

Verification of Existing Chiller Plant Capacity as per ARAMCO Ambient Conditions

The existing chiller plant capacity was investigated by heat load calculation by CARRIER HAP 4.5 at two different ambient conditions as recommended in ARAMCO standards SAES-A-112.

Below.

Condition-1

Summer design dry bulb temperature (105.8 F DB (41 C DB) @1% exceedence):

Mean coincident wet bulb temperature (77 F WB (25 C WB)@1% exceedence):

Condition-2

Summer design wet bulb temperature 84.2 F WB (29 C WB)@1% exceedence):

Mean coincident dry bulb temperature 93.2 F DB (34 C DB)@1% exceedence):

Calculation of heat load capacity at condition-1

Outside Conditions are based on ARAMCO standards SAES-A-112. Summer design dry bulb & mean coincident wet bulb @ 1% exceedance. 105.8 F DB / 77 F WB (41 C DB / 25 C WB).

AHU Tag#	Total Cooling Capacity (TR) @ 41 C DB / 25 C WB	Sensible Coil Capacity (TR)	Air Flow (cfm) @ 73 F Space Temperature	Remarks
AHU-1	39.3	39.3	15976	Calculated Load
AHU-2	39.9	34.5	15417	Calculated Load
AHU-3	56.7	51.5	24741	Calculated Load
AHU-4	128.8			Load from Equipment Schedule
AHU-5				To be served by new DX machine
AHU-6	13.3	9.74	4078	Calculated load
	278			

Calculation of heat load capacity at condition-2

Outside Conditions are based on ARAMCO standard SAES-A-112. Summer design wet bulb & mean coincident dry bulb @ 1 % exceedance 84.2 F WB / 93.2 F DB (29 C WB / 34 C DB).

AHU Tag#	Total Cooling Capacity (TR) @ 34 C DB / 29 C WB	Sensible Coil Capacity (TR)	Air Flow (cfm) @ 73 F Space Temperature	Remarks
AHU-1	40.4	30.2	14620	Calculated Load
AHU-2	40.4	29.8	14064	Calculated Load
AHU-3	54.7	43.4	21613	Calculated Load
AHU-4	128.8			Load from Equipment Schedule
AHU-5				To be served by new DX machine
AHU-6	14.9	7.74	3716	Calculated load
	279.2			

By considering both the ambient design conditions, it was found that the max. heat load is 286.4 TR at 86.2 F WB summer design wet bulb and 95.7 F DB mean coincident dry bulb

Veirfication of existing chiller capacity:

The capacity of the existing duty / standby chiller is 269 TR as per Zamil submittal at 115 F ambient temperature and 45 F leaving chilled water temperature.

At 105 F, the cooling capacity: 290.2 TR (from catalogue)

At 115 F, the cooling capacity: 269 TR (from AHU selection)

For every degree rise in temperature, the capacity of the chiller reduces by 2.12 TR

BY interpolating the values, the cooling capacity of the chiller

at 106 F would be $290.2 - (2.12 \times 1) = 288\text{TR}$

Therefore the existing chiller capacity is adequate to meet the cooling requirement of building