml/min)</b> | <b>T<sub>1</sub>* As-<br/>Found<br/>(ml/min)</b> | <b>T<sub>2</sub>* As-<br/>Found<br/>(ml/min)</b> |
|------------|--|--------------------------------|--|--|
| E41-F403   | HPCI PCM - Suppression Pool Division 2 Torus Level Instrument Isolation Valve (SOV)  | 3785.00                        | 0.00   | 0.00   |
| E41-F401   | HPCI PCM - Suppression Pool Division 1 Torus Level Instrument Isolation Valve (SOV)  | 3785.00                        | 0.00   | 0.00   |
| T50-F412A  | PCAM Primary Containment Torus Level Monitoring Division 1 Isolation Valve (SOV)     | 3785.00                        | 0.00   | 16.24  |
| T50-F412B  | PCAM Primary Containment Torus Level Monitoring Division 2 Isolation Valve (SOV)     | 3785.00                        | 2.32   | 0.00   |
| G5100-F604 | Torus Water Management to RHR Test Line Inboard Isolation Valve (MOV)                | 2672.00                        | 0.00   | 3.87   |
| G5100-F605 | Torus Water Management to RHR Test Line Outboard Isolation Valve (MOV)               | 2672.00                        | 11.60  | 0.00   |
| P34-F407   | Division 2 PASS Liquid Sample Return Outboard Isolation Valve (SOV)                  | 500.00                         | 0.00   | 0.00   |
| P34-F409   | Division 2 PASS Liquid Sample Inboard Isolation Valve (SOV)                          | 500.00                         | 0.00   | 0.00   |
| G5100-F600 | Torus Water Management (South TWMS Pump Inboard Suction) Isolation Valve (MOV)       | 3785.00                        | 30.90  | 232.00   |
| G5100-F601 | Torus Water Management (South TWMS Pump Outboard Suction) Isolation Valve (MOV)      | 3785.00                        | 11.60  | 46.40  |
| G5100-F602 | Torus Water Management (North TWMS Pump Inboard Suction) Isolation Valve (MOV)       | 3785.00                        | 293.90   | 132.24   |
| G5100-F603 | Torus Water Management (North TWMS Pump Outboard Suction) Isolation Valve (MOV)      | 3785.00                        | 7.70   | 0.00   |
| G5100-F606 | Torus Water Management Return to Core Spray Test Line Inboard Isolation Valve (MOV)  | 1514.00                        | 29.00  | 46.40  |
| G5100-F607 | Torus Water Management Return to Core Spray Test Line Outboard Isolation Valve (MOV) | 1514.00                        | 1406.10  | 1137.70  |

\* T<sub>1</sub> is the most recent test and T<sub>2</sub> is the next most recent test.