

Tarikh: 07 Julai 2023



Kementerian Kesihatan Malaysia

WORK INSTRUCTION (WI)
CHILLER PROGRAM KELESTARIAN
HOSPITAL QUEEN ELIZABETH II

UNIT KEJURUTERAAN

HOSPITAL QUEEN ELIZABETH II

BERKUAT KUASA MULAI: 07 JULAI 2023

No. Rujukan: HQE2/JRT(DOK.DLMN)/05



WORK INSTRUCTION (WI) CHILLER
PROGRAM KELESTARIAN
UNIT KEJURUTERAAN , HOSPITAL QUEEN
ELIZABETH II

E-Mel : engineeringhqeii@gmail.com
Tel./Ext. : 088-324600 / 1001

DISEDIAKAN OLEH :


(Ir THOMSON LAI TECK YONG)
JURUTERA HOSPITAL

DISEMAK OLEH :


(DR AHMAD HUMAIZI ZAKRI)
KETUA UNIT KUALITI

DISAHKAN OLEH :



(DR. FERRO FIRDAUS BIN IBRAHIM)
PENGARAH HOSPITAL

DIKEMASKINI PADA : 07 JULAI 2023

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	<i>WORK INSTRUCTION (WI)</i>		

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1.0 SAFETY AND HEALTH PRECAUTION

- Wear appropriate PPE

2.0 ENVIRONMENT CAUTION

- High Voltage
- Noise Hazard
- Slippery
- Rotation and moving components

3.0 EQUIPMENT & TOOLS

- Tool box
- BAS Control

4.0 FREQUENCY

- Monthly
- Yearly

5.0 PURPOSE

- To carry out proper maintenance of Chiller in order to meet operational parameters requirement
- To optimize the operation of the Chiller and its fittings and accessories in order to minimize the probability of breakdown and to implement energy management practice.

6.0 OPERATION & MAINTENANCE FLOW

The conventional water-cooled chillers mainly comprise of three cycles namely the refrigeration cycle, the cooling water loop and the chilled water loop. The whole system works together as one under the vapour compression cycle which uses refrigerant as the working fluid. The importance of optimizing a chiller

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system that can save energy and cost has to be stressed on but at the same time, the cooling load requirement at end-user side still complied.

6.1 DAILY LOG

The log allows us to build a history of operating conditions including temperatures, pressures, fluid levels, and flow rates. It helps us to generate trend reports that help to identify maintenance needs before they become an issue. The parameters that need to be taken are;

- a. Temperature of in/out of chilled water and condenser water for HQE II is 44.9°F
- b. Temperature of refrigerant at evaporator and condenser
- c. Pressure of refrigerant at evaporator and condenser
- d. Operating oil level
- e. Flow rates at chilled water piping and condenser water piping

6.2 KEEP TUBES CLEAN FOR EFFICIENT HEAT TRANSFER

Heat transfer efficiency has the greatest single effect on chiller performance, so clean heat transfer is fundamental to maintaining high efficiency. Contaminants such as minerals, scale, mud, algae and other impurities increase thermal resistance and reduce overall performance. Approach temperatures are a good indicator of heat transfer efficiency. Higher approach temperatures are prime indicators that heat transfer efficiency is decreasing. Condenser tubes should be brush cleaned at least annually, or per your demand maintenance schedule to keep them free of contaminants.

The parameters that need to be taken are;

- a. Temperature of in/out of chilled water and condenser water

6.3 KEEP THE WATER QUALITY AT HIGH

All condenser water loops using open cooling sources require water treatment of some sort to eliminate scale, corrosion and biological growth. All lead to

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fouling in the condensers and impedes heat transfer and can decrease tube and piping effectiveness. Inspect chilled water loops once a year or regularly with remote monitoring for general water quality and evidence of corrosion.

To make sure the water quality test on condenser water system and chilled water system being carried out every month by competent water treatment specialist. The comments and recommendations should be considered accordingly.

6.4 KEEP THE WATER FLOW RATE IN RANGE

Changing the chilled water flow rate affects a chiller's performance. Too low a flow rate lowers the chiller efficiency and ultimately leads to laminar flow. The minimum flow rate is typically around 1,347 USgpm. Too high a flow rate leads to vibration, noise, and tube erosion. The maximum recommended flow rate is typically around 5,386 USgpm.

6.5 KEEP THE REFRIGERANT LEVEL ADEQUATE

The actual amount of cooling a chiller provides depends on how much refrigerant it moves through the compressor. It is important to maintain the proper level of refrigerant for the conditions desired. Refrigerant leaks, as well as air and moisture introduced into the system, will decrease efficiency and the reliability of the system. A low refrigerant charge will cause the compressor to work harder for less cooling effect.

To make sure the temperature and pressure of the refrigerant reading taken into log sheet.

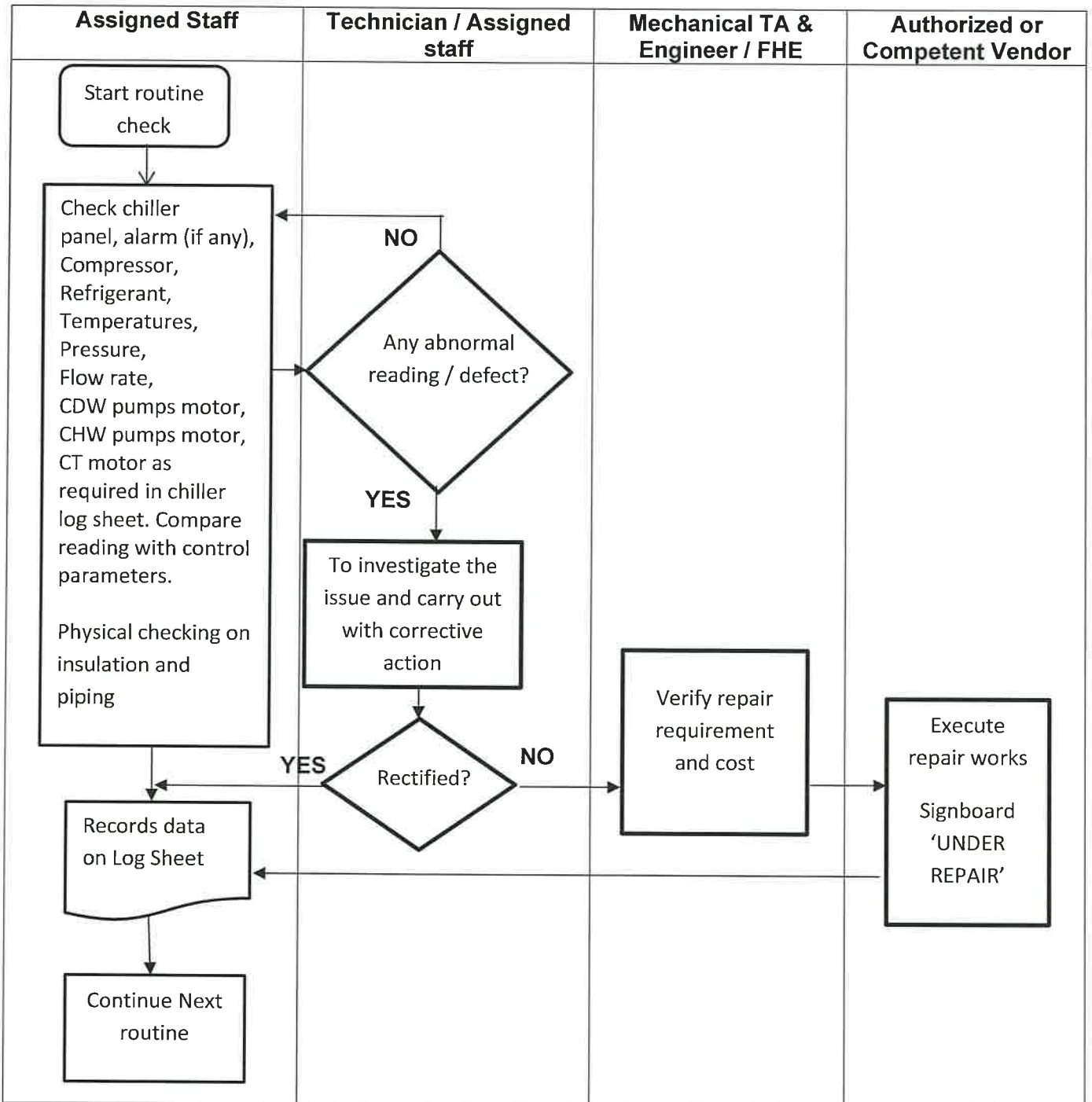
6.6 KEEP THE PIPING SYSTEM IN GOOD CONDITION


Non-condensables such as air and moisture leak into low pressure chillers because their evaporators operate in a vacuum. Non-condensables can lower the real efficiency of the chiller from the rated performance by as much as 4% at 60% load and 7% at 100% load. Purge units minimize the effect of non-condensables. We have to make sure;

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- a. The whole piping system free from any leakage.
- b. Insulation not damaged, tear or peel-off.

OPERATING FLOW CHART



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7.0 LOG SHEET : CENTRIFUGAL CHILLER

N O	Chilled Water Set _____ deg F / 3 / 4 / 5	Chiller No. 1 / 2		TIME (HRS)		
		Control Parameters	0800	1400	2000	0200
	Setting Auto / Manual					
1	Purge Unit	Min	Max			
	Run (Hrs)					
	Suction Temp (Deg F)					
2	Compressor Report					
(a)	Differential Oil Pressure (Psid)	18	40			
(b)	Oil Tank Temperature (Deg F)	100	170			
(c)	Discharge Oil Pressure (Psi)					
	Compressor phase (Amps R)					
	Compressor phase (Amps Y)					
	Compressor phase (Amps B)					
	Bearing Temperature 1 (Deg F)					
	Bearing Temperature 2 (Deg F)					
	Operating Oil Level (High / Low)	1/4	3/4			
3	Refrigerant Report					
(d)	Evaporator Refrigerant pressure (Inches hg / Psi)	25	45			
(e)	Evaporator Refrigerant temperature (Deg F)	30	45			
(f)	Condenser Refrigerant Pressure (Psig)	90	125			
(g)	Condenser Refrigerant temperature (Deg F)	80	100			
4	Temperature (Deg F)					
(h)	Condenser water inlet	83	92			



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(l)	Condenser water outlet	92	102				
(j)	Chilled water inlet	52	57				
(k)	Chilled water outlet	42	46				
5 Pressure (Psig)							
(L)	Condenser water inlet	15	35				
(m)	Condenser water outlet	10	30				
(n)	Chilled water inlet	50	110				
(o)	Chilled water outlet	10	100				
6 Flow rate (USgpm)							
(p)	Chilled water flow rate	1,347	5,386				
(q)	Condenser water flow rate	1,347	5,386				
1 Condenser water Pump Motors – Current (A)							
	Pump 1	50	60				
	Pump 2	50	60				
	Pump 3	50	60				
2 Chilled water Pump Motors - Current (A)							
	Pump 1	50	60				
	Pump 2	50	60				
	Pump 3	50	60				
3 Cooling Tower motor- Current (A)							
	Tower 1	10	12				
	Tower 2	10	12				
	Tower 3	10	12				

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INCIDENCE RECORD		Technician On Duty:
		1 st Shift 1. _____ 2. _____ 2nd Shift 1. _____ 2. _____ 3rd Shift 1. _____ 2. _____
Raise Schedule Corrective Maintenance work order if necessary		
Supervising Personnel		
Checked By : _____ Date _____ Verified BY: _____ Date: _____		