DOC NUMBER: **569-DB7A-PRO-500-004**	CLIENT NUMBER: **PRD-MEC-MDE-008**
CLIENT: **TAKEDA**	
PROJECT **BURITI EPCMV**	

FINAL DRUG PRODUCT COOLING WATER SYSTEM DESCRIPTION REPORT

RE	DATE	DESCRIPTION	EXEC	CHECK	APPROV
1	25MAY2022	ISSUED FOR CONSTRUCTION AS PER N+1 UPDATE	PTC	MPA	MSS
0	30JUL2021	ISSUED FOR CONSTRUCTION	JRM	LFF	MSS
A	23JUN2021	90% DD ISSUE	JRM	CCO	MSS

1. REVISION HISTORY

Rev	Reason For Change
A	90% DD ISSUE
0	ANSWERING TAKEDA COMMENTS – SUBMITAL 324.0 UPDATED ACCORDING TO CALCULATION REPORT, REVISION 0
1	AS PER N+1 UPDATE

2. PURPOSE

This document is intended to describe the process characteristics for the Cooling Water System, building 7A – Final Drug Product – FDP, intended to Buriti Project, located at Hermobrás site in Goiania – Pernambuco state, Brazil.

3. REFERENCE

The following documents were used as reference:

Item	Number	Title
01	7A-M-0-5-42	COOLING WATER SYSTEM
02	PRD-MEC-CLC-009	COOLING WATER SYSTEM CALCULATION
03	7A-M-0-5-43	CHILLED WATER GENERATION SYSTEM (HVAC)
04	7A-M-0-5-45	CHILLED WATER GENERATION SYSTEM (PROCESS)
05	7A-M-0-5-81	COMPRESSED AIR GENERATION SYSTEM
06	7A-Z-0-2-31	PROC. WASTE – COLLECT & TEMP./ LIFT STATION, SK-8001

4. PROCESS DESCRIPTION

The Cooling Water System was sized to feed the 2 HVAC Chillers (2 chillers operating), 1 Process Chiller (1 chiller operating), 1 Process Waste Sump Cooler and 1 Air Compressor based on the following conditions:

- DESIGN CONDITION – Sizing Criterion for Cooling Towers - 100% of the capacity of all equipment and an oversizing of 20%. – 2 Cooling Towers operating.
- MAXIMUM OPERATING CONDITION – 100% of the capacity of all equipment operating at the same time – 2 Cooling Towers operating.
- MINIMUM OPERATING CONDITION – 100% of the capacity of all equipment operating at the same time – 2 Cooling Towers operating at the same time (minimum pressure drop of the system).

It is a closed system, with the equipment shown below:

- 2 Cooling Towers CT-7A 2/ 3 (2 cooling towers are operating). Each cooling tower was sized for the capacity 2,718,608 kcal/h.

- 2 Pumps P-C-7A-1/ 2 (2 pumps are operating). Each pump was sized for the flow rate of 495.00 m³/hr and the HEAD of 26 mlc. Total flow rate of 990 m³/hr.
- 1 Chemical Dosing system.

4.1 COOLING TOWER

The Cooling Tower (CT-7A-2/ 3) are located on the Second Floor on the building 7A, where both are operating at the same time with a total thermal load of 5,437,215.3 kcal/hr and a total flow rate of 990 m³/hr.

The Cooling Towers reduce the cooling water temperature from 37.0°C to 31.5°C and, after that, it is distributed for consumers.

Each Cooling Towers has the following instruments:

EQUIPMENT	INSTRUMENT	FUNCTION
CT-7A-2	XV-940083	Timed Solenoid valve for Cooling Tower Blowdown
	SC-940041	Cooling Tower Fan Speed Control – to keep the supply temperature at 31.5°C with the Temperature Transmitter (TIT-940053)
	LCV-940078	Level Control Valve
	BV-940073	Static Balancing Valve
CT-7A-3	XV-940085	Timed Solenoid valve for Cooling Tower Blowdown
	SC-940042	Cooling Tower Fan Speed Control – to keep the supply temperature at 31.5°C with the Temperature Transmitter (TIT-940053)
	LCV-940079	Level Control Valve
	BV-940074	Static Balancing Valve

The Cooling Towers are interconnected in cooling water basin, not requiring an external line for equalization. Shall be in an elevation of 1.5 m above the floor to protect the pumps.

At the return line are installed a Pressure Transmitter (PIT-940020) and a Temperature Transmitter (TIT-940020) to check the cooling water operating conditions. There are alarms for High Pressure (PAH-940020), Low Pressure (PAL-940020) and High Temperature (TAH-940020).

4.2 PUMPS

Pumps (PC-7A-1/ 2) are sized for a capacity of 495.00 m³/hr and a Head of 26.0 meters for each pump, with frequency inverter, where both are operating. Although these pumps have a frequency inverter, they will operate with a speed fixed. At discharge of each pump is installed a manometer (PI-940051 for P-C-7A-1 and PI-940050 for P-C-7A-2).

For drainage of the pumping system goes to waste.

At the discharge of the pumps there are the following instruments:

INSTRUMENT	LINE	FUNCTION
PIT-940053	16"-TWS-940053-CS1-NI	Pressure indication High Pressure Alarm Low Pressure Alarm
TIT-940053	16"-TWS-940053-CS1-NI	Temperature Indication Temperature Control High Temperature Alarm Low Temperature Alarm
FIT-940054	6"-TWS-940054-CS1-NI	Flow Indication Low Flow Alarm
FIT-940090	6"-TWS-9400090-CS1-NI	Flow Indication Low Flow Alarm
FIT-940092	2"-TWS-940092-CS1-NI	Flow Indication Low Flow Alarm
FIT-940053	14"TWS-940053-CS1-NI	Flow Indication Low Flow Alarm

4.3 CHEMICAL FEEDING SYSTEM

The chemical feeding system it is efficient in the prevention of slime generation, scaling and corrosion and material removal already formed in the lines and refrigeration equipment circuit.

It was considered for this system one Chemical Dosing Pump (BM-7A-1), one Chemical Tank (TK-7A-3) and one Spill Containment Pallet (CN-7A-3).

Chemical feeding system capacity will be informed by the supplier and the chemical will be dosed in the tower's basin.

4.4 BALANCING VALVES

Along the Cooling Water System, balancing valves were considered, as bellow:

- Static balancing valves at the pump discharge.
- Static balancing valves at the cooling water return – inlet of each Tower.
- Static balancing valves at the inlet or outlet of equipment

4.5 CONSUMERS

The Cooling Tower System feeds the following equipment:

EQUIPMENT	TAG	SIMULT. FLOWRATE		
		(m³/h)	(lpm)	(kg/h)
HVAC Chiller	CH-7A-1	365.0	6,083.3	363,286.9
HVAC Chiller	CH-7A-2	365.0	6,083.3	363,286.9
Process Chiller	PCH-7A-1	104.0	1,733.3	103,511.9
Process Waste Sump Lift Station	TC-8001	114.6	1,910.0	114,062.1
Compressor	COM-7A-1	5.4	90.0	5,374.7

Each equipment has the following instruments (cooling water side):

- HVAC Chillers

EQUIPMENT	INLET LINE		OUTLET LINE	
	INSTRUMENT	FUNCTION	INSTRUMENT	FUNCTION
CH-7A-1	PIT-960061 *(1)*	Pressure indication	PIT-960062 *(1)*	Pressure indication
			TIT-960062	Temperature indication High Temperature Alarm Low Temperature Alarm
	TIT-960061	Temperature indication High Temperature Alarm Low Temperature Alarm	FIT-960062	Flow rate indication Low flow shutdowns the chiller
			XV-960004	Automatic valve is closed when the chiller is out of operation
CH-7A-2	PIT-960063 *(2)*	Pressure indication	PIT-960064 *(2)*	Pressure indication

EQUIPMENT	INLET LINE		OUTLET LINE	
	INSTRUMENT	FUNCTION	INSTRUMENT	FUNCTION
			TIT-960064	Temperature indication High Temperature Alarm Low Temperature Alarm
	TIT-960063	Temperature indication High Temperature Alarm Low Temperature Alarm	FIT-960064	Flow rate indication Low flow shutdowns the chiller
			XV-960005	Automatic valve is closed when the chiller is out of operation

Notes:

(1) If high differential pressure or low differential pressure, the PDS-9600195 shutdown the chiller.

(2) If high differential pressure or low differential pressure, the PDS-9600194 shutdown the chiller.

- Process Chillers

EQUIPMENT	INLET LINE		OUTLET LINE	
	INSTRUMENT	FUNCTION	INSTRUMENT	FUNCTION
PCH-7A-1	PIT-980052 *(1)*	Pressure indication	PIT-9800656*(1)*	Pressure indication
			TIT-980056	Temperature indication High Temperature Alarm Low Temperature Alarm
	TIT-980052	Temperature indication High Temperature Alarm Low Temperature Alarm	FIT-980056	Flow rate indication Low flow shutdowns the chiller
			XV-980056	Automatic valve is closed when the chiller is out of operation

Notes:

(1) If high differential pressure or low differential pressure, the PDS-960053 shutdown the chiller.

- Air Compressor

EQUIPMENT	INLET LINE	
	INSTRUMENT	FUNCTION
COMP-7A-1	FSL-840017	Low Flow Alarm
COMP-7A-1	PIT-840021	Pressure Indication

- Process Waste Sump Lift Station

EQUIPMENT	INLET LINE		OUTLET LINE	
	INSTRUMENT	FUNCTION	INSTRUMENT	FUNCTION
TC-8001	TI	Temperature Indication	TI	Temperature Indication
	PI	Pressure Indication	PI	Pressure Indication
	CBV	Static Balancing Valve	XV	On Off Valve