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THREE MILE ISLAND NUCLEAR STATION
UNIT #2 SURVEILLANCE PROCEDURE 2303-H27A/3
MOTOR DRIVEN EMERGENCY FEEDPUMP
FUNCTIONAL TEST AND VALVE OPERABILITY TEST
Table of Effective Pages

Page	Date	Revision	Page	Date	Revision	Page	Date	Revision
1.0	12/01/77	1	26.0			51.0		
2.0	12/01/77	1	27.0			52.0		
3.0	05/04/78	3	28.0			53.0		
4.0	05/04/78	3	29.0			54.0		
5.0	05/04/78	3	30.0			55.0		
6.0	05/04/78	3	31.0			56.0		
7.0	08/30/78	4	32.0			57.0		
8.0	05/04/78	3	33.0			58.0		
9.0	08/30/78	4	34.0			59.0		
10.0	05/04/78	3	35.0			60.0		
11.0	08/30/78	4	36.0			61.0		
12.0	12/01/77	1	37.0			62.0		
13.0	05/04/78	3	38.0			63.0		
14.0	08/30/78	4	39.0			64.0		
15.0	12/01/77	1	40.0			65.0		
16.0	05/04/78	3	41.0			66.0		
17.0	08/30/78	4	42.0			67.0		
18.0	08/30/78	4	43.0			68.0		
19.0			44.0			69.0		
20.0			45.0			70.0		
21.0			46.0			71.0		
22.0			47.0			72.0		
23.0			48.0			73.0		
24.0			49.0			74.0		
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Unit 1 Staff Recommends Approval

Approval N.A. Date _____
Cognizant Dept. Head

Unit 2 Staff Recommends Approval

Approval N.A. Date _____
Cognizant Dept. Head

Unit 1 PORC Recommends Approval

N.A. Date _____
Chairman of PORC

Unit 2 PORC Recommends Approval

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N.A. Date _____

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N.A. Date 3/30/78

Manager Generation Quality Assurance Approval

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THREE MILE ISLAND NUCLEAR STATION

UNIT #2 SURVEILLANCE PROCEDURE 2303-M27A/B

MOTOR DRIVEN EMERGENCY FEEDPUMP
FUNCTIONAL TEST AND VALVE OPERABILITY TEST

NOTE: 2303-M27A includes pump and valve testing, 2303-M27B
includes pump testing only.

1.0 PURPOSE

1.1 To insure compliance with Technical Specification 4.0.5 which references ASME Section XI for testing of pumps. ASME Section XI specifies test quantities to be measured and acceptable ranges for those quantities.

1.2 To insure compliance with TMI Unit #2 Technical Specifications, Section 4.0.5.a, which states:

Inservice testing of ASME Code Class 1, 2, and 3 pumps and valves shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable addenda as required by 10 CFR50, Section 50.55a(g).

The above inservice testing will confirm the operation of the following ASME Code Class 3 valves:

EF-V1 A and B and EF-V27 A and B and EF-V2 (CLOSED)

2.0 APPLICABLE SURVEILLANCE FREQUENCY AND MODES

2.1 Surveillance Frequency --

31 days (H) for the pump tests (2303-M27B)

92 days (Q) for the valve tests (2303-M27A)

NOTE: Subsection 6.1 of this procedure includes both valve and pump testing; subsection 6.2 includes pump testing only. If 2303-M27A and 2303-M27B

12/01/77
are both scheduled on the Weekly Checklist.

Master Schedule, perform subsection 6.1 only.

If only 2303-M27B is scheduled perform subsection 6.2 only. All of the steps in 6.2 are included in 6.1.

- 2.2 Modes: 1 thru 4 - Testing required per ASME Section XI.
5 and 6 - Testing optional per ASME Section XI.

3.0. LIMITS AND PRECAUTIONS

- 3.1 When a reference value or set of values may have been affected by repair or routine servicing of the pump, a new reference value or set of values shall be determined, or the previous value reconfirmed by an inservice test run prior to or within 96 hours after return of the pump to normal service. Deviations between the previous and new set of reference values shall be identified and verification that the new values represent acceptable pump operation shall be placed in the Technical Specifications surveillance file for that pump.
- 3.2 An inservice test shall be run on each pump nominally each month during normal plant operation. It is recommended that this test frequency be maintained during cold shutdown periods where this can reasonably be accomplished, although this is not mandatory.
- 3.3 Pumps that are operated more frequently than every month need not be run or stopped for a special test provided the quantities specified were measured, observed, and analyzed.
- 3.4 All test data must be analyzed within 96 hours after test completion.
- 3.5 Bearing temperatures are only required to be measured once every year. When measurement of bearing temperature is not required,

each pump shall be run for at least five minutes under conditions as stable as the system permits. At the end of this time at least one measurement of each of the quantities specified shall be made and recorded.

- 3.6 The vibration probe must be placed in the same position each test to insure repeatable measurements.
- 3.7 Record identification of the instruments used on the Data Sheet.
- 3.8 Instruments used for measuring quantities shall not have a scale range exceeding four times the reference value.
- 3.9 If a valve is in an out of service system, it need not be exercised until immediately prior to return of the system to service.
- 3.10 After a valve or its control system has either been replaced, repaired, or has undergone maintenance that could affect its performance, and prior to the time it is returned to service, it shall be tested as necessary to demonstrate that the performance parameters which could be affected are within acceptable limits. Adjustment of stem packing; removal of the bonnet, stem assembly, or actuator; or disconnection of hydraulic or electrical lines are examples of maintenance that could affect valve performance parameters.

4.0 LOCATION OF SYSTEM

- 4.1 Emergency feedwater pumps are located in the Control Building Area, elevation 230'6".
- 4.2 Controls for the emergency feedwater pumps are located in Control Room on Panel 4. Local controls are also available.

5.0 EQUIPMENT REQUIRED

- 5.1 IRD Vibration Analyzer, Model 306, or equivalent.
- 5.2 Eagle Eye Meter, Model 77C, $\pm 1.5\%$ full scale, 0-50 inches of water or equivalent.

5.3 Stopwatch - required only if 2303-M27A is scheduled.

6.0 PROCEDURE

NOTE: The following procedure may be used for Motor Driven Emergency Feedpump 2A or 2B. Those components designations in (parenthesis) refer to the B system.

NOTE: Subsection 6.1 includes both valve and pump testing; subsection 6.2 includes pump testing only. If 2303-M27A and 2303-M27B are both scheduled on the Weekly Checklist Master Schedule, perform subsection 6.1 only. If only 2303-M27B is scheduled perform subsection 6.2 only. All of the steps in 6.2 are included in 6.1.

Initial Each Step After Satisfactory Completion.

6.1 Emergency Feed Pump (EF-P2A(B)) and valve test.

____ 6.1.1 INSTALL Eagle Eye Meter or equivalent at CO-FE-7616 (7617).

____ 6.1.2 PERFORM Appendix A (B) Valve Line up.

____ 6.1.3 RECORD on Data Sheet A (B) the pump idle inlet pressure from CO-PI-2025 (2026).

____ 6.1.4 INSURE Proper lube oil level on pump from bearing sight glasses and INITIAL Data Sheet.

____ 6.1.5 From its local control switch, OPEN EF-V-27A(B) and time from when the open button is pressed until only the red open light is illuminated on the panel. Record time on Data Sheet A(B).

____ 6.1.6 CLOSE EF-V27A(B).

- 6.1.7 START EF-P-2A (B) from Panel 4.
- 6.1.8 INSURE EF-V27A (B) automatically opens.
- 6.1.9 THROTTLE OPEN EF-V39 (EF-V40) until the flow rate as indicated by the differential pressure across CO-FE-7616 (7617) corresponds to the reference value. The reference value is designated on the Data Sheet. Calculate flow rate from the equation $Q = 66.05 \sqrt{\Delta P}$ where ΔP is the differential pressure across CO-FE-7616 (7617) in inches of water, and Q is in gpm.
- 6.1.10 Cooling water flow to floor drain indicates that check valves EF-V1A(B) opened as required. Record on Data Sheet A(B) if valves EF-V1A(B) opened as required.
- 6.1.11 With pump EF-P-2A(B) operating as required, verify that pump EF-P-2B(A) is not windmilling due to fluid backflow through EF-V1B(A). Record on Data Sheet B(A) that valves EF-V1B(A) closed as required.
- 6.1.12 With pump EF-P-2A or EF-P-2B operating as required, verify that pump EF-P-1 (steam driven EF pump) is not windmilling due to fluid backflow through EF-V2. Record on Data Sheet A that valve EF-V2 closed as required.
- 6.1.13 LET pump run five minutes or longer until system stabilizes.

NOTE: Perform the following two steps only the first time this test is run during each calendar year, since bearing temperature measurement is only required once each year.

- 6.1.14 ALLOW EF-P-2A (2B) to run until three successive bearing temperature measurements (as indicated by Computer Group 16, or Computer points 1653 and 1654 (1658 and 1659)) taken at 10 minute intervals, change by less than 3%.
- 6.1.15 RECORD on Data Sheet A (B) the bearing temperatures, and times taken. RECORD the final temperatures in the table.
- 6.1.16 RECORD the pump running inlet pressure from CO-PI-2025 (2026).
- 6.1.17 RECORD the pump running discharge pressure from EF-PI-2002 (2001).
- 6.1.18 CALCULATE and RECORD flow rate on Data Sheet A (B) using the equation $Q = 66.05 \sqrt{\Delta P}$ where ΔP is the D/P across CO-FE-7616 (7617) in inches of water, and Q is in gpm.
- 6.1.19 MEASURE and RECORD the pump inboard bearing vibration in the horizontal and vertical plane perpendicular to the rotating shaft. INDICATE the higher of the two vibration amplitudes and designate whether in the horizontal (H) or vertical (V) plane. INSURE the probe is on the designated test points.
- 6.1.20 STOP EF-P-2A (B).
- 6.1.21 REMOVE Eagle Eye Meter.

6.1.22 Insure EF-V3A(B) is open, EF-V12A(B) is open, EF-V7A(B) is closed, and close EF-V39(EF-V40).

6.2 Emergency Feed Pump (EF-P2A(B)) Test.

6.2.1 INSTALL Eagle Eye Meter or equivalent at CO-FE-7616 (7617).

6.2.2 PERFORM Appendix A (B) Valve Line up.

6.2.3 RECORD on Data Sheet A (B) the pump idle inlet pressure from CO-PI-2025 (2026).

6.2.4 INSURE Proper lube oil level on pump from bearing sight glasses and INITIAL Data Sheet.

6.2.5 START EF-P-2A (B) from Panel 4.

6.2.6 INSURE EF-V27A (B) automatically opens.

6.2.7 THROTTLE EF-V39 (EF-V40) until the flow rate as indicated by the differential pressure across CO-FE-7616 (7617) corresponds to the reference value. The reference value is designated on the Data Sheet. Calculate flow rate from the equation $Q = 66.05 \sqrt{\Delta P}$ where ΔP is the differential pressure across CO-FE-7616 (7617) in inches of water, and Q is in gpm.

6.2.8

LET pump run five minutes or longer until system stabilizes.

NOTE:

Perform the following two steps only the first time this test is run during each calendar year, since bearing temperature measurement is only required once each year.

6.2.9

ALLOW EF-P-2A (2B) to run until three successive bearing temperature measurements (as indicated by Computer Group 16, or Computer points 1653 and 1654 (1658 and 1659)) taken at 10 minute intervals, change by less than 3%.

6.2.10

RECORD on Data Sheet A (B) the bearing temperatures, and times taken. RECORD the final temperatures in the table.

6.2.11

RECORD the pump running inlet pressure from CO-PI-2J25 (2026).

6.2.12

RECORD the pump running discharge pressure from EF-PI-2002 (2001).

6.2.13

CALCULATE and RECORD flow rate on Data Sheet A (B) from the equation $Q = 66.05 \sqrt{\Delta P}$ where ΔP is the differential pressure across CO-FE-7616 (7617) in inches of water, and Q is in gpm.

6.2.14

MEASURE and RECORD the pump inboard bearing vibration in the horizontal and vertical plane perpendicular to the rotating shaft. INDICATE the higher of the two vibration amplitudes and designate whether in the horizontal (H) or vertical (V) plane. INSURE the probe is on the designated test points.

6.2.15

STOP EF-P-2A (B).

- 6.2.16 REMOVE Eagle Eye Meter.
- 6.2.17 Insure EF-V3A(B) is open, EF-V12A(B) is open, EF-V7A(B) is closed, and close EF-V39 (EF-V40).

7.0 ACCEPTANCE CRITERIA

- 7.1 If measured values fall within the Acceptable Range, Analysis portion of the data sheet shall be filled out and signed by the Shift Supervisor/Shift Foreman within 96 hours.
- 7.2 If deviations fall within the Alert Range, the frequency of testing shall be doubled until the cause of the deviation is determined and the condition corrected. Analysis portion of the data sheet shall be filled out and signed by the Lead Mechanical Engineer/ISI Coordinator within 96 hours.
- 7.3 If deviations fall within the Required Action Range, the pump shall be declared inoperative and not returned to service until the cause of the deviation has been determined and the condition corrected. Analysis portion of the data sheet shall be filled out and signed by the Lead Mechanical Engineer/ISI Coordinator.

NOTE: Correction can be replacement or repair or an analysis to demonstrate that the condition does not impair pump operability and that the pump will still fulfill its function. A new set of reference values shall be established after such analysis.

NOTE: Modes 1 thru 3 - Two motor driven emergency feedpumps OPERABLE per T.S. 3.7.1.2.

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NOTE: If the acceptance criteria are not met, proceed with
ACTION statement 3.7.1.2.

- 7.4 Each of the valves which has been tested to function, shall have been observed to function as required on the data sheet. If a valve fails to exhibit the required change of valve stem or disc position during the test, corrective action shall be initiated immediately. If the condition is not or can not be corrected within 24 hours, the valve shall be declared inoperative. When corrective action is required as a result of tests during cold shutdown, the condition shall be corrected before startup. A retest showing acceptable operation shall be run following any required corrective action before the valve is returned to service.
- 7.5 When valve testing has been performed, the Analysis portion of the data sheet shall be filled out by the Lead Mechanical Engineer/ISI Coordinator.

DATA SHEET.A

Motor Driven Emergency Feedpump EF-P-2A Functional Test

1. Pump idle inlet pressure _____ psig
2. Pump running inlet pressure (6.1.16 or 6.2.11) _____ psig
3. Pump running discharge pressure (6.1.17 or 6.2.12) _____ psig
4. Calculate differential pressure (#3 - #2) _____ psig
5. Lube oil level (Initial if satisfactory) _____
6. Pump Inboard Bearing Vibration (mils) H _____
V _____

QUANTITY	MEASURED VALUE	ACCEPTABLE RANGE	REQUIRED ACTION				REFERENCE VALUE
			ALERT RANGE		RANGE		
			LOW	HIGH	LOW	HIGH	
PUMP IDLE INLET PRESS. (PSIG)		>7.8	NA	NA	<7.8	NA	150
PUMP RUNNING INLET PRESS. (PSIG)		>7.8	NA	NA	<7.8	NA	145
PUMP DIFF. PRESSURE (PSI)		1269 to 1392	1228 to 1269	1392 to 1405	<1228	>1405	1365
FLOW RATE (GPM)		117.5 to 127.5	112.5 to 117.5	127.5 to 128.75	<112.5	>128.75	125
PUMP INBOARD BEARING TEMP. (°F)	*	<180	NA	NA	NA	≥180	91.3
PUMP OUTBOARD BEARING TEMP. (°F)	*	<180	NA	NA	NA	≥180	109.9
MAX VIBRATION (MILS)		0.0 to 1.0	NA	>1.0 to 1.5	NA	>1.5	.15 V

*Measurements taken only during first test run each calendar year.

DATA SHEET A (Cont'd)

Bearing Temperatures

NOTE: To be measured yearly.

<u>TIME</u>	<u>INBOARD BEARING TEMP.</u>	<u>OUTBOARD BEARING TEMP.</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

NOTE: Three consecutive measurements taken at 10 minute intervals must change by less than 3%.

	CO-PI-2025	EF-PI-2002	CO-FE-7516	EAGLE EYE METER	VIBRATION INSTRUMENT
MANUFACTURE					
MODEL					
SERIAL NO.					
SCALE RANGE					

PERFORMED BY: _____ DATE: _____ TIME: _____

APPROVED BY: _____ DATE: _____

<u>Valve No.</u>	<u>Stroke Time (sec)</u>	<u>Acceptance Criteria</u>
------------------	--------------------------	----------------------------

EF-V27A	OPEN in _____	<3 sec.
---------	---------------	---------

<u>Valve No.</u>	<u>Valve Function Requirement</u>	<u>Date/Initial</u>
------------------	-----------------------------------	---------------------

EF-V1 A	(check valve) OPEN	_____
---------	--------------------	-------

EF-V1B	(check valve) CLOSED	_____
--------	----------------------	-------

EF-V2	(check valve) CLOSED	_____
-------	----------------------	-------

PERFORMED BY: _____ DATE: _____

APPROVED BY: _____ DATE: _____

ANALYSIS:

Analysis by: _____ DATE: _____ TIME: _____

Analysis performed within 96 hours? Yes _____ No _____

DATA SHEET B

Motor Driven Emergency Feedpump EF-9-2B Functional Test

1. Pump idle inlet pressure _____ psig
2. Pump running inlet pressure (6.1.16 or 6.2.11) _____ psig
3. Pump running discharge pressure (6.1.17 or 6.2.12) _____ psig
4. Calculate differential pressure ($\bar{\#}3 - \bar{\#}2$) _____ psig
5. Lube oil level (Initial if satisfactory) _____
6. Pump Inboard Bearing Vibration (mils) H _____
V _____

QUANTITY	MEASURED VALUE	ACCEPTABLE RANGE	REQUIRED ACTION				REFERENCE VALUE
			ALERT RANGE		RANGE		
			LOW	HIGH	LOW	HIGH	
PUMP IDLE INLET PRESS. (PSIG)		>7.8	NA	NA	<7.8	NA	148
PUMP RUNNING INLET PRESS. (PSIG)		>7.8	NA	NA	<7.8	NA	144
PUMP DIFF. PRESSURE (PSI)		1279 to 1403	1238 to 1279	1403 to 1417	<1238	>1417	1375
FLOW RATE (GPM)		117.5 to 127.5	112.5 to 117.5	127.5 to 128.75	<112.5	>128.75	125.3
PUMP INBOARD BEARING TEMP. (°F)	*	<180	NA	NA	NA	≥180	114
PUMP OUTBOARD BEARING TEMP. (°F)	*	<180	NA	NA	NA	≥180	96.6
MAX VIBRATION (MILS)		0 to 1	NA	>1 to 1.5	NA	>1.5	.32V

*Measurements taken only during first test run each calendar year.

Bearing Temperatures

NOTE: To be measured yearly.

TIME

INSCARD BEARING TEMP.

OUTBOARD BEARING TEMP.

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NOTE: Three consecutive measurements taken at 10 minute intervals must change by less than 3%.

DATA SHEET 2 (Cont'd)

05/04/78

	CO-PI-2026	EF-PI-2001	CO-FE-7617	EAGLE EYE METER	VIBRATION INSTRUMENT
MANUFACTURE					
MODEL					
SERIAL NO.					
SCALE RANGE					

PERFORMED BY: _____ DATE: _____ TIME: _____

APPROVED BY: _____ DATE: _____

Valve No. Stroke Time (sec.) Acceptance Criteria

EF-V27B OPEN in _____ ≤ 3 sec.

Valve No. Valve Function Requirement Date/Initial

EF-V1 B (check valve) OPEN _____

EF-V1A (check valve) CLOSED _____

PERFORMED BY: _____ DATE: _____

APPROVED BY: _____ DATE: _____

ANALYSIS:

Analysis by: _____ DATE: _____ TIME: _____

Analysis performed within 96 hours? Yes _____ No _____

APPENDIX A

Motor Driven Emergency Feedpump, EF-P-2A Recirculation Valve Line-Up

Valve	Description	Position	Initial
CO-V85	Iso Valve on Header from Cond. Pumps	OP	_____
CO-V82A	Iso Valve from Cond. Storage Tanks	OP	_____
CO-V83A	Suction to EF-P-2A	L.O.	_____
EF-V7A	EF-P-2A Recirc to Cond.	OP	_____
EF-V8A	EF-P-2A Recirc. to CO-T-1A	CL	_____
EF-V9	CO-T-1A isolation valve	OP	_____
CO-V92A	EF Suction from CO-T-1A	OP	_____
CO-V98B	EF Suction From CO-T-1B	OP	_____
CO-V87	EF Pumps Suct Hdr Block	OP	_____
EF-V11A	Emerg. F.W. to RC-H-1A	CL	_____
EF-V12A	Emerg. F.W. to RC-H-1A	CL	_____
EF-V32A	EF-V11A Bypass	CL	_____
EF-V33A	EF-V12A Bypass	CL	_____
EF-V29A	EF-P-2A Cooling Water Inlet	OP	_____
EF-V31A	Bearing cooling water outlet	OP	_____
EF-V11B	Emerg. F.W. to RC-H-1B	CL	_____
EF-V12B	Emerg. F.W. to RC-H-1B	CL	_____
EF-V32B	EF-V11B Bypass	CL	_____
EF-V33B	EF-V12B Bypass	CL	_____

APPENDIX B

Motor Driven Emergency Feedpump, EF-P-2B Recirculation Valve Line-Up

Valve	Description	Position	Initial
CO-V85	Iso Valve on Header from Cond. Pumps	OP	_____
CO-V82B	Iso Valve from Cond. Storage Tanks	OP	_____
CO-V83B	Suction to EF-P-2B	L.O.	_____
EF-V7B	EF-P-2B Recirc to Cond.	OP	_____
EF-V8B	EF-P-2B Recirc. to CO-T-1A	CL	_____
EF-V9	CO-T-1B isolation valve	OP	_____
CO-V98A	EF Suction from CO-T-1A	OP	_____
CO-V98B	EF Suction From CO-T-1B	OP	_____
CO-V87	EF Pumps Suct Hdr Block	OP	_____
EF-V11A	Emerg. F.W. to RC-H-1A	CL	_____
EF-V12A	Emerg. F.W. to RC-H-1A	CL	_____
EF-V32A	EF-V11A Bypass	CL	_____
EF-V33A	EF-V12A Bypass	CL	_____
EF-V29B	EF-P-2B Cooling Water Inlet	OP	_____
EF-V31B	Cooling water outlet	OP	_____
EF-V11B	Emerg. F.W. to RC-H-1B	CL	_____
EF-V12B	Emerg. F.W. to RC-H-1B	CL	_____
EF-V32B	EF-V11B Bypass	CL	_____
EF-V33B	EF-V12B Bypass	CL	_____