

HIGHER TECHNICAL INSTITUTE

MECHANICAL ENGINEERING DEPARTMENT

DIPLOMA PROJECT

DESIGN OF AN AIR CONDITIONING  
SYSTEM FOR A BUILDING

CHRISTODOULOS ELLINOPOULOS

2001

# DESIGN OF AN AIR CONDITIONING SYSTEM FOR A BUILDING

BY

CHRISTODOULOS ELLINOPOULOS

*Project Report  
Submitted to  
The Department of Mechanical Engineering  
of the Higher Technical Institute*

NICOSIA – CYPRUS

*In partial fulfillment of the requirements  
for the diploma of*

TECHNICIAN ENGINEER

in

MECHANICAL ENGINEERING

JUNE 2001



# CONTENTS

## PAGES

<b><u>CHAPTER 1:</u></b> SUMMARY AND INTRODUCTION.....	2
<b><u>CHAPTER 2:</u></b> BUILDING SURVEY AND LOAD ESTIMATE.....	6
<b><u>CHAPTER 3:</u></b> DESIGN CONDITIONS.....	11
<b><u>CHAPTER 4:</u></b> AIR CONDITIONING LOADS.....	14
<b><u>CHAPTER 5:</u></b> LOAD ESTIMATION.....	21
<b><u>CHAPTER 6:</u></b> AIR CONDITIONING SYSTEMS.....	26
<b><u>CHAPTER 7:</u></b> MAINTENANCE.....	29
<b><u>CHAPTER 8:</u></b> CALCULATION AND TABLES.....	30
<b><u>CHAPTER 9:</u></b> COST ESTIMATION.....	41
<b><u>CHAPTER 10:</u></b> CONCLUSIONS.....	42

# **CHAPTER 1**

**SUMMARY  
AND  
INTRODUCTION**

## **SUMMARY**

The objective of this Diploma Project is to design an Air Conditioning System for a building located in Nicosia.

To achieve this and design it successfully, the following steps should be followed:

1. To calculate the thermal load of the building for heating and cooling.
2. To select the system to be employed.
3. To carry out equipment, duct and pipe sizing.
4. To select appropriate machinery.
5. To prepare detailed drawings for the installation.
6. To prepare an estimated cost analysis for the system.
7. To prepare a preventive maintenance scheme for the equipment.

# **INTRODUCTION**

Although air conditioning in the past was conceited to be a luxury item in nowadays is thought to be a necessity. In fact many other modern processes and products would not exist or preserved without precise control of environmental conditions.

The primary function of air conditioning is to maintain conditions that are

1. Conducive to human comfort,
- or
2. Required by a product or process within a space.

The four atmospheric conditions, which affect human comfort, are:

1. The temperature of the surroundings (ambient) air.
2. The humidity of the air (i.e. moisture content).
3. Ventilation.
4. Filtering of air in space.

True air conditioning implies that all these four atmospheric conditions for human comfort are satisfied.

## **DESIGN OF AN AIR CONDITIONING SYSTEM FOR A BUILDING**

To perform this function equipment of the proper capacity must be installed and controlled throughout the year. The equipment capacity is determined by the actual instantaneous peak load requirements; type of controlled is determined by the conditions to be maintained during the peak and partial load. Generally, it is impossible to measure either the actual peak or the partial load in any given space these load must be estimated.

Before the load can be estimated, it is imperative that a comprehensive survey be made to assure accurate evaluation of the load components. If the building facilities and the actual instantaneous load within a given mass of the building are carefully studied, an economical equipment selection and system design can result, and smooth trouble free performance is then possible.

The heat gain or loss is the amount of heat instantaneously coming into or going out of the space.

The actual load is defined as the amount of heat, which is instantaneously added or removed by the equipment. The instantaneously heat gain and the actual load on the equipment will rarely be equal because of the thermal inertia or storage effect of the building structures surrounding a conditioned space.

The following chapters contain the data from which the instantaneous heat gain or loss is estimated and also provides the data and procedure for applying storage factors to the appropriate heat gain to result in the actual

***DESIGN OF AN AIR CONDITIONING SYSTEM FOR A BUILDING***

load and also provides the bridge between the load estimate and the equipment selection.