

DUKE POWER COMPANY

McGUIRE NUCLEAR STATION

PUMP AND VALVE INSERVICE TESTING

UNIT 1

REVISION #5

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DUKE POWER COMPANY
MCGUIRE NUCLEAR STATION
PUMP INSERVICE TESTING PROGRAM
ASME SECTION XI, SUBSECTION IWP

The inservice testing of ASME Code Class 1, 2, and 3 pumps provided with an emergency power source will be tested as required by Section XI, Subsection IWP, of the ASME Boiler and Pressure Vessel Code 1980 Edition, except where specific written relief has been granted by the Commission. A description of the proposed inservice testing program, as well as specific requests for relief from code requirements determined to be impractical, is described by the following.

- 4 | I. The following are specific requests for relief from certain code requirements.
 - A) IWP-4120 requires the full scale range of each instrument to be three times the reference value or less. This was changed from four times the reference value in the edition of Section XI that was in effect prior to unit licensing. 10CFR, Section 50.55a(g)(4) states that design provisions are excluded from the requirement to upgrade to subsequent editions of Section XI. Since any cases where the three-times reference value criterion is not met would require design changes in instrumentation, we will continue to apply the four-times reference value criterion, as interpreted in B) below, for instrument accuracy evaluation.
 - B) In several cases, instrumentation does not meet the four times reference value criterion. These cases predominantly involve suction pressure gauges where a larger range is required to accommodate varying conditions at the suction of the pump. In all cases where the four-times reference value criterion cannot be met, an instrument error evaluation is performed to demonstrate that the overall accuracy of the differential pressure measurement is within the limits established by IWP. These cases are RHR discharge, nuclear service water suction, and control room chilled water suction gages.
 - 4 | C) Table IWP-3100-1 establishes the parameters that are to be measured. The previous edition of Section 11 specified that in a fixed resistance system, either ΔP or Q was to be measured, not both. The centrifugal charging pumps are tested using fixed resistance flow paths, with no flow indication provided. Based on the design
5 | change exclusion provided by 10CFR50.55a(g)(4), we will continue to apply the criterion that it is not required to measure flow in a fixed resistance system. The Residual Heat Removal Pumps are in a fixed resistance system that does have a flow gauge available. There
5 | is no way to adjust flow in the system and the gauge is not sufficiently accurate at low flows to provide a precise indication of flow. For these pumps, a flow will be recorded but will not be used for comparison to any reference values.
 - 4 | D) Table IWP-4110-1 states that vibration measurement should have an accuracy of $\pm 5\%$. McGuire has no permanently installed vibration instrumentation. The portable instruments used to measure vibration have an uncertainty of $\pm 11\%$.

- II. The following Safety Class 1, 2, and 3 pumps (See Attachment #1 for specific safety class and available instrumentation) will be tested in accordance with the intent of Subsection IWP of the ASME code:

NUCLEAR SERVICE WATER PUMPS (1A, 1B)
CONTAINMENT SPRAY PUMPS (1A, 1B)
SAFETY INJECTION PUMPS (1A, 1B)
MOTOR-DRIVEN AUX. FEEDWATER PUMPS (1A, 1B)
TURBINE-DRIVEN AUX. FEEDWATER PUMP (NO. 1)
CENTRIFUGAL CHARGING PUMPS (1A, 1B)
COMPONENT COOLING PUMPS (1A1, 1A2, 1B1, 1B2)
RESIDUAL HEAT REMOVAL PUMPS (1A, 1B)

- III. The following Safety Class 1, 2, and 3 pumps (See Attachment #1 for specific safety class and available instrumentation) will be tested in accordance with the intent of Subsection IWP, except for the request for relief for the specific requirements determined to be impractical as described below.

A) PUMP: CONTROL AREA CHILLED WATER PUMPS (CRA-P-1, CRA-P-2)

SAFETY CLASS: 3

FUNCTION: To provide chilled water to air handling units supplying control area air conditioning

TEST REQUIREMENTS: 1 Measure pump bearing temperature during inservice testing.

2. Annually run pumps until bearing temperatures stabilize.

BASIS FOR RELIEF: There is no instrumentation installed to measure bearing temperature, and no meaningful data can be obtained from bearing housing surface temperature measurements.

ALTERNATE TESTING: The inservice testing of the Control Area Chilled Water Pumps will be in accordance with the intent of Subsection IWP except that bearing temperature will not be monitored and subsequently the pumps will not be run annually until bearing temperature stabilizes.

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- IV. The following Safety Class 1, 2, and 3 pumps are provided with insufficient instrumentation to perform any meaningful testing in accordance with the intent of Subsection IWP and therefore the following alternate testing methods, as well as requests for relief from compliance with Subsection IWP, are described by the following.

A) PUMP: D/G FUEL OIL TRANSFER PUMPS (1A, 1B)
SAFETY CLASS: 3
FUNCTION: Diesel generator auxiliary support
TEST REQUIREMENT: Test pumps in accordance with Subsection IWP
BASIS FOR RELIEF: Pumps contain insufficient instrumentation (See Attachment #1) to perform any meaningful testing in accordance with the intent of Subsection IWP.
ALTERNATE TESTING: Monthly Diesel Generator starting and loading as required by McGuire Technical Specifications is sufficient in assessing the hydraulic condition of the subject auxiliary pumps and demonstrating the capability of the individual components to perform their design function.

5 | The mechanical condition of the subject pumps will be determined from vibration data to be gathered quarterly. Flow will be monitored by observing level rise in the day tank. |

B) PUMP: D/G ROOM SUMP PUMPS (1A2, 1A3, 1B2, 1B3)
SAFETY CLASS: 3
FUNCTION: Water removal from Diesel Generator rooms
TEST REQUIREMENT: Test pumps in accordance with Subsection IWP
BASIS FOR RELIEF: Pumps contain insufficient instrumentation (See Attachment #1) to perform any meaningful testing in accordance with Subsection IWP.
ALTERNATE TESTING: Due to the anticipated infrequent normal operation of these pumps, quarterly, each pump will be verified to be capable of performing their design function of removing water from the sump at a rate greater than or equal to 419 gpm. The time which it takes to pump a known volume from the sump is recorded and converted to a flow rate.

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- V. The Standby Makeup Pump is not safety related and does not receive emergency power. It is required to be tested by McGuire Technical Specifications. Therefore, the request for relief and alternate testing method is described below.

PUMP:	Standby Makeup Pump (1)
SAFETY CLASS:	N/A
TEST REQUIREMENT:	Test pump in accordance with IWP (Technical Specification requirement)
BASIS FOR RELIEF:	Pump contains insufficient instrumentation (see Attachment #1) to perform any meaningful testing in accordance with Subsection IWP.
ALTERNATE TESTING:	<p>Pump will be verified to be capable of performing its design function on a quarterly basis by verifying that with pump in operation in a test loop that design flowrate can be achieved.</p> <p>The mechanical condition of the pump will be determined from vibration data to be gathered quarterly.</p>

SAFETY RELATED CLASS 1, 3 PUMPS PROVIDED WITH AN
EMERGENCY POWER SOURCE

PUMPS			Safety Class	Test Frequency	Speed, N	Inlet Pres., Pi	Diff. Pres., ΔP	Flow Rate, Q	Vib. Amplitude, V	Lubricant Level	Bearing Temp, Tb	Discharge Pres., Pd	Duke Flow Diagram
	Nuclear Service Water Pumps (1A, 1B)	(RN)	3	QU	NR	X	X	X	X(1)	X	X	X	MC-1574-1.1
	Containment Spray Pumps (1A, 1B)	(NS)	2	QU	NR	X	X	X	X(1)	X(3)	X(2)	X	MC-1563-1.1
4	Residual Heat Removal Pumps (1A, 1B)	(ND)	2	QU	NR	X	X	X	X(1)	X(3)	X(2)	X	MC-1561-1.0
	Safety Injection Pumps (1A, 1B)	(NI)	2	QU	NR	X	X	X	X(1)	X	X	X	MC-1562-3.0
	M/D Aux. Feedwater Pumps (1A, 1B)	(CA)	3	MO	NR	X	X	X	X(1)	X	X	X	MC-1592-1.1
	T/D Aux. Feedwater Pump (No. 1)	(CA)	3	MO	X	X	X	X	X(1)	X	X	X	MC-1592-1.1
	Cent. Charging Pumps (1A, 1B)	(NV)	2	QU	NR	X	X	NR	X(1)	X	X	X	MC-1554-3.1
	Component Cooling Pumps (1A1, 1A2, 1B1, 1B2)(KC)		3	QU	NR	X	X	X	X(1)	X	X	X	MC-1573-1.0
4	Control Area Chilled Water Pumps (CRA-P-1,2)(YC)		3	QU	NR	X	X	X	X(1)	X	X(4)	X	MC-1618-1.0
	D/G Fuel Oil Transfer Pumps (1A, 1B)	(FD)	3	QU	NR	-	-	X	X(1)	-	-	X	MC-1609-3.0
	D/G Room Sump Pumps (1A2, 1A3, 1B2, 1B3)(WN)		3	QU	NR	-	-	-	-	-	-	X	MC-1609-7.0
5	Standby Makeup Pump (1)(NV)		NS	QU	NR	-	-	X	X(1)	-	-	-	MC-1554-1.3

NOTES

1. Vibration to be measured with portable instrumentation (Accuracy + 11%).
2. Pump contains no bearings, but is close coupled, therefore motor bearing will be monitored.
3. Pump is close coupled, therefore motor lubricant level will be observed.
4. No instrumentation is installed to measure bearing temperature.

LEGEND

- | | | |
|-----------------------------------|--------------------------------------|----------------|
| X - Instrumentation | MO - Monthly | QU - Quarterly |
| - - Instrumentation not available | NR - Not required for IWP Compliance | () - Note |
| NS - Non Safety Related | | |

DEFINITIONS OF TESTING REQUIREMENTS AND ALTERNATIVES

Cold Shutdown (CS)

Testing will be performed when the unit is in a cold shutdown (Mode 5) whose planned length is of sufficient duration to establish necessary test conditions and to perform the test. In the case of frequent shutdowns, the testing will not be performed more than one per three (3) months. Testing will commence as soon as the cold shutdown condition is achieved but not later than 48 hours after shutdown, and continue until complete or the plant is ready to return to power. Completion of all valve testing is not a prerequisite to return to power. Any testing not completed at one cold shutdown will be performed during any subsequent cold shutdowns that may occur before refueling to meet the code-specified testing frequency.

Cycle and Time (CT)

Valve will be tested to verify that its stroke time is less than the maximum allowable stroke time specified by McGuire Nuclear Station.

Leak Test (LT)

Valve will be tested to verify that the seat leakage is limited to a specific maximum amount.

Movement Test (MT)

Valve will be tested to verify that the valve is operable and/or the valve moves to the position required to fulfill its purpose. No timing is involved.

Quarterly (Q)

Testing will be performed at least once per three (3) months.

Refueling Outage (RF)

Testing will be performed when the unit is shut down for refueling (Mode 6). Safety valves will be tested periodically per the testing schedule defined in ASME Subsection IWV-3510.

Refueling Outage (RF*)

Valve will normally be tested during refueling outages, however, testing is not required more often than once per 24 months per Appendix J to 10CFR50.

Setpoint (SP)

Valve will be tested to verify that it will relieve pressure at its specified setpoint.

GENERAL RELIEF

- 5 | I. TEST REQUIREMENT: Perform trend analyses on category A and B valves as described in IWV-3417(a).
- BASIS FOR RELIEF: Trend analyses performed on rapid acting valves does not give reliable indication of valve stroke time deterioration.
- 4 | TESTING ALTERNATIVE: Trend analyses will not be performed on valves that normally operate with cycle times of less than 5 seconds. Maintenance will be initiated if valve time exceeds max. limit.
- 5 | II. TEST REQUIREMENT: Measure the full-stroke time for valves requiring cycle time test as defined in IWV-3413.
- BASIS FOR RELIEF: McGuire's Operator Aid Computer and Portable Valve Timers operate by measuring the time between limit switch operations, rather than from the initiation of the actuating signal. The only way to time the valve using the initiation signal is through some manual means, such as a stopwatch. It is felt that more consistent and repeatable results can be obtained by automated timing of the valve from limit switch to limit switch.
- TESTING ALTERNATIVE: Valves will normally be times from limit switch to limit switch. In cases where this is not practical, timing will be manually done from initiating signal.
- III. TEST REQUIREMENT: Leak rate test Category A valves in accordance with IWV-3420.
- BASIS FOR RELIEF: McGuire Tech Specs require leak rate testing in accordance with 10CFR50 Appendix J. The Tech Specs establish the required acceptance criteria, which is more restrictive than that required by IWV. In order to eliminate redundant paperwork, all valve leak rate testing will be conducted as per Appendix J.
- TESTING ALTERNATIVE: Category A valves will be leak tested in accordance with 10CFR50 Appendix J.

SYSTEM:

CHEMICAL & VOLUME CONTROL SYSTEM

FLOW DIAGRAMS:

MC-1554-1.1

MC-1554-1.2

MC-1554-1.3

MC-1554-2.0

MC-1554-3.0

MC-1554-3.1

System: Chemical and Volume Control											
Valve Number	Class	Drawing Number	Coordinates	Valve Category				Test Requirements	Relief Requests	Testing Alternative	Remarks
				A	B	C	D				
INV-94A	B	MC-1554-1.1	J-13		X			CT	X		10 sec. max. cycle time
INV-95B	B	MC-1554-1.1	H-13		X			CT	X		10 sec. max. cycle time
4 INV-12	B	MC-1554-1.2	F-11			X		MT			
5 INV-21A	A	MC-1554-1.2	E-3		X			CT	X		60 sec. max. cycle time
4 INV-22	A	MC-1554-1.2	C-3			X		MT			
INV-457A	B	MC-1554-1.2	I-7		X			CT			Isolation time \leq 15 sec.
INV-458A	B	MC-1554-1.2	J-7		X			CT			Isolation time \leq 15 sec.
INV-459A	B	MC-1554-1.2	K-7		X			CT			Isolation time \leq 15 sec.
INV-7B	B	MC-1554-1.2	J-10		X			CT	X	CS	10 sec. max. cycle time
4 INV-1A	A	MC-1554-1.2	C-5		X			CT	X	CS	10 sec. max. cycle time
INV-2A	A	MC-1554-1.2	D-5		X			CT	X	CS	10 sec. max. cycle time

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Valve Number	Class	Drawing Number	Coordinates	Valve Category				Test Requirements	System: Chemical and Volume Control		
									Relief Requests	Testing Alternative	Remarks
				A	B	C	D				
INV-24B	A	MC-1554-1.2	D-6		X			CT			60 sec. max. cycle time
INV-25B	A	MC-1554-1.2	D-7		X			CT			60 sec. max. cycle time
INV-1013C	E	MC-1554-1.3	F-12		X			CT			30 sec. max. cycle time
INV-1012C	E	MC-1554-1.3	F-12		X			CT			30 sec. max. cycle time
INV-844	E	MC-1554-1.3	F-5			X		MT			
INV-1007	B	MC-1554-1.3	F-13			X		MT	X	CS	
INV-1008	B	MC-1554-1.3	F-13			X		MT	X	CS	
INV-1009	B	MC-1554-1.3	F-14			X		MT	X	CS	
INV-1010	B	MC-1554-1.3	F-14			X		MT	X	CS	

System: Chemical and Volume Control

Valve Number	Class	Drawing Number	Coordinates	Valve Category				Test Requirements	Relief Requests	Testing Alternative	Remarks
				A	B	C	D				
INV-842A, C	B	MC-1554-1.3	F-2		X			CT			15 sec. max. cycle time
INV-849A, C	B	MC-1554-1.3	F-8	X				LT CT			15 sec. max. cycle time
INV-1002	B	MC-1554-1.3	F-10	X		X		LT MT	X	RF	
INV-141A	B	MC-1554-2.0	B-8		X			CT	X	CS	10 sec. max. cycle time
INV-142B	B	MC-1554-2.0	B-7		X			CT	X	CS	10 sec. max. cycle time
INV-244A	B	MC-1554-3.0	K-8		X			CT	X	CS	10 sec. max. operating time
INV-245B	B	MC-1554-3.0	K-9		X			CT	X	CS	10 sec. max. operating time

VALVE: INV-21A

CATEGORY: B

CLASS: A

FUNCTION: Isolates Pressurizer Auxiliary Spray

TEST REQUIREMENT: Cycle and time every three months

BASIS FOR RELIEF: Opening this valve could result in a reactor low pressure trip

ALTERNATE TESTING: Valve will be cycled and timed during cold shutdown.

VALVES: 1VP-1B, 1VP-2A, 1VP-3B, 1VP-4A, 1VP-6B, 1VP-7A, 1VP-8B,
1VP-9A, 1VP-10A, 1VP-11B, 1VP-12A, 1VP-13B, 1VP-15A,
1VP-16B, 1VP-17A, 1VP-18B, 1VP-19A, 1VP-20B

CATEGORY: A

CLASS: B

FUNCTION: Provide containment isolation.

TEST REQUIREMENT: Cycle and time valves every three months.

BASIS FOR RELIEF:

5 | Technical Specification 3.6.1.9 places severe restrictions
4 | on the operational time and alignment permitted for this
5 | system during normal operation. 1VP-1, 1VP-2, 1VP-3, and
4 | 1VP-4 may be opened for only 250 hours a year at power.
The rest of the VP valves may not be opened at all during
power operation.

ALTERNATE TESTING: Valves will be timed whenever the system is operated or
whenever the valves are cycled, and the elapsed time since
the previous test has been three months or greater.

SYSTEM:

NUCLEAR SERVICE WATER

FLOW DIAGRAMS:

MC-1574-1.0

MC-1574-1.1

MC-2574-1.1

MC-1574-2.0

MC-1574-2.1

MC-1574-3.0

MC-1574-3.1

MC-1574-4.0

System: Nuclear Service Water

Valve Number	Class	Drawing Number	Coordinates	Valve Category				Test Requirements	Relief Requests	Testing Alternative	Remarks
				A	B	C	D				
5 ORN-7A	C	MC-1574-1.0	J-9		X			CT			60 sec. max. cycle time
5 ORN-2B	C	MC-1574-1.0	K-10		X			CT			60 sec. max. cycle time
5 ORN-3A	C	MC-1574-1.0	K-10		X			CT			60 sec. max. cycle time
5 ORN-13A	C	MC-1574-1.0	J-11		X			CT			60 sec. max. cycle time
5 ORN-12A,C	C	MC-1574-1.0	I-11		X			CT			60 sec. max. cycle time
5 ORN-14A	C	MC-1574-1.0	I-13		X			CT			60 sec. max. cycle time
5 ORN-15B	C	MC-1574-1.0	F-13		X			CT			60 sec. max. cycle time
5 ORN-4A	C	MC-1574-1.0	F-12		X			CT			60 sec. max. cycle time
5 ORN-5B	C	MC-1574-1.0	E-12		X			CT			60 sec. max. cycle time
5 ORN-10A,C	C	MC-1574-1.0	G-11		X			CT			60 sec. max. cycle time

System: Nuclear Service Water

Valve Number	Class	Drawing Number	Coordinates	Valve Category				Test Requirements	Relief Requests	Testing Alternative	Remarks
				A	B	C	D				
5 ORN-11B	C	MC-1574-1.0	F-11		X			CT			60 sec. max. cycle time
5 ORN-1	C	MC-1574-1.0	I-10		X			CT			60 sec. max. cycle time
5 ORN-301A,C	C	MC-1574-1.0	G-10		X			CT			60 sec. max. cycle time
5 ORN-302B	C	MC-1574-1.0	F-10		X			CT			60 sec. max. cycle time
5 ORN-9B	C	MC-1574-1.0	D-9		X			CT			60 sec. max. cycle time
5 ORN-149A	C	MC-1574-1.0	J-7		X			CT			60 sec. max. cycle time
5 ORN-152B	C	MC-1574-1.0	E-7		X			CT			60 sec. max. cycle time
5 ORN-150A	C	MC-1574-1.0	I-6		X			CT			60 sec. max. cycle time
5 ORN-151B	C	MC-1574-1.0	F-6		X			CT			60 sec. max. cycle time
1RN-299A	C	MC-1574-1.0	K-2		X			CT			60 sec. max. cycle time

Valve Number	Class	Drawing Number	Coordinates	Valve Category				Test Requirements	Relief Requests	Testing Alternative	System: Nuclear Service Water
				A	B	C	D				Remarks
1RN-279B	C	MC-1574-1.0	K-2		X			CT			60 sec. max. cycle time
1RN-64A	C	MC-1574-1.0	I-2		X			CT	X	CS	60 sec. max. cycle time
4 1RN-63B	C	MC-1574-1.0	I-2		X			CT	X	CS	60 sec. max. cycle time
1RN-296A	C	MC-1574-1.0	I-1		X			CT			60 sec. max. cycle time
5 ORN-147A,C	C	MC-1574-1.0	H-2		X			CT			60 sec. max. cycle time
5 ORN-148A	C	MC-1574-1.0	H-3		X			CT			60 sec. max. cycle time
1RN-297B	C	MC-1574-1.0	G-2		X			CT			60 sec. max. cycle time
5 ORN-283A,C	C	MC-1574-1.0	F-2		X			CT			60 sec. max. cycle time
5 ORN-284B	C	MC-1574-1.0	F-2		X			CT			60 sec. max. cycle time