

## APPENDIX 2A

### Inservice Testing of Pumps

Discussion: The pumps that require inservice tests for operational readiness under the ASME B & PV Code, Section XI, Subsection IWP are listed below. The inservice test parameters and test frequencies are tabulated for each pump. The requested test exceptions and basis for each exception are given for the applicable parameters.

General: The pumps listed are directly coupled to induction motor drivers; therefore, the rotation speed need not be measured as prescribed in Subarticle IWP-4400. Operating modes, as designated in this appendix, are as follows: Mode 1 - Power Operation, Mode 2 - Hot Standby, Mode 3 - Hot Shutdown, Mode 4 - Cold Shutdown, Mode 5 - Refueling Shutdown.

#### Low Pressure Safety Injection Pumps SI-1A, B      Class 2

P&ID: CE-E-23866-210-130, Sheet 1 of 2 (G4)

Function: The LPSI pumps are available for safety injection of borated water into the reactor coolant system following a LOCA and are used to remove residual heat for cold shutdowns.

#### Containment Spray Pumps SI-3A, B, C      Class 2

P&ID: CE-E-23866-210-130, Sheet 1 of 2 (G3, G2, G2)

Function: The CS pumps are available to spray borated water into containment following a LOCA.

#### High Pressure Safety Injection Pumps SI-2A, B, C      Class 2

P&ID: CE-E-23866-210-130, Sheet 1 of 2 (G6, G7, G7)

Function: The HPSI pumps are available for safety injection of borated water into the reactor coolant system following a LOCA and are used to maintain the required water level in the safety injection tanks.

<u>Test Parameter</u>	<u>Frequency</u>	<u>Subarticle Exceptions</u>	<u>Operating Modes Required for Testing</u>
Inlet Pressure	Quarterly	IWP-3100	1, 2, 3, 4 or 5
Differential Pressure	Quarterly	IWP-3100	1, 2, 3, 4 or 5
Vibration Amplitude	Quarterly		1, 2, 3, 4 or 5
Lubrication Level	Quarterly		1, 2, 3, 4 or 5
Bearing Temperature	Yearly		1, 2, 3, 4 or 5
Flow Rate	-	IWP-3100	-

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Exceptions:

IWP-3100 Flow measurement

Basis: Original plant design did not include flow measurement for these pumps. These pumps are in fixed resistance systems. The inservice testing of differential pressure across these pumps under a minimum recirculation flow condition (and thus near shutoff head) is deemed adequate to allow determination of pump functionality and or degradation.

IWP-3100 Inlet and differential pressure measurement

Basis: Inlet pressure for these tests will be determined by measuring the static head tank level.

Charging Pumps CH-1A, B, C Class 2

P&ID: CE-E-23866-210-120, Sheet 1 of 2 (E6, E4, E3)

Function: The charging pumps are provided to return the purification flow to the reactor coolant system during plant steady state operations.

<u>Test Parameter</u>	<u>Frequency</u>	<u>Operating Mode Required for testing</u>
Inlet Pressure	Quarterly	1, 2 or 3
Differential Pressure	Quarterly	1, 2 or 3
Flow Rate	Quarterly	1, 2 or 3
Vibration Amplitude	Quarterly	1, 2 or 3
Lubricant Level and Pressure	Quarterly	1, 2 or 3
Bearing Temperature	Yearly	1, 2 or 3

Component Cooling Pumps AC-3A, B, C Class 3

P&ID: GHDR-11405-M-10 (D2, C2, B2)

Function: The component cooling pumps supply cooling water to equipment in the containment and auxiliary building.

<u>Test Parameter</u>	<u>Frequency</u>	<u>Subarticle Exceptions</u>	<u>Operating Modes Required for Testing</u>
Inlet Pressure	-	IWP-3100	-
Differential Pressure	-	IWP-3100	-
Flow Rate	-	IWP-3100	-
Vibration Amplitude	Quarterly	-	1, 2, 3, 4 or 5
Lubricant Level or Pressure	-	IWP-3100	-
Bearing Temperature	Yearly	-	1, 2, 3, 4 or 5



## Exceptions

### IWP-3100 Inlet and differential pressure measurement

Basis: System design does not include instrumentation for measuring these parameters. Discharge pressure will be measured on a quarterly schedule to help determine possible pump degradation.

Establishment of a reference value for flow rate

Basis: There are many components or subsystems on the component cooling water system with several possible piping configurations. Some of the components are critical elements to which the flow rate cannot arbitrarily be varied for the sake of running a pump test. Consequently, establishing a reference flow rate for a pump test on a periodic basis is impractical.

Lubricant level or pressure observation

Basis: The pump bearings are cartridge type that have been re-packed with the proper amount of grease and under normal conditions require no further attention for the life of the bearings.

Reference: Ingersoll Rand Instruction Manual

### Boric Acid Pumps CH-4A, B Class 3

P&ID: CE-E-23866-210-121

Function: The boric acid pumps supply blended boric acid to the charging pump header and provide makeup to the SIRW and volume control tanks.

<u>Test Parameter</u>	<u>Frequency</u>	<u>Subarticle Exceptions</u>	<u>Operating Modes for Testing</u>
Inlet Pressure	Quarterly	IWP-3100	1, 2, 3, 4 or 5
Differential Pressure	Quarterly	IWP-3100	1, 2, 3, 4 or 5
Vibration Amplitude	Quarterly	-	1, 2, 3, 4 or 5
Lubricant Level	Quarterly	-	1, 2, 3, 4 or 5
Bearing Temperature	Yearly	-	1, 2, 3, 4 or 5
Flow Rate	-	IWP-3100	-

### Exceptions:

#### IWP-3100 Flow measurement

Basis: Original plant design did not include flow measurement for these pumps. These pumps are in fixed resistance systems. The inservice testing of differential pressure across these pumps under a minimum recirculation flow condition (and thus near shutoff head) is deemed adequate to allow determination of pump functionality and or degradation.



IWP-3100 Inlet and differential pressure measurement

Basis: Inlet pressure will be determined by measuring the static head tank level.

Raw Water Pumps AC-10A, B, C, D Class 3

P&ID: GHDR-11405-M-100

Function: The raw water pumps provide a cooling medium for the component cooling water system.

<u>Test Parameter</u>	<u>Frequency</u>	<u>Subarticle Exceptions</u>	<u>Operating Modes Required for Testing</u>
Inlet Pressure	-	IWP-3100	-
Differential Pressure	-	IWP-3100	-
Flow Rate	-	IWP-3100	-
Vibration Amplitude	Quarterly	-	1,2,3,4 or 5
Bearing Temperature	-	IWP-3100	-
Discharge Pressure vs. Motor Amperage	Quarterly	IWP-3100	1,2,3,4 or 5

Exceptions:

IWP-3100 Inlet pressure measurement  
Basis: System design does not permit direct measurement of inlet pressure. Varying river level and unknown accumulations of sand near the pump suction bell make it impossible to determine the inlet pressure.

Differential pressure measurement  
Basis: Because of the inability to measure inlet pressure, differential pressure measurement is not possible.

Flow rate measurement  
Basis: The system design does not provide an accurate indication of flow rate due to fouling by untreated river water.

Bearing temperature measurement  
Basis: All bearings are inaccessible for temperature measurement. All are submerged in river water.

Discharge pressure vs. motor amperage  
Basis: To be performed in lieu of a differential pressure measurement. An acceptable motor amperage value will be determined over a discharge pressure range of 26 through 40 psig.

Auxiliary Feedwater Pumps FW-6, FW-10 Class 3

P&ID: GHDR-11405-M-253

Function: The auxiliary feedwater pumps provide water to the steam generators when normal condensate feedwater flow is unavailable.