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Designing of Air Conditioning Unit for a Computer Laboratory

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Abstract: - *Increasing temperature and for better life of the computer units an air conditioning unit is to be installed in the computer room. Air conditioning systems are mostly designed to meet the indoor environmental requirements of all the entities in the conditioned space. Three types of air conditioning systems are mostly used, namely, window, split and central. This paper includes the procedure involved in designing of the air conditioning unit such as the heat load calculation, etc.*

Keywords— air conditioning systems, designing, components.

I. INTRODUCTION

Air – conditioning is the process of treating air to control its temperature, humidity, cleanliness, quality and distribution to meet the requirement of the occupants, process or product in the conditioned space [1]. Air conditioning could be used for both domestic and commercial environments. It provides a comfortable environment and is used to cool and dehumidify rooms filled with heat generating devices.Air conditioners uses a fan to evenly distribute the conditioned air to an occupied space to improve thermal comfort and quality of indoor air. The cooling is achieved by a refrigeration cycle.

II. DESIGN OF APPROPRIATE AIR CONDITIONING SYSTEMS

A building having a roof and walls designed to provide shelter and ensure comfort for its occupants. Heerwagen [2] has outlined the basic requirements of a building to include controlling its internal environment well enough to satisfy the occupants physical and physiological needs, supporting the psychological state of each occupant, and resisting the natural forces that act against it. The above mentioned requirements should be provided at a reasonable cost and efficient use of resources. The design of an air conditioning system to meet the requirements of an indoor environment begins with a study of architectural drawings to determine the following data [3]:

i) The function of building.

ii) The geographical site location.

iii) The room area, height, materials used for the walls and roof.

v) The weather and climatic design data for location of the building.

vi) Indoor environmental data, air quality and ventilation requirements.

vii) Internal load data.

By proper estimation of the building sensible and latent cooling loads, the next step in the design process is the selection of an air-conditioning system that can compensate for the loads and produce the desired cooling effect in the best way with the minimum consumption of energy. All such systems must be capable of maintaining the indoor environmental condition required in each area. The ability to provide adequate thermal zoning is also mandatory [3]. For each system considered, the following items should be evaluated: (i) the space requirements for equipment and piping, (ii) electrical use and thermal storage requirements, (iii) operating costs, (iv) acoustical requirements, (v) the compatibility with the building plan and structural system, and (vi) the effect of indoor air quality, illumination, noise and vibration [3]. The results of this study will lead to the selection of an appropriate air conditioning system.

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The design process is concluded by providing a detailed specification of the components required. By this data the designer can convey the design requirements to the manufacturer. The drawings and specifications must define the work to be done in a clear, complete and unambiguous manner.

According to ASHRAE data : Hottest DB(May) =5.1, DB=35.9ºC, MCWB=22.7ºC [1]

2.1 Construction of building: light concrete, GROUP E, u=0.348 BTU/hr.ft² ºF [5]

2.2 Cooling Load Calculations:-

Table 2.1
Load Values

Elements	Sesnsible Heat (Btu/Hr)	Latent Heat (Btu/Hr)
Transmission load	19522.22	0
Lighting load	682.42	0
Occupancy load	760	4850
Equipment load	9212.78	0
Infilteration Load	2557.26	1452.9

BTU'S/HR (SENSIBLE) =3574.68

BTU'S/HR (LATENT) = 6302.9

Overall BTU'S/HR Required = 45877.58

So, We Know That 1TR= 12000 BTU'S

Therefore Required Tonnage= 3.82 TR

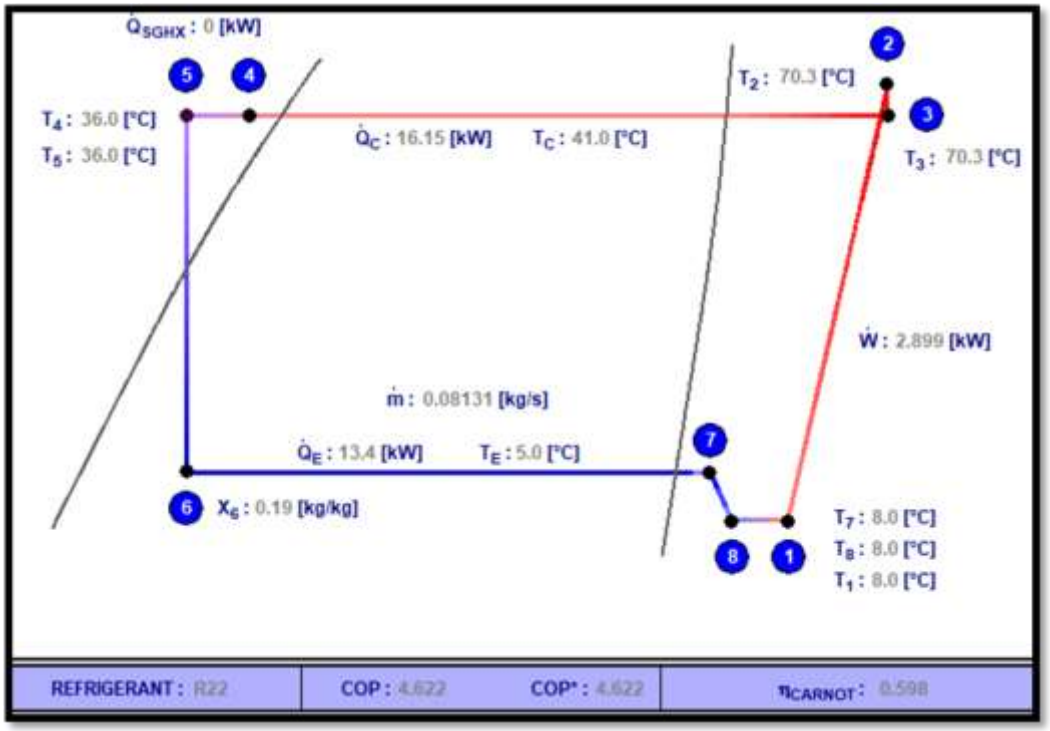

Fig.2.1 Air Refrigeration Cycle

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