

# FERMI 2 INSERVICE TESTING PROGRAM FOR PUMPS AND VALVES

FERMI 2 THIRD 10 YEAR INTERVAL - START DATE 02/17/2010

## PART 9: IST PROGRAM REFUELING OUTAGE JUSTIFICATIONS

REVISION 4

Revision Summary:

- 1. Revised per the 4<sup>th</sup> Interval Update.

QUAL

Prepared: Jeffrey D. Antea Date: 10-23-20 PE-03   
IST Program Manager

Reviewed: VLADIMIR TAMANKYAROV Date: 1/22/2021 PE-03

Reviewed: James D. Wines /s/, e54431, see attached email. Date: 2/2/21 N/A  
Supervisor, Performance Engineering

Approved: Randy D. Breymaier /s/, e50801, see attached email. Date: 2/2/21 N/A  
Manager, Performance Engineering

---

### INFORMATION AND PROCEDURES

DSN: IST Program ROJ Rev: 4 Date: 2/3/21  
DTC: TM PLAN File: 1715.04 Recipient: \_\_\_\_\_  
Date Approved: \_\_\_\_\_ Release authorized by: \_\_\_\_\_

## IST PROGRAM PLAN PART 9

### REFUELING OUTAGE JUSTIFICATIONS (ROJ)

#### INDEX

Refueling Outage Justification No.	Description
ROJ-001	Feedwater Check Valves Closure Testing
ROJ-002	EECW check valve testing
ROJ-003	SRV/MSIV Accumulator Check Valves Functional Testing
ROJ-004	Not used
ROJ-005	Not used
ROJ-006	RWCU Isolation Valves Stroke Time Testing
ROJ-007	Not used
ROJ-008	Not used
ROJ-009	Not used
ROJ-010	Not used
ROJ-011	Not used
ROJ-012	RHR SDC Thermal Relief Check Valves Functional Testing
ROJ-013	Not used
ROJ-014	Not used
ROJ-015	RHR SW and EDGSW Minimum Flow Valve Testing
ROJ-016	Not used
ROJ-017	Not used
ROJ-018	SLC Pump Discharge Check Valves Closure Testing
ROJ-019	SRV Vacuum Breaker Valves Functional Testing
ROJ-020	Not used
ROJ-021	Not used
ROJ-022	RHR Shutdown Cooling Valves Stroke Time Testing
ROJ-023	Not used
ROJ-024	Not used
ROJ-025	Not used

**REFUELING OUTAGE JUSTIFICATION - ROJ-001****SYSTEM: FEEDWATER****VALVES:**

<b>Valve PIS No.</b>	<b>Code Class</b>	<b>Category</b>	<b>Drawing</b>
B2100F010A	1	A/C	5715-1
B2100F010B	1	A/C	5715-1
B2100F076A	1	A/C	5715-1
B2100F076B	1	A/C	5715-1

**FUNCTIONS:**

These check valves must close to isolate Primary Containment and to limit leakage to a specific amount. Valve B2100F076A must also close to ensure HPCI injection flow to the Reactor Vessel. Valve B2100F076B must also close to ensure RCIC injection flow to the Reactor Vessel.

**QUARTERLY TEST REQUIREMENTS:** CVC Exercising (ISTC-3510)

**JUSTIFICATION:**

These check valves cannot be exercised to the closed (CVC) position during reactor operation because the feedwater system is needed to maintain primary coolant inventory and these valves can only close with the cessation of feedwater flow. The air operators on feedwater check valves B2100F076A and B2100F076B cannot close the valves against feedwater flow. Closure verification is performed via a leak test which requires system draining and test equipment setup. This test evolution is not practical during cold shutdowns.

**ALTERNATE TESTING:**

These valves will be exercise tested in the closed direction (CVC) during the Appendix J leak test (AT-1) of the feedwater penetrations during reactor refueling outages.

**REFUELING OUTAGE JUSTIFICATION - ROJ-002****SYSTEM: EMERGENCY EQUIPMENT COOLING WATER****VALVES:**

Valve PIS No.	Code Class	Category	Drawing
P4400F282A	3	A/C	5729-1
P4400F282B	3	A/C	5729-2

**FUNCTIONS:**

These check valves are primary containment isolation valves which isolate the Emergency Equipment Cooling Water (EECW) drywell return containment penetrations.

**QUARTERLY TEST REQUIREMENTS:** CVC Exercising (ISTC-3510)

**JUSTIFICATION:**

During power operation the RBCCW/EECW system supplies cooling water to the components inside the drywell, including the Reactor Recirculation pumps and motors. Exercising check valves P4400F282A/B in the closed direction (CVC) would require isolation of cooling water flow to the drywell, including flow to the reactor recirculation pumps and motors bearings, potentially causing damage to these components. Open functional testing is performed during normal power operation with flow.

It is not practical to test these valves Quarterly or during Cold Shutdowns as a drywell entry is required and the drywell is inerted during operations and most cold shutdowns. Closure testing these valves also requires the reactor recirculation pumps to be shutdown. Shutting down and restarting these pumps causes unnecessary wear and tear on the pumps, motors and seals as well as significant changes in reactor power level during operations. Starting and stopping the reactor recirculation pumps and de-inerting during cold shutdowns solely to allow inservice testing is not practical (Ref. NUREG 1482 Rev. 3, Sections 3.1.1.3 and 3.1.1.4).

**ALTERNATE TESTING:**

These valves will be exercised closed (CVC) during reactor refueling outages.

**REFUELING OUTAGE JUSTIFICATION - ROJ-003****SYSTEM: NUCLEAR BOILER AND PRIMARY CONTAINMENT PNEUMATIC SUPPLY****VALVES:**

Valve PIS No.	Code Class	Category	Drawing
B2100F029A	3	A/C	5701-1
B2100F029B	3	A/C	5701-1
B2100F029C	3	A/C	5701-1
B2100F029D	3	A/C	5701-1
T4901F019	3	A/C	5740
T4901F022	3	A/C	5740
T4901F025	3	A/C	5740
T4901F028	3	A/C	5740
T4901F031	3	A/C	5740
T4901F034A	3	A/C	5740
T4901F034B	3	A/C	5740
T4901F034C	3	A/C	5740
T4901F034D	3	A/C	5740
T4901F039	3	A/C	5740
T4901F040	3	A/C	5740

**FUNCTIONS:**

These check valves must close upon loss of air / nitrogen supply to isolate their corresponding accumulator. These check valves isolate the accumulators for the SRVs with LLS / ADS function and MSIVs. These check valves must also open to supply air / nitrogen to the accumulators.

**QUARTERLY TEST REQUIREMENTS:** CVO/CVC Exercising (ISTC-3510)

**JUSTIFICATION:**

The change in obturator position of these simple check valves cannot be verified during normal plant operation or cold shutdown, as there are no external or control room indications. To verify the disk position requires special testing which requires access to these valves which are located in the drywell and main steam tunnel. De-inerting during cold shutdowns solely to allow inservice testing is not practical (Ref NUREG 1482 Rev. 3, Section 3.1.1.3). Additionally, a portion of the testing to verify change in obturator position requires isolating the supply air to the accumulators. Test setup and valve access restrictions prevent testing these valves during

power operations and cold shutdowns.

**ALTERNATE TESTING:**

These valves will be exercised open (CVO) and closed (CVC) during reactor refueling outages.

**REFUELING OUTAGE JUSTIFICATION - ROJ-006****SYSTEM: REACTOR WATER CLEANUP****VALVES:**

Valve PIS No.	Code Class	Category	Drawing
G3352F001	1	A	5711-1
G3352F004	1	A	5711-1

**FUNCTIONS:**

These valves provide isolation of the Reactor Water Cleanup System from the Primary Containment.

**QUARTERLY TEST REQUIREMENTS:** ETO and ETC Exercising (III-3610, III-3620, III-3721), stroke time closed (STC) per 10CFR50.55a (b)(3)(ii)(D)

**JUSTIFICATION:**

The Reactor Water Cleanup System (RWCU) is inservice during normal plant operations to maintain water purity, and provides a backup function during post accident cleanup. This system ensures that reactor chemistry is maintained within specified limits and process fluid radioactivity is minimized. These system functions are necessary to prevent the likelihood of exceeding 10CFR100 release limits and to maintain water purity to minimize the occurrence of stress corrosion cracking of the vessel and attached stainless steel piping systems.

Closing of the containment isolation valves to perform a full stroke test requires the removal of the RWCU system from service. Quarterly performance of this activity would also accelerate degradation of the RWCU pump seals due to stopping and starting the RWCU pumps with the reactor at operating pressure. This leads to increases in the frequency of RWCU pump seal failure. Replacing a pump seal causes water purity to degrade, and exposes Fermi personnel to approximately 2 to 3 man-rem of dose (per occurrence).

Cold shutdown stroke testing is not practical since it is more critical during a forced shutdown to have RWCU in-service to mitigate the effects of a chemistry transient as a result of the shutdown. Failure of these valves in the closed position, as a result of testing, during a cold shutdown outage would result in loss of the RWCU system and could inhibit the ability to recover from the chemistry transient. This could lead to a delay in the plant startup, which impacts unit availability.

**ALTERNATE TESTING:**

These valves will be full stroke exercised (ETO/ETC) and stroke timed closed (STC) at a Refueling Outage frequency. The ASME OM code requires open/close exercising and stroke time closed per a 10CFR50.55a Condition.

**REFUELING OUTAGE JUSTIFICATION - ROJ-012****SYSTEM: RESIDUAL HEAT REMOVAL****VALVES:**

Valve PIS No.	Code Class	Category	Drawing
E1100F408	1	A/C	5706-1
E1100F409	1	C	5706-1

**FUNCTIONS:**

The safety function of these valves is to open to provide thermal relief protection between valves E1150F009, E1150F608, and E1150F008. Additionally, valve E1100F408 is required to close to satisfy its containment isolation function.

**QUARTERLY TEST REQUIREMENTS:** CVO/CVC Exercising (ISTC-3510)**JUSTIFICATION:**

Both of these valves are non-testable check valves located inside the primary containment and have no remote flow or position indication. Testing of these valves inside the containment during power operation and when the drywell is inerted is unacceptable from both the ALARA and personnel safety perspectives. De-inerting during cold shutdowns solely to allow inservice testing is not practical (Ref. NUREG 1482 Rev. 3, Section 3.1.1.3). Additional problems associated with testing these valves during power operation involve the potential exposure of test personnel to reactor pressure during valve manipulations.

These valves serve as a thermal relief path and as such have no design flow. All that is required is that they open to relieve the hydraulic pressure between E1150F009, E1150F608, and E1150F008 produced by the thermal expansion of water in an isolated volume.

Since these valves are designed such that they begin to unseat at approximately 1 psid and are fully open at 4 psid, they will be tested by the application of pressure/flow across the valves at approximately 50 psig. This will assure that the valves are exercised (CVO) to the full open position and are capable of performing their safety function to open.

The closing function of these valves will be verified by a back flow leakage test through the valve with an open vent downstream and sufficient pressure applied upstream. This reverse exercise testing is not practical during non-refueling Cold Shutdown conditions due to the need to secure RHR Shutdown Cooling while the reactor is in a short time to boil condition.

**ALTERNATE TESTING:**

E1100F408 and E1100F409 will be full stroked exercised open (CVO) and closed (CVC) during reactor refueling outages.

**REFUELING OUTAGE JUSTIFICATION - ROJ-015**

**SYSTEM: RESIDUAL HEAT REMOVAL SERVICE WATER (RHRSW) EMERGENCY  
DIESEL GENERATOR SERVICE WATER (EDGSW)**

**VALVES:**

Valve PIS No.	Code Class	Category	Drawing
E11F400A	3	B	5706-3
E11F400B	3	B	5706-3
E11F400C	3	B	5706-3
E11F400D	3	B	5706-3
R30F400	3	B	5706-3
R30F401	3	B	5706-3
R30F402	3	B	5706-3
R30F403	3	B	5706-3

**FUNCTIONS:**

Minimum flow valves assure minimum pump flow requirements are maintained for the RHRSW and EDGSW systems and thus assure the pumps are not damaged should the normal flow path be isolated or restricted. The subject valves are air-to-open and spring-to-close valves that fail closed on loss of air. These valves are normally closed and their safety function is to close which assures system flow is not diverted through the minimum flow lines back to the RHR reservoir. These systems are normally aligned for startup with open flow paths so that the minimum flow valve function to open is not required when the pumps are started.

**QUARTERLY TEST REQUIREMENTS:** ETC, FSC Exercising (ISTC-3510)(ISTC-5100 no stroke timing required)

**JUSTIFICATION:**

All 8 valves are classified as control valves and have fail-safe safety functions only. Thus, no stroke timing is required per ISTC-5100. These valves automatically open when the pump discharge pressure is high and close when pressure decreases. There are no manual override switches or controls. High discharge pressure indicates that the normal pump flow path is either closed or severely restricted. Normal pressure indicates viable flow path is available.

Testing these valves on a quarterly basis using system pressure (i.e. "dead-heading" pump) can potentially cause damage to other service water system components; reference CARD 19-21475. In addition, using system pressure does not properly exercise the valves to full open and then back to full closed. Also, this methodology does not perform a proper fail safe test from full open to full closed using the springs. This is due to the fact that these valves open and close proportionally with system pressure using an air control system.

It is possible to full stroke these valves on a less frequent basis using a temporary test rig. This requires the breaking of normal control air connections rendering the system inoperable.

Because of the time limitations placed on the unavailability of safety systems and the potential damage to the connections after frequent disconnecting and reconnecting, conformance to the quarterly requirements would result in unusual hardship and difficulty without a compensating increase in the level of safety and quality (reference NUREG-1482 Rev.2 Section 4.1.6).

This testing is not practical during non-refueling Cold Shutdown conditions because of its duration and safety system operability impact. The systems involved are relied upon for reactor safety during both operating and shutdown conditions. This testing is not within the normal scheduling parameters for a forced outage scenario and would create challenges for Operations to control and protect the operability of the opposite divisions during such testing.

**ALTERNATE TESTING:**

These valves will be exercised test closed (ETC) and fail-safe closed (FSC) at a Refueling Outage frequency.

**REFUELING OUTAGE JUSTIFICATION - ROJ-018****SYSTEM: STANDBY LIQUID CONTROL (SLC)****VALVES:**

Valve PIS No.	Code Class	Category	Drawing
C4100F033A	2	C	5704
C4100F033B	2	C	5704

**FUNCTIONS:**

The safety function of these check valves is to open upon Standby Liquid Control (SLC) system initiation and injection and to close to prevent back-flow through the non-running pump. The valves are normally closed lift check valves with internal springs to assist in closing.

**QUARTERLY TEST REQUIREMENTS:** CVC Exercising (ISTC-3510)

**JUSTIFICATION:**

Both of these valves are simple lift check valves and have no external arm or position indication. The piping configuration upstream of each pumps discharge check valve is welded, so it is not possible to test the check valve in the closed direction by verifying that no back-flow is present with the opposite pump running without removing / disassembling the individual pump relief valves. Removal of these relief valves online would significantly increase system unavailability and is a level of intrusive maintenance which is not justified against the benefits of a quarterly check valve test. Open functional testing (CVO), for both valves, is performed during the quarterly SLC pump and valve operability test.

The closure (CVC) testing is not appropriate for non-refueling Cold Shutdown conditions due to the duration and intrusive nature of the testing. SLC pump discharge relief valves must be temporarily removed from the system to provide the vent path to perform the closing tests for these check valves. This testing is not within the normal scheduling parameters for a forced outage scenario and would require maintenance resources which would likely be devoted to critical forced outage recovery activities.

**ALTERNATE TESTING:**

These check valves will be exercise tested in the close (CVC) direction during reactor refueling outages.

**REFUELING OUTAGE JUSTIFICATION - ROJ-019****SYSTEM: NUCLEAR BOILER, SRV VACUUM BREAKER VALVES****VALVES:**

Valve PIS No.	Code Class	Category	ISI Drawing
B2100F037A	3	C	5701-1
B2100F037B	3	C	5701-1
B2100F037C	3	C	5701-1
B2100F037D	3	C	5701-1
B2100F037E	3	C	5701-1
B2100F037F	3	C	5701-1
B2100F037G	3	C	5701-1
B2100F037H	3	C	5701-1
B2100F037J	3	C	5701-1
B2100F037K	3	C	5701-1
B2100F037L	3	C	5701-1
B2100F037M	3	C	5701-1
B2100F037N	3	C	5701-1
B2100F037P	3	C	5701-1
B2100F037R	3	C	5701-1

**FUNCTIONS:**

During an SRV discharge, these valves (SRV Vacuum Breakers) must be closed to direct the steam into the torus water. After an SRV discharge, the steam remaining in the SRV discharge line will condense and try to draw a vacuum in the line. These check valves (vacuum breakers) will open and permit the containment atmosphere to enter the line, thus relieving the vacuum condition.

**QUARTERLY TEST REQUIREMENTS:** CVO/CVC Exercising (ISTC-3510)**JUSTIFICATION:**

The only practical method for exercising these valves open and closed is by measuring opening force with a push-pull gage pushing the disk from its seat and visually verifying that the valve reseats manually. This type of exercise test (CVO/CVC) verifies both open and close direction. Since this requires access to the valves, which are located in the drywell, the test will be deferred to refuel outage when the plant is shut down and the drywell is de-inerted.

This testing is not practical during non-refueling Cold Shutdown conditions due to the need for high drywell access and the duration/dose involved

**ALTERNATE TESTING:**

These check valves will be full stroke exercise tested (CVO/CVC) during reactor refueling outages.

**REFUELING OUTAGE JUSTIFICATION - ROJ-022****SYSTEM: RESIDUAL HEAT REMOVAL****VALVES:**

Valve PIS No.	Code Class	Category	Drawing
E1150F015B	1	A	5706-1

**FUNCTIONS:**

This valve is designated as a pressure isolation valve (PIV). Pressure isolation valves are defined as valves which isolate the portions of a system designed for low pressure service from the portions of a system connected to the Reactor Coolant Pressure Boundary (RCPB) which are designed for high pressure service (Ref. NUREG-0677 and ongoing RACTs commitment 94175). This valve also provides the flow-path for Shutdown Cooling operation.

**QUARTERLY TEST REQUIREMENTS:** ETO and ETC Exercising (III-3610, III-3620, III-3721)

**JUSTIFICATION:**

Inadvertent opening of this valve is prevented by system interlocks that require the primary system pressure to be below the secondary design pressure prior to opening. Routinely exercising this valve open and closed (ETO and ETC) during power operation would place the plant in an unsafe condition by potentially exposing low pressure piping to reactor coolant pressure, which could result in inter-system LOCAs.

Interfacing system LOCAs produce consequences that are very difficult to mitigate. The best defense is to minimize the probability of occurrence. An important contribution to such minimization is to test pressure boundary valves only at conditions of low reactor vessel pressure.

Exercising of this valve in a non-refueling Cold Shutdown condition can incur risk to reactor safety. During refueling conditions, the reactor head is removed and the vessel is flooded up. This greatly increases time to boil because of the large additional water volume as compared to a Cold Shutdown non-refueling situation. There are also more redundant decay heat removal options available during the refueling conditions than in cold shutdown condition. Exercising of this valve involves interruption and/or reconfiguration of Shutdown Cooling. With reduced time to boil any interruptions of Shutdown Cooling incur additional risk. [Reference IST Evaluation 09-037 for detailed basis for this deferral to refueling outage interval]

**ALTERNATE TESTING:**

This valve will be exercised (ETO/ETC) at a Refueling Outage frequency.

**Jeffrey D Auler**

---

**From:** James D Wines  
**Sent:** Tuesday, February 2, 2021 3:27 PM  
**To:** Jeffrey D Auler  
**Cc:** James D Wines  
**Subject:** Electronic Signature

I have reviewed and approve the following as the Supervisor/s/, Programs Engineering.

DTC	DSN	Revision	Approval
TMPLAN	IST Program CSJ	4	Reviewer: James D Wines /s/
TMPLAN	IST Program ROJ	4	Reviewer: James D Wines /s/

I also authorize any page renumbering required by inclusion of this email within the overall document as required per NSIP-20-0005.

**James Wines | Supervisor – Nuclear Engineering (Programs)**

Phone: 734.586.1701 | [Text](#): 734.625.3154 | [Pager](#): 734.227.0076 | eMail: [James.Wines@dteenergy.com](mailto:James.Wines@dteenergy.com)

**Jeffrey D Auler**

---

**From:** Randy D Breymaier  
**Sent:** Tuesday, February 2, 2021 12:23 PM  
**To:** Jeffrey D Auler  
**Subject:** Approval of IST Program CSJ and ROJ Rev 4

I have reviewed and approve the following as the Manager/s/, Programs Engineering.

DTC	DSN	Revision	Approval
TMPLAN	IST Program CSJ	4	Reviewer: Randy D. Breymaier /s/
TMPLAN	IST Program ROJ	4	Reviewer: Randy D. Breymaier /s/

I also authorize any page renumbering required by inclusion of this email within the overall document as required per NSIP-20-0005.

Randy Breymaier  
 Manager Performance Engineering