Chapter 2

THE DESIGN CONTENT

2.1 THE AIR CONDITIONING SYSTEM.

The air conditioning is an important field in cold techniques, it is popular in many areas of the economy such as the spearhead: precise mechanical, electronic engineering, information technology, aerospace and specially created good facilities for serving the people. A few parameters of energy:

The annual average temperature is 27°C, the hottest month average temperature is 34.6°C, the highest temperature is 40°C, the coldest month is 21°C, the lowest temperature is 13.8°C.

Average annual humidity 70%, humidity at 13h-15h 55% the hottest month.

The calculated parameters outside the area of Ho Chi Minh City: (69-page Appendix C TCVN5687-2010)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry bulb temperature</td>
<td>t_D = 34.6°C</td>
</tr>
<tr>
<td>Wet bulb temperature</td>
<td>t_W = 28°C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>( \varphi = 70% )</td>
</tr>
</tbody>
</table>

The hottest month: April, solar radiation:

West - South 296 W/m² at 16h a day in April.

East - South 296 W/m² at 16h a day in April.

The hottest temperature of the day is at 3pm, and at 3pm is also the time when the largest number of people are present, so choose the time of the day at 3pm.

Air condition design in the room: (Calculated parameters inside the building (Appendix A page 46 - TCVN5687-2010)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>t = 24°C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>( \varphi = 60% )</td>
</tr>
</tbody>
</table>
Wind direction: West - southwest winds blow in the rainy season with an average speed of 3.6 m/s. North - Northeast winds blow from November to February with an average speed of 2.4 m/s.

The fresh air flow needs to be given to each m$^2$ floor of the building:

<table>
<thead>
<tr>
<th>Type of works</th>
<th>The smallest fresh air volume ($1/s/m^2 floor$)</th>
<th>Selection ($1/s/m^2 floor$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>0.65</td>
<td>0.65</td>
</tr>
<tr>
<td>Supermarket, Department store</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Corridor, lobby, walkway</td>
<td>0.25</td>
<td>0.25</td>
</tr>
</tbody>
</table>

The average annual rainfall is 216 mm. From December to January almost no rain. From June to September rainfall reaches the highest.

### 2.2 WATER SUPPLY - FIRE FIGHTING SYSTEM

The water supply system in the home is responsible for bringing water from the home's water supply network to all sanitary equipment or appliances in the home.

Factors influencing schema selection:
- Function of the house.
- The pressure value is ensured in the outside water supply pipeline.
- The pressure required to bring water to sanitary appliances, machinery disadvantage.
- The comfort level of the house.
- The distribution of equipment to collect water in the home or stratified. Basically the water supply system in the house can be divided into the following categories:
  - Functionally.
  - According to the water pressure of the street pipe

When the design needs to study carefully, compare the plan (economic, technical, comfort ...) to get the most appropriate scheme, satisfying the following conditions:
- Thoroughly use external water supply pipeline pressure.
- Economy, easy management, convenient.
- Limited use of pumps due to power consumption and management costs.
- Combined with the architectural beauty of the house and the noise of the house.
Convenient for the user.

An important aspect of fire prevention is the timely detection of an outbreak of fire, while alerting residents in buildings and fire departments. This is an important role for fire detection and alarm systems. Depending on fire prevention scenarios, building structure and purpose of use; the number and the occupants; Limits of content and tasks, these systems can provide a number of key functions.

First, it provides a means for detecting fires that are exploding by manual or automatic methods.

Second, it warns residents in the building that there is fire and must evacuate.

A common function is to transmit fire signals to fire departments or other emergency response organizations.

They can also disconnect power, control air handling equipment, or other special operations (elevators, fire doors ...). And it can be used to fire system startup.

Automated fire alarm system is a system composed of a set of equipment to detect and alarm when a fire occurs. Emitting of fire signals can be done automatically by probe (smoke, heat, fire, etc.) or by human (via emergency button). The system must operate continuously 24/24 even if the power failure.

2.3 CONTROL SYSTEM

The control system utilizes the most advanced digital control system including at least the following functions: the Pro-Dialog digital microprocessor, incorporating a scroll diagnostic display with 6 alphanumeric keys and operation keys. Ability:

- Control the chiller's cooling capacity based on the chilled water temperature from the evaporator by the return flow temperature sensor.

Water flow control is below the allowable level at startup so that the temperature drops within the allowable range from 0.1°C to 1.1°C within 1 minute to avoid exceeding the allowable limits when the machine is started.

- It is possible to adjust the chilled water temperature corresponding to the return chilled water temperature via the 0-10 V signal indicator.

- Cold water temperature can be set via remote control signal.

- Cold water pump on / off

- Equipped with RS485 port for connection to remote alarm system.

2.4 ERROR DIAGNOSIS SYSTEM

The system has the function of error as follows:

- The screen is capable of displaying parameters: setpoints, operating status of the system (including temperature, pressure, running current of each compressor, operating time, percentage of load) , alarm incidents.
- The controller allows quick check of all parameters of the machine to check the operating parameters of each switch, CB, contacts ... before the chiller starts.

- The controller is capable of balancing the operating time and the number of start-up compressors.

- Electronic throttles are controlled based on the amount of gas flowing into the evaporator, ensuring that the condenser reaches degree of superheat and aftercooled

2.5 SUPPORT SYSTEM

A) Air duct system:

The air duct made of zinc coated steel fabric is manufactured according to SMACNA standard. Sheet thickness as follows:

<table>
<thead>
<tr>
<th>Large size of wind duct (mm)</th>
<th>Sheet thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 600 mm</td>
<td>0.58 mm</td>
</tr>
<tr>
<td>Up to 900 mm</td>
<td>0.75 mm</td>
</tr>
<tr>
<td>Up to 1200 mm</td>
<td>1.1 mm</td>
</tr>
</tbody>
</table>

B) Water treatment system:

- PVC-class PVC water-insulated drainage hose with 10 mm thick insulation to avoid surface fog. When installing the horizontal exhaust pipe always ensure that the pipe slope must be at 1/100 the length of the pipe.

C) Cold water pipes:

- Cold water pipe is black steel pipe. Cold water pipes and fittings are connected by welding joints to pipes of DN50 or higher and by threading with pipe sizes DN40 and below. The finished steel pipes are cleaned before cleaning. Pipes are measured in place. Distance plumbing as shown in the technical specifications.

- On the vertical pipeline is mounted the exhaust valve at the highest point.

D) Refrigerant conduction system:

- The refrigerant pipes are made of standard materials, which are resistant to corrosion and high pressure when the system is operating (about 50 kg / cm²).

- The coolant tubes will be protected against heat loss and dew phenomena by an outer layer of insulation and the same as a wet tire. The thickness of the insulating layer depends on the diameter of the pipe. conduction of the refrigerant in the tube.
2.6 ELECTRICAL SYSTEM

The electrical system in this design describes the power supply and control within the air conditioning system.

Power requirements: 380-415V / 3P / 50Hz.

The main power supply consists of all power supplies, relays, measuring devices and protective equipment.

-Electrical requirements

The electrical equipment installed for the air conditioning system in the building must be safe, able to withstand the change of weather and conditions of continuous operation. Therefore, the electrical equipment here must ensure the technical standards in accordance with Vietnam and the International.

- Description of electric wire

In order to meet the electrical safety requirements for the air conditioning system of the building, all electrical wires in this building must be of PVC sheathed outside, ensuring insulation of 0.6 kV and the cross section of the conductor must comply with the technical requirements of the design drawing.

- Description of the switchgear.

The switchgear must be of the same type to facilitate the replacement and subsequent repair. Switchgear must be of rated current from 6 to 300 A and short circuit current of ICU - 4.5 kA.

2.7 LIGHTING SYSTEMS

A) Lighting systems in works.

+ Indoor lighting system is designed according to lighting standard (IEC).

All offices, lounges and clinics in the building use 2x36W reflective fluorescent lighting.

+ Dressing room, toilet using compact fluorescence type 1x18W.

Clean corridors, sterile corridors, and operating rooms use fluorescent lamps for clean rooms with a capacity of 2x36W.

+ The lights are placed on the ceiling and because it is the type of trough should be considered no airflow or in this way.

+ Time to use the lamp: average 10 hours, maximum is 16 hours.

+ Operation time of equipment: minimum 16 hours.

Minimum illumination in the following areas:

- Office: 300 lux.

- Technical, Pump: 200 lux.
- Corridor, stairs, WC, warehouse, garage: 200 lux.
- Professional, clean corridors, sterile corridors: 300 ~ 700 lux.

B) Lighting system outside the building.

Outdoor lighting uses garden lighting to ensure light for traffic and protection outside the building. Lamps used as street lights, high pressure mercury ball, mounted on octagonal steel posts, tree lights, mushroom lights ... depending on the scenery where installed. Outdoor lighting systems are operated automatically or manually. The outdoor lighting control panel is located in the living room, operated by security guards.