**HVAC BASIC TYPE:**

**1) Centralize System**: Chiller plant, VAHP (Vapour absorption heat pump)

Only one system used for all merge area or separate area

AHU system 1

Centralize system

AHU system 2

AHU system 3

AHU system 4

**2) DX (Direct Expansion):** AHU with outdoor unit system is installed separate to each area

DX system 3

DX system 2

DX system 1

AHU system 3

AHU system 2

AHU system 1

**Chiller plant P&I diagram**

Evaporator coil or Heat exchanger

Expansion device

Condensor

Compressor

 **DX system P&I Diagram**

Compressor

Expansion device

Condensor

AHU system

**HVAC ABERRATION**

CFM: Cubic feet/Minutes

ACPH: Air change per hour

TR: Ton of refrigeration

HVAC: Heat ventilation and air conditioning system

AHU: Air handling unit

BTU: British thermal unit

DBT: Dry bulb temperature

WBT: Wet bulb temperature

**HVAC Term**

Compressor, Condensor, Evaporator coil, Expansion device, Blower, Motor, AHU, Duct, Damper, Controller, Dehumidifier, Diffuser, DBT, WBT, Grill, Heating system

**BASIC DESIGN OF ROOM**

**How Find Required Blower CFM Of area**

**If Room LxWxH 10x10x10 feet and ACPH is 75 for clean area then find TR and CFM**

10 feet

10 feet

10 feet

$$CFM=\frac{ACPH x Volume of Room}{60}$$

$$CFM=\frac{75 x 1000}{60}$$

 $$CFM=1250$$

**Conclusion: If room volume is 1000 feet3 and our requirement of 75 ACPH then we required blower of 1250 CFM**

 **Now Find TR capacity for room**

If Room volume 1000 feet3 and partition thermal conductivity factor is 0.8 then find TR for achieve 25 ̊C temperature and outside temperature is 40 ̊C (For Pharma company temperature limit 21-25 $̊$C)

$$BTU/Hour =Volume of room x Thermal conductivity factor x Temprature difference of in and out$$

$$=1000 x 0.8 x 15$$

$$=12000 BTU/Hour$$

Convert BTU/Hour into TR

1 TR = 12000 BTU/Hour

If add new Load with 1 hp motor of m/c then,

= 1 x 2545

= 2545

 If add lighting load 18 w (10 nos LED)

 = 10 x 18 x 3.5

 = 630 BTU

 Man power load add (3 Person in room)

 = 3 x 350

 = 1050 BTU/Hour

 If add heater in room 700 Watt

 = 700 x 3.41

 = 2387 BTU/Hour

**Total BTU/Hour**

= 12000+2545+630+1050+2387

= 18612 BTU/Hour

**Convert BTU/Hour into TR**

$$TR=\frac{18612}{12000}$$

= 1.55 TR

**Conclusion:** If room area 1000 feet3 then generate heat 18612 BTU/ hour for above provision for required 25 ̊C temperature is 1.55 TR system needed