APPROPRIATE PASSIVE COOLING STRATEGIES FOR HOT AND HUMID CLIMATES: A CASE STUDY IN CYPRUS

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
BUILDING SCIENCE
IN
ARCHITECTURE

MARCH 2008

Approval of the thesis:

APPROPRIATE PASSIVE COOLING STRATEGIES FOR HOT AND HUMID CLIMATES: A CASE STUDY IN CYPRUS

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ABSTRACT

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March 2008, 137 pages

In this study, energy conservation potential of appropriate passive cooling and basic heat avoidance strategies were investigated for hot and humid climates. Within this framework, thermal behavior of a case study building that is situated in Cyprus was assessed by collecting temperature and relative humidity data from various rooms of the building during certain days in August. Then, by using feasible simulation strategies of the software tool Summer-Building®, the effectiveness of passive cooling measures in reducing energy consumption were examined, for summer months.

In this context, the case study building was re-evaluated by applying natural ventilation, night ventilation and ground cooling strategies as well as solar control and shading devices as overhangs and side fins.

Consequently, based on the results of the evaluation model, it was found that the proposed passive cooling strategies and basic heat avoidance concepts could provide more than 50 % energy conservation, relative to the completely air conditioned reference building, between 1st to 15th August 2007.

Keywords: passive cooling, heat avoidance, energy conservation, Summer-Building®

ÖZ

SICAK VE NEMLİ İKLİMLERDEKİ YAPILARDA DOĞAL SOĞUTMA STRATEJİLERİ: KIBRIS ÜZERİNE ÖRNEK ÇALIŞMA

Hançerli, Mustafa Yılmaz
Yüksek Lisans, Yapı Bilimleri, Mimarlık Bölümü
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Mart 2008, 137 sayfa

Bu çalışmada, sıcak ve nemli iklimlerdeki binalarda, uygulanabilir doğal soğutma ve istenmeyen ısı kazanım engelleme stratejileri açısından, elde edilebilecek potansiyel enerji tasarrufu irdelenmiştir.

Bu bağlamda ilk olarak, Ağustos 2007'de Kuzey Kıbrıs'ta bulunan mevcut bir konut yapısı termal koşullar açısından, evin farklı bölümlerinden sıcaklık ve nisbi nem verileri ölçülerek, değerlendirilmiştir. Daha sonra, Summer-Building® adlı simülasyon programı ile evin modellenerek, mevcut koşullarda uygulanabilir doğal soğutma yöntemleri ve bu stratejilerin sıcak yaz aylarındaki potansiyel enerji verimlikleri incelenmiştir.

Bu çerçevede, seçilmiş yapı doğal havalandırma ile soğutma, gece havalandırması ile soğutma ve topraktan soğutmayla beraber güneş kontrolü ve gölgelendirme açısından da yapılan bilgisayar simülasyonlarına göre değerlendirilmiştir.

Sonuç olarak, 1-15 Ağustos 2007 tarihlerinde incelenen modele göre, önerilen doğal soğutma ve ısı kazanım engelleme yöntemleri sayesinde, değerlendirmede referans olarak alınan ve mekanik soğutma ile soğutulan modele kıyasla, ortalama % 50'den fazla enerji tasarufu sağlanabileceği ortaya çıkmıştır.

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Anahtar Kelimeler: doğal soğutma, ısı kazanım engelleme, enerji tasarrufu, Summer-Building®

To My Parents,

...for their endless trust and love

ACKNOWLEDGEMENTS

I would firstly like to express my sincere appreciation to my supervisor, Assoc. Prof. Dr. Soofia Tahira Elias Özkan who gave me the opportunity to study with her and make use of her experiences and knowledge. I want to thank her for the thoughtful feedback she provided, constructive criticism and encouragement at every stage of the study.

I am also grateful to Prof. Dr. Mat Santamouris for providing me the simulation tool Summer-Building® and Kerkenes Eco-Center Team for their technical and practical contributions.

I would like to express my special thanks and love to my family for their continuous encouragement and patience during my studies.

Lastly, special thanks to my faithful friends for their continual support and help.

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LIST OF ABBREVATIONS

A/C	Air Condition
AIVC	Air Infiltration and Ventilation Centre
ASHRAE	American Society of Heating Refrigerating and Air Conditioning Engineers
BPT	Balance Point Temperature
HVAC	Heating Ventilation and Air-conditioning
RH_{avg}	Average Relative Humidity
RH_{max}	Maximum Relative Humidity
RH_{min}	Minimum Relative Humidity
T_{avg}	Average Temperature
T_{max}	Maximum Temperature
T_{min}	Minimum Temperature
TRNC	Turkish Republic of Northern Cyprus
U-Value	Thermal Transmittance
$\Delta RH_{max-min}$	Difference of Maximum and Minimum Relative Humidity
ΔT_{in-out}	Difference of Indoor and Outdoor Temperature
$\Delta T_{max-min}$	Difference of Maximum and Minimum Temperature

LIST OF TERMS FOR SIMULATION TOOL

Air Changes per Hour (ACH)	Volume of air exhausted or supplied every hour divided by the room volume.
Ambient Temperature Amplitude	Defined as "(maximum daily temperature - average daily temperature) * 2".
Azimuth Angle	Angle between projection of the normal to the surface on horizontal plane and North-South direction which is defined as zero in South, positive in West and negative in East.
Curtain Factor	Measure of the ability of the cover material to transmit radiation (range between 0-1).
Ground Albedo	Ratio of the intensity of light reflected from the ground, to that of the light it receives from the sun (range between 0-1).
Tilt Angle	Vertical angular distance between the ground and the surface of the element.
Thermal Diffusivity of the Ground	Ratio of thermal conductivity to volumetric heat capacity in m2/hour.

LIST OF UNITS

°C	Centigrade Degree Celsius
kg	Kilogram
kg/m^2	Kilogram per Meter Square
kg/m^3	Kilogram per Cubic Meter
m	Meter
cm	Centimeter
mm	Millimeter
m^2	Meter Square
kWh/day	Kilowatts-Hour per Day
m/s	Meter per Second

CHAPTER 1

INTRODUCTION

This chapter presents the argument and objectives of the study, together with a brief overview of its procedure. In addition, the contents of the study are briefly explained under disposition part of the chapter.

1.1. Argument

In order to provide thermal comfort to occupants, conventional buildings are designed without much thought to the amount of energy that will be consumed. Consequently, HVAC systems are installed, which are operated by using non-renewable energy sources that do not bode well for the sustainability of our built environment.

In this context, if certain design principles are adopted, it is possible to reduce the heating or cooling loads of buildings. Such principles are the basis of passive cooling and passive heating strategies which should be integrated in the design of the building. Therefore, passive cooling techniques can be used to reduce and in some cases eliminate, mechanical air conditioning requirements in areas where cooling is a dominant problem; especially in hot climates like Cyprus.

In other words, passive cooling strategies ensure thermal comfort conditions within a building without consuming conventional energy resources and can help to keep a building cool when the cooling effect is needed during hot weather conditions in terms of occupant's thermal comfort.

As literature sources emphasize, the process involved in passive cooling are fundamentally linked to those of the climate and the earth's daily energy exchange. Similarly, the body's comfort tolerances will influence the choice of cooling techniques used in different circumstances. In addition, modification of the microclimate around a building can help to improve comfort conditions in and around the building, while reducing cooling loads

In this context, buildings can be cooled by passive systems through the utilization of several natural heat sinks such as the ambient air, the upper atmosphere, water and the undersurface soil, where each of these cooling sources can be utilized in various ways resulting in different systems.

However, the study and application of passive cooling is a multilayered and multidisciplinary process. So, it is important to treat the subject in conjunction with other aspects of architectural design. Consequently, the passive cooling design should aim at lowering the indoor temperatures, with the use of passive cooling strategies, by considering the main heat avoidance and removal concepts to obtain a balance point temperature within the building.

1.2. Objectives

The main objective of this study was to determine such design strategies which could be utilized to provide thermal comfort in terms of reducing the energy loads of buildings, under hot and humid weather conditions. Hence, a literature survey was conducted on passive cooling and basic heat avoidance strategies, as presented in Chapter 2.

The second objective was to apply as many strategies to improve the thermal behavior of an existing building and determine the energy saving potential by simulations.

In this context, the aim was to verify and analyze the appropriate passive cooling and basic shading strategies that would be effective on the energy efficiency of the selected building, depending on the local conditions of the region.

1.3. Procedure

The study was carried out on an existing residential building which is situated in Kyrenia, Cyprus.

Firstly, the thermal behavior of the selected building was examined by collecting and analyzing the temperature and relative humidity data from most of the rooms of the case study building for 5 days, during one of the hottest months, which is August for this region.

Then, the building was defined to the computer simulation tool, Summer-Building®, to examine the influence of the feasible passive cooling and basic heat avoidance (shading) strategies on the case study building for a 15 day period.

Finally, the outcomes of the simulation, in terms of energy efficiency, were determined and assessed by means of daily and fortnightly energy savings. In this context, the energy required for cooling the case study building to acceptable comfort conditions, with the use of conventional air conditioning or appropriate passive cooling strategies (natural ventilation, night ventilation, buried pipes and combinations of all), were evaluated independently, including basic shading strategies for windows (glazed surfaces).

1.4. Disposition

The information covered in this research is composed of five chapters, of which this introduction is the first.

The second chapter, which is the literature survey, is a brief summary on the general aspects of the subject matter. It covers the relevant information based on the passive cooling of buildings including the main strategies. In this context, ventilative cooling, radiative cooling, evaporative cooling, ground cooling and basic heat avoidance concepts are defined.

In the third chapter, the input data referring the examined case study building, weather data and simulation program, which were used for the evaluation, are presented. In addition, the weather data collection and the simulation process of the selected building are also described.

In the fourth chapter, the results of the research are presented and discussed. The outcomes of the weather data collected from the selected building and the results of the simulation are analyzed.

In the last chapter, the concluding remarks of the survey are described and wider concerns are summarized.

CHAPTER 2

LITERATURE SURVEY

This chapter covers the relevant information in literature, regarding the subject of this thesis study which is based on the passive cooling of buildings including the main strategies and related examples. In the first section the basic heat avoidance strategies are discussed. Then the main passive cooling strategies, ventilative cooling, radiative cooling, evaporative cooling and ground cooling are defined. In the last part, the recent applications of passive cooling are presented.

According to Givoni (1994), there seem to be several reasons for the emerging interest in passive cooling techniques. The first is obviously the rising cost of electricity, especially during peak demand times, which is often caused by the increased use of air-conditioning in hot summer days. Secondly, passively cooled homes take the advantage of natural energy flows to maintain indoor air quality by means of thermal comfort.

Santamouris and Assimakopoulos (1996) argue that passive techniques as alternatives to air conditioning can bring important energy, environmental, financial, operational and qualitative benefits. The authors have emphasized that the passive cooling strategies in buildings have proven to be extremely effective and can greatly contribute in decreasing the cooling load of buildings. Details regarding these strategies are given in the following sections.

2.1. Basic Heat Avoidance Strategies

Briefly, there are three major sources of unwanted summer heat: direct solar impacts on building; heat transfer and infiltration of exterior high temperatures; and the internal heat produced by appliances, equipment and inhabitants. Of the three, the first is potentially the greatest problem, but it is usually the easiest to control[1].

In this context, logically there is no point in applying passive cooling systems in a hot climate to a building that does not have an appropriate design for that climate. Minimizing the cooling needs of a building by appropriate architectural design is important by means of minimizing the solar load and the conductive daytime heat gain through the envelope. Therefore, at first the design should aim at lowering the indoor temperatures by avoiding heat gain (Givoni, 1994).

2.1.1. Microclimate and Site Design

If the buildings are to relate properly to their environment, they must be designed for the microclimate in which they exist. In this context, as Santamouris (1993) states, site layout (sitting) and landscaping represent the two important groups of strategies that improve the microclimate around buildings.

Appropriate sitting (depending on existing topographical features) of a building can provide natural solar protection and help to take advantage of local winds and breezes. In addition, nearby mountains, valleys, lakes and sea may improve these effects. On the other hand landscaping can play an important role in microclimate modifications both over-heated and under-heated conditions. Also, vegetation provides natural protection from the sun (Santamouris, 1993).

2.1.2. Building Form

Building shape may be used as a means of reducing or increasing the ratio of exposed surface to volume. In this context, as Givoni (1994, p.22) points out "the

[1] http://www.azsolarcenter.com/design/passive-3.html

appropriate layout of buildings in hot regions depends on whether the building is to be air-conditioned or if it is to rely on natural ventilation whenever ventilation can provide indoor comfort".

In the first case, in hot dry as well as in hot humid regions, the building should be compact, with a minimum envelope surface area relative to occupied space, in order to reduce the heat gain and the resulting load on the cooling equipment. On the other hand, when a building is designed to enjoy as much natural ventilation as possible in order to minimize the need for air conditioning, a very compact shape is not the best design. In this case the details of a specific optimal shape are somewhat different in hot dry and hot humid climates, also by depending on the microclimatic conditions (Givoni, 1994).

2.1.3. Orientation of Rooms and Windows

Generally, building orientation affects the indoor climate in two respects, by its regulation of the influence of two distinct climatic factors (Givoni, 1976):

- Solar radiation and its heating effect on walls and rooms facing different directions.
- Ventilation problems associated with relation between the direction of the prevailing winds and the orientation of the building.

In this context, especially the main issue is the orientation of windows. Since, Givoni (1994, p.23) states that, "solar energy penetration through large windows in summer can elevate a building's indoor temperature high above the outdoor daytime level and thus cause significant thermal stress, as well as increasing the buildings cooling load".

The balance between heating, cooling and day-lighting is a critical consideration for the choice of orientation and sizing of openings. The design of openings will usually depend on the building type and may be influenced by building regulations, particularly with regard to maximum or minimum sizes for glazed areas. Also, thermal zoning may be used as a buffering strategy in the arrangement and use of internal spaces and to improve cross ventilation. Deep plan arrangements and subdivisions into many layers of spaces require careful design as they can inhibit air movement within the building (Goulding, 1994). In other words, basically good orientation for passive cooling excludes unwanted sun and hot winds and ensures access to cooling breezes.

In addition to all, unglazed intermediate spaces such as verandas, arcades or courtyards can create their own microclimates and have a role in wind channeling and solar protection for adjacent openings and surfaces (Goulding, 1994).

2.1.4. Solar Control and Shading

Solar control is one of the most important strategies for heat gain prevention. Its role focuses on the prevention of solar gains on building or landscape surfaces, occupants' clothing or skin, the regulation of daylight and the protection of occupants and room contents from glare and ultraviolet radiation. In the light of these principles, effective design of solar control systems should aim to balance cooling, heating and day-lighting in the building (Santamouris, 1993).

Blocking the sun before it reaches the building, particularly the glazed but also the opaque surfaces (including the roof) and reflecting the solar radiation, is fundamental to the prevention of heat gain and the suitable choice from wide range of shading systems will depend on location, orientation, building type and the overall cooling, heating and day-lighting strategies adopted in the design phase of the building (Goulding, 1994).

As Goulding (1994) indicates, shading systems may be fixed or movable and may be positioned externally, internally or within double glazed panels. Fixed shading systems include structural elements such as projecting side fins, overhangs or shelves and non-structural elements such as canopies, blinds, louvers and screens. On the other hand, movable shading is used externally or internally. Control can be either manual or power assisted and may be automated to respond to changing conditions such as current levels and day-lighting or thermal requirements.

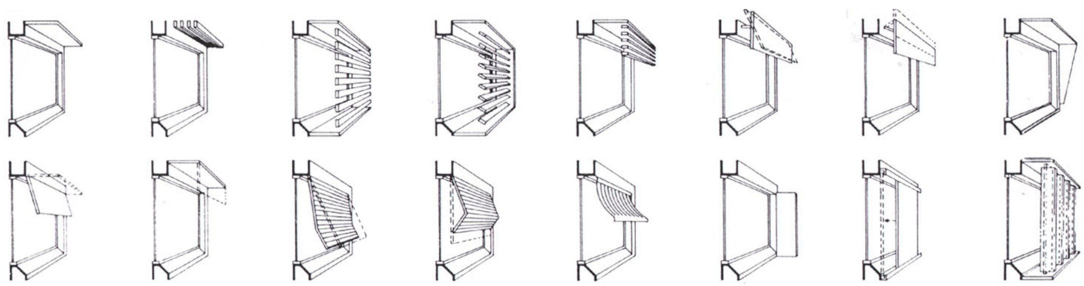

Figure 2.01 External shading devices
Source: Goulding, 1994, p. 102

2.1.5. Exterior Colors of the Building

As Givoni (1994, p.30) indicates “the color of the external surfaces of the walls and the roof has a tremendous effect on the impact of the sun on the building and on the indoor temperature of un-conditioned buildings, particularly in hot regions where solar intensity is higher than in other regions”.

> “Because of the different intensities of solar radiation incidence on the roof and on the walls with different orientations, the importance of color as a controller of the indoor temperature is variable. For the roof, the influence of color is at a maximum. The difference in the maximum external surface temperature between a white roof and a black one in a desert in the summer can be 30 to 40 °C. The resulting heat gain to the building interior depends on the thermo-physical properties of the roof, but in general it is quite significant. A western wall is almost as sensitive to the effect of color as the roof. Eastern and southern walls are also very sensitive to their external color, while the northern wall is the least sensitive. In addition southern wall presents a special case because it receives most radiation in winter, when heating may be desirable” (Givoni, 1994).

Briefly, for a reflective color of the building envelope, white or light-colored paints are very powerful architectural climatic control features and it is the most cost effective way to minimize the buildings heat load in summer, as the choice of color does not involve extra cost (Givoni, 1994).

According to Santamouris and Assimakopoulos (1996, p.40), addition to the color choice, "irregularities of the texture of the external surface can modulate the heat absorbed and radiated back to the environment. The textured surface, because of its irregularities, has an absorbing area less than its emitting surface and also presents an increased surface for convective heat transfer. This permits a textured surface to cool down faster than a flat surface."

2.2. Ventilative Cooling

Ventilation comes from the Latin word "*ventus*" and means the movement of air. It is defined by the air-conditioning industry as the process of supplying or removing air by natural or mechanical means to or from a space, usually through air exchange with the out-of-doors (Watson, 1983).

Ventilation provides cooling by using air to carry heat away from the building and/or human body. Air movement may be created by natural forces, wind or stack effect, or by use of mechanical fans (Santamouris, 1993). However, as Smith (1999) points out, the effectiveness of ventilation for cooling is limited by the temperature of the air supplied. The warmer the air, the less cooling it provides, regardless of how fast it is moved.

As Santamouris (2005, p.36) indicates, "It must be recognized that natural ventilation is not just an alternative to air conditioning. Instead it is a more effective instrument to improve indoor air quality, protect health, provide comfort and decrease unnecessary energy consumption".

In the light of this argument, according to Givoni (1994), there are two ways in which ventilation can improve comfort. One is the direct physiological effect of opening windows to let the wind in, and thus providing a higher indoor air speed that makes people inside the building to feel cooler which is called "Comfort Ventilation".

On the other hand, the other way is to ventilate the building only at night and thus to cool the interior mass of the building indirectly. Then, during the following day the cooled mass reduces the rate of indoor temperature rise and thus provides a cooling effect which is called "Nocturnal Ventilation".

According to the AIVC website[2], the main drawback of natural ventilation is lack of control, in which unreliable driving forces can result in periods of inadequate ventilation, followed by periods of over ventilation and excessive energy waste. Good design can provide some measure of flow control but normally it is necessary for the occupant to adjust ventilation openings to suit demand. Despite the difficulty of control, natural ventilation is still relied upon to meet the need for fresh air in many types of building throughout the world.

As Sev and Özgen (2003) mentions, in the design of the building's natural ventilation systems architects should pay attention to two strategies: one for summer, another for winter. In winter less fresh air should be taken in without compromising comfort. In summer, sufficient fresh air should be taken in to provide efficient cooling. In this context, the distribution of openings on the building facade is the key issue for efficient natural ventilation.

In addition, infiltration is a type of uncontrolled ventilation which occurs when air comes in from outside through cracks in walls, openings and around doors, windows. In this context, infiltration ventilation is most likely not let enough air in for good ventilation and to avoid air infiltration, insulation around all doors and windows and installing weather stripping is important (Givoni, 1994).

2.2.1. Airflow and Ventilation Strategies

In order to anticipate how ventilation will occur in a proposed design, it is helpful to understand a few basic principles that govern airflow at the building scale, as listed below: (Moore, 1993)

[2] http://www.aivc.org/Faq/faq12.html

- Air will always flow from a region of high pressure to a region of lower pressure.
- Air has mass (and thus momentum) and it will tend to continue in its direction until altered by an obstruction or adjacent airflow.
- The overall effect of wind at a site is so large that locally deflected airflow (by trees or buildings) will tend to return to the direction and speed of the previous site wind.
- Ideal ventilation requires an outlet as well as an inlet on building (Analogy: water cannot be put into a bottle that is already full unless some old water is removed first).
- If the air in the building warms, becomes more buoyant than outside air, it rises to escape out of openings high in the building (stack effect).

As air moves between different pressures and spaces, in order to provide enough ventilation to clear and cool the exhaust air, it is necessary to understand some basic concepts of airflow around the objects.

When inlet and outlet are aligned with the wind, the air flow is short-circuited and poor secondary flow is generated next to the main stream (Figure 2.02 a). On the other hand, if the wind is oblique to the openings, the air flow circulates in the entire building (Figure 2.02 b). However, if the wind is parallel to the opening, no significant movement occurs within the occupied space (Figure 2.02 c), (Goulding, 1994).

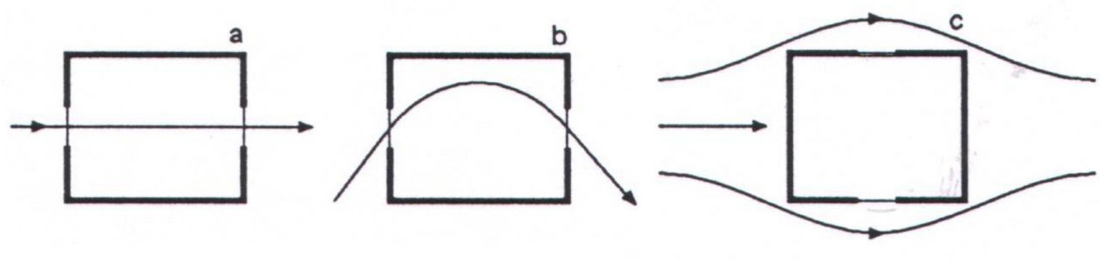

Figure 2.02 Basic air flow principles, (i)
Source: Goulding, 1994, p. 103

The vertical position of inlets is important in maximizing the airflow through the lower, occupied portion of the room. High inlets do not generate a strong air velocity in the occupied zone and are thus less suitable for occupant cooling (Figure 2.03 a-b). Openings at body height generally offer good ventilation (Figure 2.03 c). When the building is too deep to offer ventilation, or when opposing openings are not possible, roof openings may be used to encourage an anabatic flow (Figure 2.03 d), (Goulding, 1994).

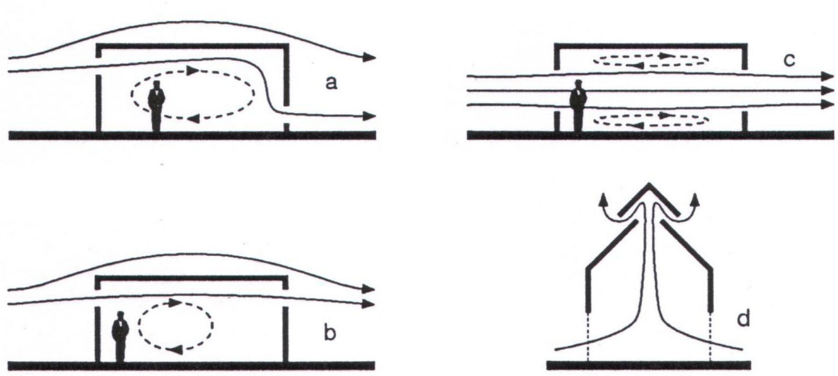

Figure 2.03 Basic air flow principles, (ii)
Source: Goulding, 1994, p. 103

Cross ventilation can be enhanced by placing two outlets on the building sidewalls (Figure 2.04). The distribution of the openings on the building facade is a key issue for efficient natural ventilation. In this context, position of inlets which dominate the main airflow pattern is more effective then position of outlets (Goulding, 1994).

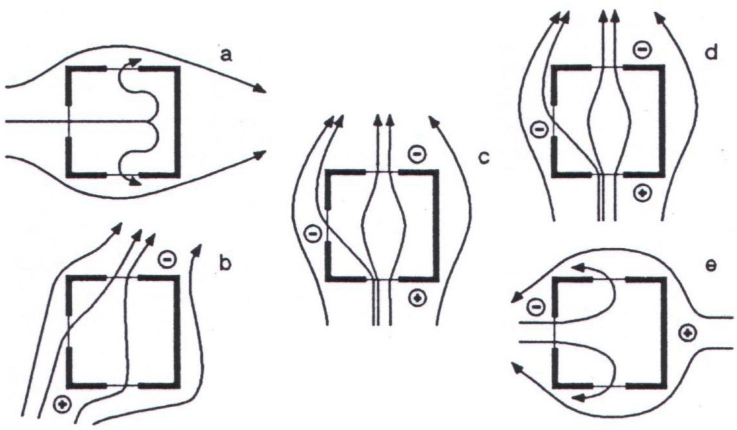

Figure 2.04 Basic air flow principles, (iii)
Source: Goulding, 1994, p. 103

As shown in Figure 2.05, if the room has openings on adjacent walls, wingwalls can considerably improve cross ventilation. On the other hand, wingwalls can also modify the initial flow within the space (Goulding, 1994).

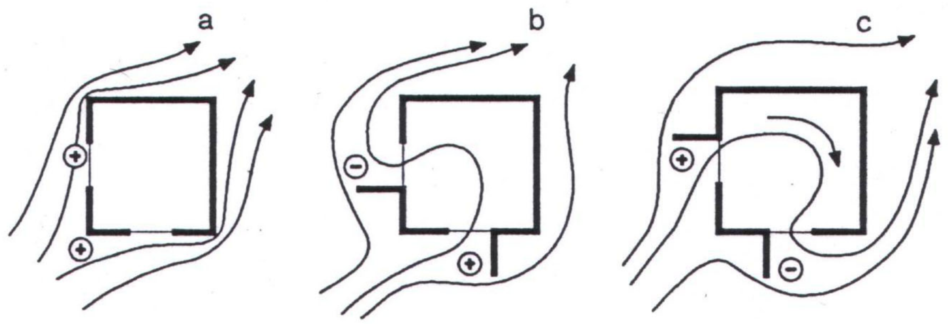

Figure 2.05 Basic air flow principles, (iv)
Source: Goulding, 1994, p. 103

As Goulding (1994) states, cross ventilation is often optimal if a room has three openings on different facades. Unfortunately, this configuration is rare as most rooms have only one external wall. However, ventilation can be improved if two windows can be placed on the facade, as far apart as possible. In addition, attachment of wingwalls can improve the pressure differences between two windows and induce air circulation within the space (Figure 2.06).

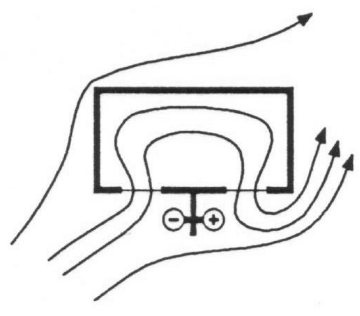

Figure 2.06 Basic air flow principles, (v)
Source: Goulding, 1994, p. 103

In addition, as presented in Figure 2.07, some other applications can be integrated into the building design for ventilative cooling such as wind towers and solar chimneys.

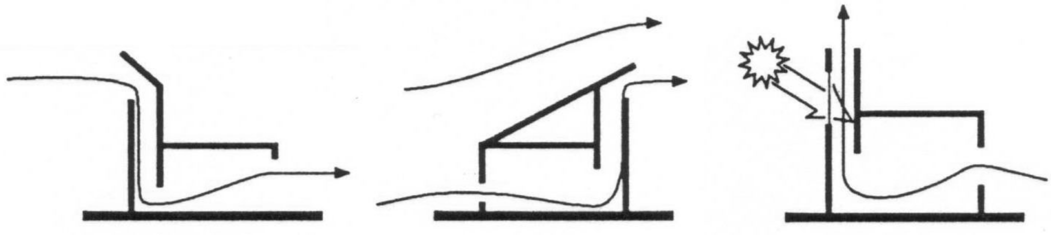

Figure 2.07 Basic air flow principles, (vi)
Source: Goulding, 1994, p. 103

Actually, the rate of air flow through a naturally ventilated building and the distribution of air velocities throughout the ventilated space depend both on the wind conditions around the building and on design details of the building itself. In this context, the main details of building design that affect indoor ventilation conditions are listed by Givoni (1994, p.42) as:

- Type of the building (town house, high-rise apartment, etc.).
- Geometrical configuration of the building's envelope; its shape and profilation (projection, recesses, etc.).
- Location and size of windows with respect to wind direction.
- Type of windows and details of their openings.
- Subdivisions and planning of interior space.

As a brief conclusion, as Santamouris and Assimakopoulos (1996, p.221) describe;

> "Successful design of a naturally ventilated building requires a good understanding of the air flow patterns around it and the effect of the neighboring buildings as well as the existing design strategies to improve ventilation. In this context, the objective is to ventilate the largest possible part of the indoor space. Fulfillment of this objective depends on window location, interior design and wind characteristics."

2.2.2. Comfort Ventilation

As Lechner (1991, p.196) states "air passing over the skin creates a physiological cooling effect that can create thermal comfort when the air temperature is somewhat above the normal comfort zone". In the light of these, the term comfort ventilation is used for this technique of using air motion across the skin to promote thermal comfort.

Comfort, ventilation, which provides human comfort mainly during daytime, is the simplest strategy in warm, humid regions. With daytime effective cross ventilation the indoor air temperature closely follows the outdoor level if it is accompanied by a relatively high indoor air speed. Therefore, the temperature limit of applicability of comfort ventilation is the comfort limit at the enhanced air speed, at any region or season. Consequently, assuming an indoor air speed of 1.5 to 2.0 m/s, comfort ventilation is applicable in regions and seasons when the outdoor maximum air temperature does not exceed about 28 to 32 °C, depending on the acclimatization and comfort expectation of the population (Givoni, 1994).

When comfort ventilation is chosen as the main strategy, the building design should aim at achieving high air speed and fast cooling of the interior during the evening hours, when the wind usually subsides. This calls for relatively large but well shaded windows. Materials should not absorb and store too much heat during the daytime hours. Therefore the preferable structural materials for buildings relying on comfort ventilation would be lightweight that are wood, lightweight concrete or perforated bricks (Givoni, 1994). In addition to all, as Lechner (1991) indicates, for comfort ventilation the operable window area should be about 20 % of the floor area with the openings split about equally between windward and leeward walls.

A well-known example for comfort ventilation is Frank L. Wright's Robie House (Figure 2.08). It has very large roof overhangs to shade the walls made entirely of glass doors and windows that could be opened for ventilation. Since Chicago has very hot and humid summers, plentiful ventilation and full shade were the major cooling strategies before air- conditioning became available (Lechner, 1991).

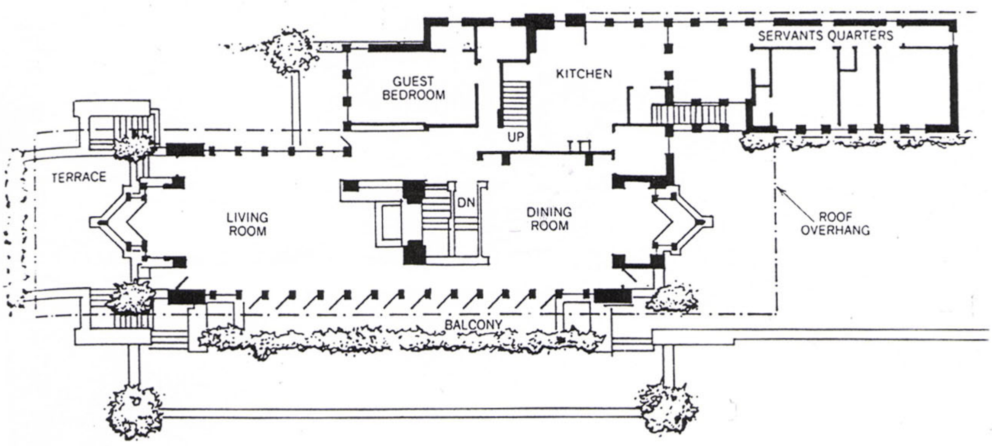

Figure 2.08 An example for comfort ventilation, Robie House in Chicago
Source: Lechner, 1991, p.197

2.2.3. Nocturnal Ventilation

As Lechner (1991, p.197) mentions, "In most climates, the night air is significantly cooler than the daytime air. This cool night air can be used to flush out the heat from a building's mass". In this context, during the day, the cooled building mass serves as a heat sink, keeping indoor temperatures below outdoor levels for a while. In addition, the length of time, this cooling can be stored, is extended by circulating the cooler air using ceiling or personal fans. Then, outside air is supplied when interior temperatures finally rise above outdoor levels (Smith, 1999).

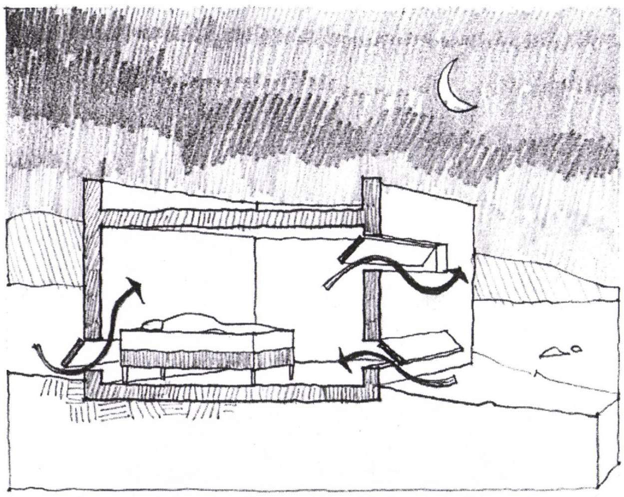

Figure 2.09 Nocturnal ventilative cooling
Source: Heerwagen, 2004, p. 151

In order to have a better understanding of nocturnal ventilation, Breesch (2006) underlines the uses of the outside air at night, as a heat sink to cool down a building, as follows. Cold outside air enters the building at night and cools down the exposed building structure, in which the heat of the previous day is accumulated. The heated air subsequently leaves the building. This airflow is driven by natural ventilation forces as temperature difference and wind. As a result, the indoor temperature peaks during daytime are reduced and postponed.

From the climatic aspect, nocturnal ventilative cooling would be preferable to comfort ventilation in regions where the daytime temperatures in summer are above the upper limit of the comfort zone, with air speed about 1.5 m/s. This strategy is applicable mainly in arid regions where the daytime temperatures are between 30 °C and 36 °C and the night temperatures at or below 20 °C, to enable sufficient nocturnal cold storage. In this situation, daytime ventilation is not desirable, even if it could provide conditions acceptable in the daytime, because additional heat will be stored in the structural mass and raise the indoor temperatures at night, when the wind usually settles (Givoni, 1994).

2.3. Radiative Cooling

Radiative cooling is the transfer of heat from a warmer surface to a cooler surrounding surface. It may be used to cool the building where warm building surfaces radiate heat to sky or to cool people where the warm skin radiates heat to cooler surrounding room surfaces (Martin, 1990).

In short, this cooling system is based on the fundamental principle that any warm body emits thermal energy in the form of electromagnetic radiation to the facing colder ones. In this context, if two elements at different temperatures are facing one another, a net radiant heat loss from the hotter element will occur. If the coldest element is kept at a fixed temperature, the other element will cool down to reach equilibrium with the colder element. This physical principle forms the basis of radiative cooling (Goulding, 1994). So, as Santamouris and Assimakopoulos (1996) mentions, the sun is radiating heat, in the form of short-wave radiation, to the earth and the earth is radiating back heat, in the form of long-wave radiation, to the cool sky. In addition to these, as Givoni (1994, p.81) states;

> "At the ordinary temperatures found on the earth, the emitted radiation is in the long-wave range. When a given surface faces other surfaces at similar temperatures (for example, the ground around the building or the walls of other buildings) the net gain or loss is rather small. However, when a given surface such as the roof of a building, is exposed to the sky, the situation is different. The downward flux of atmospheric long-wave radiation is weaker than the radiation emitted upward by ordinary surfaces. The result is a net long-wave radiant heat loss and a cooling of surfaces exposed to sky."

Furthermore, emission of long-wave radiation, that produces cooling effect, takes place continuously, day and night. However, during the daytime the surfaces radiating in the long-wave part of the spectrum are unprotected to solar radiation. In this context, "The solar, short-wave, radiation absorbed at the surface which depends on its color produces heating, which in most cases outweighs the cooling effect produced by the emission of long-wave radiation. Therefore, net radiant cooling can only be obtained during the night hours. For this reason radiant cooling is often referred to as nocturnal radiation". (Givoni, 1994, p.82)

Another important principle of radiative cooling is that it will not work well in cloudy regions and it is reduced by the existence of particles (carbon dioxide, dust, water vapor…etc.) in the atmosphere. It performs best under clear skies and low humidity. This is because the water vapor and other particles in the air absorb outgoing long-wave radiation, reducing the net rate of heat dissipation (Yannas, 2006).

2.3.1. Direct Radiative Cooling

As mentioned before, the roof is the element of the building that absorbs the biggest part of the solar radiation during summer and has also the best view of the sky dome and thus is an effective radiator. In other words, potentially the most efficient approach to radiant cooling is to make the roof itself the radiator. For example, an exposed concrete roof will rapidly lose heat by radiating to the night sky. The next day the cool mass of concrete can effectively cool a building by acting as a heat sink. The roof, however, must then be protected from the heat of the sun and hot air. Consequently, insulation must be added to the roof every morning and removed every evening (Lechner, 1991).

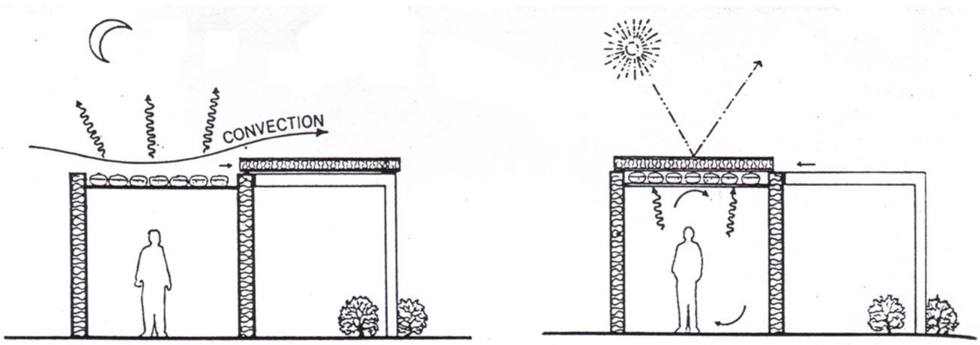

Figure 2.10 Direct radiative cooling system
Source: Lechner, 1991, p.200

According to Lechner (1991), Harold Hay has designed and built several buildings using this concept, except that he used plastic bags filled with water rather than concrete for the heat sink material. At night, the water bags are exposed to the night sky by removing the insulation that covered them during the day. When the sun rises the next day, the water bags are covered by the movable insulation. During the day the water bags, which are supported by a metal deck, cool the indoors by acting as heat sink as in Figure 2.10. Also, by reversing the operation of the panels, it is possible to provide a radiant heat source for the cool weather of the winter (Heerwagen, 2004).

Although this direct cooling sky-therm concept has been tested and shown to be effective; on the basis of researches, it is reported by Givoni (1994) that the availability of a simple, inexpensive, convenient and trouble-free system of movable insulation is still in question. In addition, as Bradshaw (2006) points out, this system is limited to single-story structures.

2.3.2. Indirect Radiative Cooling

The difficulty with movable insulation suggests the use of specialized radiators that use a heat transfer fluid as water or air. In Figure 2.11 the painted metal radiator cools air at night, which is then blown into the building to cool the indoor mass. The next morning the fan is turned off and the building is sealed. The cooled indoor mass now acts as a heat sink. The radiator is vented during the day to reduce the heat load to the building. Unless the radiator is also used for passive heating it should be painted white, since that color is a good emitter of long-wave radiation and a poor absorber of short-wave, solar, radiation (Lechner, 1991).

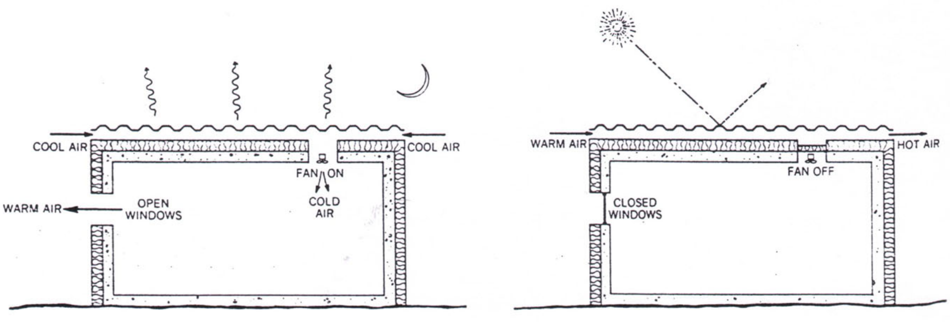

Figure 2.11 Indirect radiative cooling system
Source: Lechner, 1991, p.200

2.4. Evaporative Cooling

Vaporization of water describes the process by which liquid water is transformed into water vapor. To have a better understanding, as Yannas (2006) states, the evaporation of water, a phase change from liquid to gas (vapor), is driven by the absorption of heat from the surrounding air. The air in contact with this process loses heat and cools but gains moisture, becoming more humid. In this context, as water has to be heated to 100 °C (at normal atmospheric pressure) in order to boil, evaporation can occur at any temperature, including below freezing.

As Greenhouse website[3] points out, evaporation is an effective passive cooling method which works best when relative humidity is low (70 percent or less during hottest periods) and the air has a greater capacity to take up water vapor. In addition, rates of evaporation are increased by air movement.

There are two basic different approaches to cool buildings by evaporation. The first is to cool outdoor air directly through evaporation and then introduce that air into the building. On the other hand, the second approach is to cool a given element of the building, such as roof or wall by evaporation and then cool the indoor air indirectly (Givoni, 1994).

2.4.1. Direct Evaporative Cooling

Briefly, direct evaporative cooling system is a cooling process where relatively dry air is blown over a wetted surface and the sensible temperature is lowered and the humidity is increased (Moore, 1993). In other words, "in direct evaporative cooling systems the humidity ratio (or moisture content) of the cooled air increases, raising the relative humidity of the indoor space" (Santamouris and Assimakopoulos, 1996, p.407). In this context, if the space is sufficiently ventilated, this increase will most probably not generate discomfort.

According to Goulding (1994), many examples of direct evaporative systems exist in the vernacular architecture, where ponds, cisterns, fountains or wetted surfaces are typically placed in the incoming ventilation air stream. Such direct systems typically use little or no auxiliary power and can avoid the need for large surfaces of water and the movement of large volumes of air, and are thus particularly suited to arid regions. However, their main disadvantage is in the increased moisture content in the ventilation air supplied to the indoor spaces.

[3] http://www.greenhouse.gov.au/yourhome/technical/fs15.htm

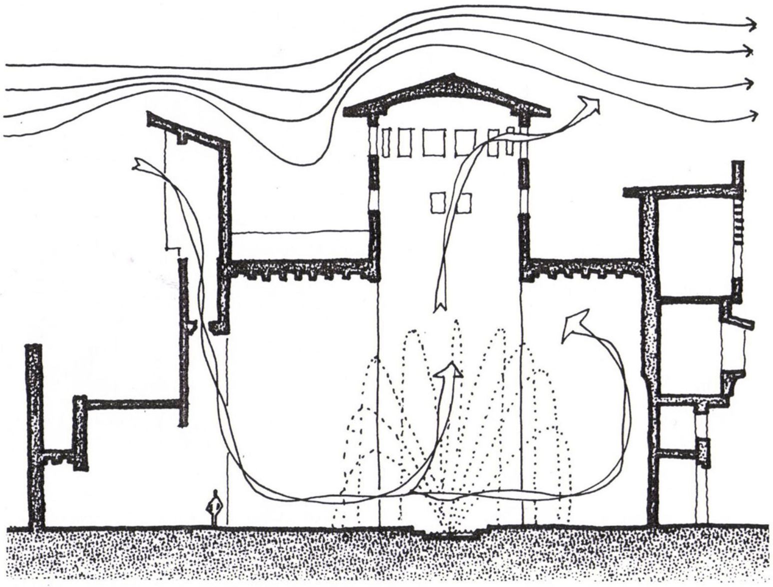

Figure 2.12 Direct evaporative cooling with the use of an interior fountain
Source: Moore, 1993

Generally, direct evaporative cooling systems include two effective contemporary sub-systems that are; evaporative pads in windows and evaporative cooling towers.

a. Evaporative pads in windows

According to Givoni (1994), when wetted pads made of fibers are installed in windows facing strong winds, with suitable design details, they can provide natural direct evaporative cooling. In order to be effective, these pads should provide a large surface area for evaporation, without creating too much resistance for the wind to penetrate through them. It is also necessary to provide a way to wet the pads at the top and collect and re-circulate the runoff water from the bottom of the pads.

As Givoni (1994, p.138) mentions, “the main disadvantages of these pads are that they block the view through the window and they reduce the air flow in seasons and times when ventilation without evaporative cooling is desirable. However, one possible way to solve this problem might be to design a fixed frame in front of an openable glazing”.

b. Evaporative cooling towers

An important technique which is used in traditional architecture is a system based on the use of a tower where water contained in a jar is precipitated down inside the tower. External air introduced into the tower is cooled by evaporation and then transferred into the building (Goulding, 1994). However, a contemporary version of this technique, a passive evaporative air cooling tower attached to a building has been developed and tested by Cunningham and Thompson as shown in Figure 2.13. According to Givoni (1994), the system consists of a down-draft tower that has vertical wetted cellulose pads at its top. In this context, water is distributed at the top of the pads and collected at the bottom by a sump and re-circulated by a pump. In the Figure 2.13, the tower is attached to a building of about 100 m², which is cooled by the air exiting from the tower.

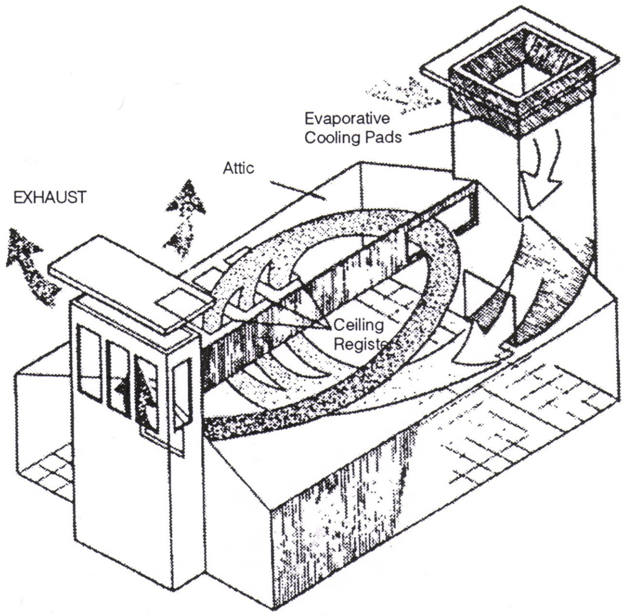

Figure 2.13 Evaporative cooling towers
Source: Santamouris and Assimakopoulos, 1996, p. 409

Givoni (1994, p.139) points out that, the measured performance of the system was very impressive. "When the outdoor temperature reached a maximum of 40.6 °C and the wet bulb temperature 21.6 °C, the tower exit air temperature was 23.9 °C and the indoor temperature only 24.6 °C."

2.4.2. Indirect Evaporative Cooling

Indirect evaporative cooling systems avoid the problems associated with increased humidity levels. In this system, the evaporatively cooled air is separated from the conditioned room air to allow reducing the dry-bulb temperature without adding humidity to the room air. The cooled element, in turn, serves as a heat sink and absorbs, through its interior surface, heat penetrating into the building through its environment or heat generated indoors (Givoni, 1994). In other words, the evaporation takes place on a surface which is cooled during this process.

Generally, passive indirect evaporative cooling systems include ventilated roof ponds with fixed insulation, roof ponds with floating insulation and roof sprinkling systems.

a. Ventilated roof ponds with fixed insulation

According to Givoni (1994, p.149), “This type of roof pond includes, in addition to the structural roof supporting the pond, a secondary lightweight insulated roof over the pond, shading the water, with large openings between the water and the shade, to permit permanent air flow over the water and enhance the evaporation”.

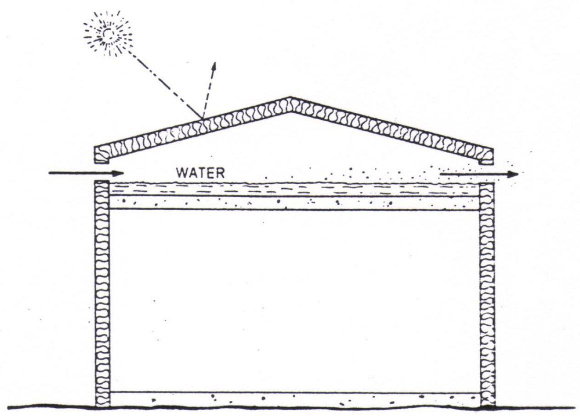

Figure 2.14 Roof pond system with fixed insulation
Source: Lechner, 1991, p. 201

In this system, as water evaporates, the pond will become cooler and together with the ceiling structure, it will act as a heat sink for the interior parts of the building. On the other hand, “during the winter the pond is drained and the roof openings are closed. The main disadvantage of this system is the cost of the double roof structure and waterproofing" Lechner (1991, p.202). However, as Givoni (1994) points out, this cooling system can provide very effective cooling in dry regions even when the daytime temperature is very high, above 40 °C.

b. Roof ponds with floating insulation

In this system, as Lechner (1991, p.202) points out "a pump sprays the water over the top of the insulation at night, and it cools by both evaporation and radiation. When the sun rises, the pump stops and the water remains under the insulation, where it is protected from the heat of the day. Meanwhile, the water together with the roof structure acts as a heat sink for interior". In addition, although the cooling occurs only at night, this indirect evaporative cooling system is very effective because of the combined action of evaporation and radiation (Figure 2.15).

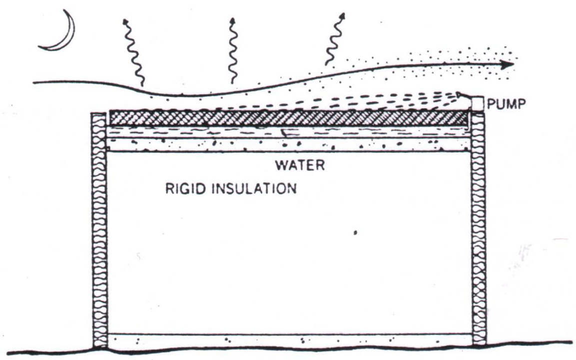

Figure 2.15 Roof pond system with floating insulation
Source: Givoni, 1994, p. 152

In the light of these, as this pond with floating insulation requires only the structural roof to support it, while repair is needed, the insulating panels can easily be removed. Therefore, considering the simplicity of construction, the lower cost and the very significant conservation of water, this type of roof pond is more preferable (Givoni, 1994).

c. Roof sprinkling systems

Exterior building wall and roof surfaces heated by radiation or convection may be cooled by spraying them with water. As the water evaporates, it absorbs large amounts of heat and cools the surface. In this context, the surfaces do not have to be sprayed continuously; it is sufficient to keep the surfaces moist. Thus, as Moore (1993) states, effective cooling, by roof sprinkling, can be achieved by intermittent spraying.

In other words, in this system a temperature gradient is created between the inside and outside surfaces causing cooling of the building (Figure 2.16). However, many studies have shown that this system is not cost effective. Also there are problems associated with the appearance of the piping and possible damage to the roof with the freezing of piping (Goulding, 1994).

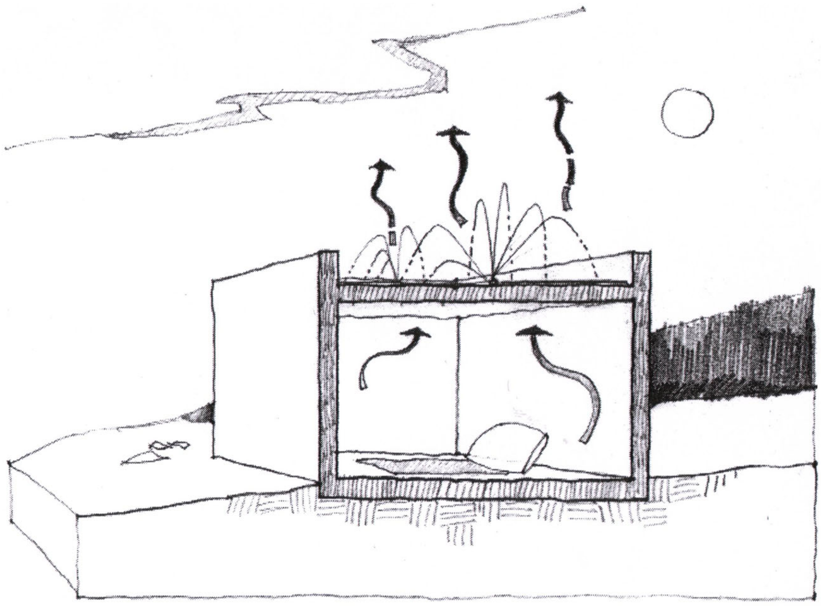

Figure 2.16 Roof sprinkling systems for cooling
Source: Heerwagen, 2004, p. 156

2.5. Ground Cooling

Ground or earth cooling makes use of the temperature difference between soil and the surrounding atmosphere. During the summer, the soil temperature at certain depths is considerably lower than the ambient temperature and therefore offers an important source for the dissipation of excess heat from the building (Santamouris, 1993).

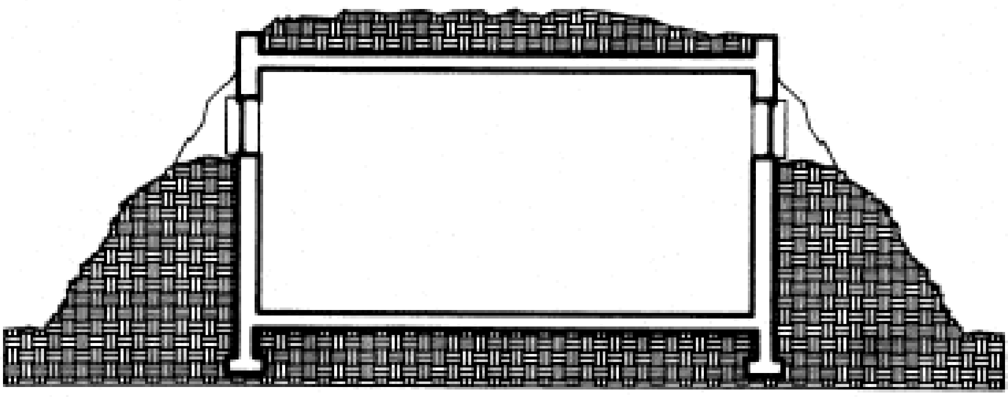

Figure 2.17 Earth-integrated building
Source: Givoni, 1994; p.211

In this context, when the ground temperature is cool enough, it is possible to utilize it for cooling buildings by several methods. In the case of earth-integrated buildings, in which the walls are bermed and the roof covered by earth, the soil adjacent to the building provides direct passive conductive cooling for the building as in figure above. However, this approach would be most suitable in hot, dry regions with mild winters. In other words, it may be undesirable for hot regions with cold winters, since it will cause a high rate of heat loss in winter. In these regions, as Givoni (1994) mentions, the approach is to insulate the building and to install air tubes or pipes in the cooled soil. When cooling is desired, air is blown through the tubes into the building and the earth acts as a heat sink to cool the air. In winter the air flow through the tubes can be either completely stopped or greatly reduced (Lechner, 1991).

Similarly, Santamouris and Assimakopoulos (1996) argues that, depth, length and the diameter of the pipes depends on the cooling load of the designed building; they are usually greater than 1.5 m depth, about 10-30 cm diameter and 12-60 m length. In the light of these, the applications of air tubes or pipes are of low cost and the systems can be dimensioned using a very simple technique.

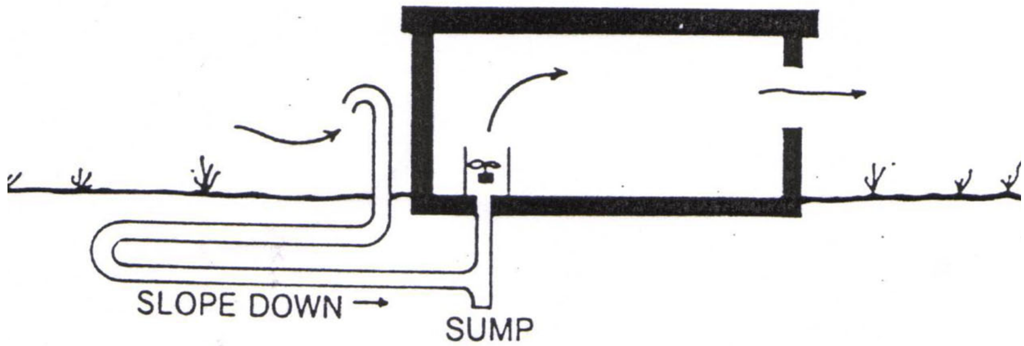

Figure 2.18 Indirect earth cooling system with pipes
Source: Lechner, 1991; p.205

In addition, Lechner (1991, p.205) points out that, "the greatest problem with earth tubes is condensation, which occurs mainly in humid climates where the earth temperature is frequently below the dew point temperature of the air. Therefore, the tubes must be sloped to drain into a sump" (Figure 2.18).

2.6. Recent Applications of Passive Cooling

Previously mentioned strategies, aiming to improve the application of passive cooling, have gained an increasing acceptance recently and several big projects have been successfully designed.

An important example which is described by Santamouris (2005, p.29), deals with Expo 92 in Seville, Spain, where extensive shading was applied in almost all zones to decrease surface temperature of the outdoor spaces (by using plants, pergolas…etc.). In addition, fountains, pools, ponds and sprinklers were used to evaporate water in the ambient air and thus decrease its temperature. Earth-to-air heat exchangers were also used to circulate the ambient air through the ground and thus decrease its temperature. In addition, cooling towers were also installed in various parts of the area. At last, extensive monitoring showed that the application of these passive cooling techniques contributed in decreasing the ambient air by to 5 °C.

As mentioned before, another example is the cooling tower system that was proposed and applied by Givoni. The system consisted of an open shaft where fine drops of water were sprayed vertically downward, like a shower. As Givoni (1994, p.139) states, "the measured performance of the system was very impressive. When the outdoor temperature maximum was 40.6 °C and the wet bulb temperature 21.6 °C the tower exit air temperature was 23.9 °C, with sufficient air speed".

A third important application is the Olympic Village 2004, in Athens, Greece. "In order to improve microclimate, cool materials, pergolas and plants, external shading, pools, ponds and fountains as well as air flow improvement techniques have been used. It is calculated that the ambient temperature is reduced by 4 °C and the maximum wind speed has been reduced by 3 m/s, while the period inside the comfort zone has been increased by 65 %" (Santamouris, 2005, p.30).

CHAPTER 3

MATERIALS AND METHODS

Briefly, this chapter presents the survey materials and the survey methodology of the investigation. In the section on survey materials, the weather data for Cyprus (as inputs through simulations and observations), the existing case study building and the Summer-Building® simulation tool are described. While, in the section on survey methodology, temperature and relative humidity data collection for the assessment of the survey building; description of the case study building and the weather data in the Summer-Building® tool; and the process of simulation and data evaluation are introduced.

3.1. The Survey Materials

Six Tinytag® dataloggers (Figure 3.01) were used to record temperature and relative humidity data for basic observations in the case study building under different ventilation conditions, as closed and opened windows for five days (Appendix B).

In addition, the daily weather data for the simulation tool, from 1st to 15th of August 2007 which include temperature, relative humidity, wind speed and direction…, etc. of Kyrenia, Cyprus, was obtained from meteorology agency of TRNC (Appendix C).

Figure 3.01 Tinytag® datalogger

Besides, the case study building, an existing house situated in Kyrenia, Cyprus and the simulation tool on passive cooling strategies Summer-Building® are presented in more detail in the following sections.

3.1.1. Case Study Building

As residential buildings are occupied 24 hours a day, providing thermal comfort to the occupants becomes very important. Therefore, the study was conducted on a typical two storey residential building that is situated in Kyrenia, Cyprus. This building was selected for investigation because it was accessible at all hours for the data collection under controlled conditions.

The two storey concrete frame building, which was constructed in 1997, is located in the Karaoğlanoğlu district of Kyrenia at about 35˚ N latitude and 33˚ E longitude at 25 m above sea level. The building layout and orientation within the Karaoğlanoğlu district is graphically shown in Figure 3.02.

This residential building mainly includes bedrooms, bathrooms, kitchen and living room with a total floor area of 170 m^2. The building has a concrete pitched roof with no heat insulation and 200 mm plastered brick walls as exterior envelope.

Figure 3.02 Location of the case study building in the Karaoğlanoğlu district
Source: Google Earth

Figure 3.03 The case study building

A view from the case study building is shown in Figure 3.03 and plans of the building which also show the placements of the dataloggers are presented in Figure 4.01 and 4.02.

In addition, all the windows are single glazed with aluminum frames where all four facades of the building (Appendix A) have more or less same amount of glazed area as presented in Table 3.01.

Table 3.01 Wall-window ratios

	North Facade	East Facade	South Facade	West Facade
Total area (m²)	64.50	61.50	64.50	61.50
Window area (m²)	9.15	10.89	11.00	9.13
% of window area	14.19	17.70	17.05	14.85

3.1.2. Summer-Building® Simulation Tool

Summer-Building® is a software tool that analyses a building by simulating its thermal performance with or without the inclusion of passive cooling strategies (Figure 3.04). The simulation tool was developed by V. Geros and M. Santamouris in the University of Athens-Department of Applied Physics, Group of Building and Environmental Studies within the frame work of The European Research Program Save of the Commission of the European Communities, Directorate-General XVII for Energy, in 1997.

According to the Summer-Building® manual, the software is a simplified design tool which enables the designer to examine how altering different aspects of the design, can influence the passive cooling characteristics of a building, by considering; solar control, thermal mass, natural ventilation, night ventilation, buried pipes and combinations of some or all of these strategies.

In the light of these, firstly, the model calculates the energy required to cool a building to acceptable comfort conditions, using conventional air conditioning, without the assistance of natural cooling. Secondly, it calculates the energy required to cool the building, using the techniques of natural ventilation, night ventilation, buried pipes and combinations of these techniques. Thus, a direct comparison can be made and the percentage of energy conserved can be determined.

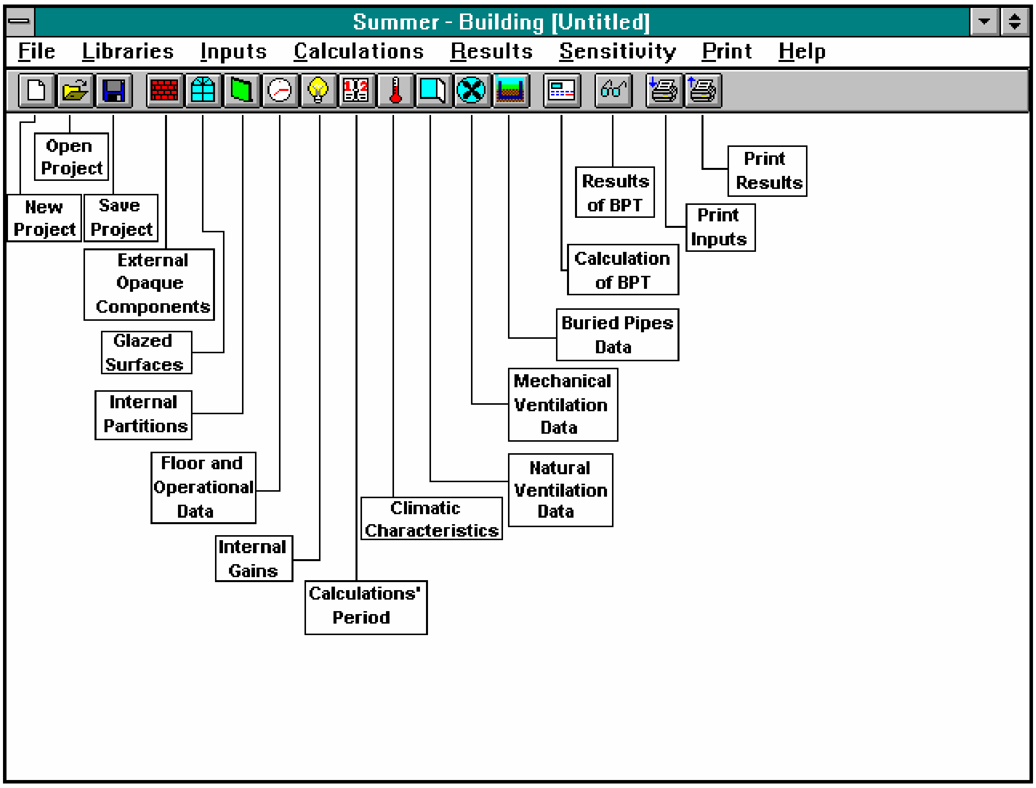

Figure 3.04 Summer-Building® main menu
Source: Summer-Building® manual

In this calculation process, the software tool calculates the hourly balance point temperature of the building and then determines the hours of the day when cooling will have to be supplied (over heating hours) and, therefore, the total daily cooling load of the building.

Lastly, by using the model, the effect of alternative design solutions about wall thicknesses, insulation types, size and orientation of openings, shading devices, etc..., can also be estimated.

3.2. The Survey Methodology

Firstly, temperature and relative humidity data, which were collected with Tinytag® dataloggers from the case study building for five days during one of the hottest month of August, were considered independently for this investigation, which are explained in more detail in the following sections.

Secondly, the simulation process of the case study building with the Summer-Building® software is presented. In this context, at first the existing building and the weather data were described as input parameters to the simulation tool and then data calculations and evaluations of the selected building were executed as main outputs.

3.2.1. Data Collection for Assessment of the Survey Building

The temperature and the relative humidity data were collected with 5 Tinytag® dataloggers at 15 minute intervals for 5 days period (5-9 August 2007) from selected rooms (3 bedrooms, living room and kitchen as shown in Figures 4.01 and 4.02) within the case study building. As the dataloggers could only be borrowed for 1 week, the data were collected for 2.5 days under all-opened and 2.5 days under all-closed window conditions.

In this context, In order to exclude external influences, the study was conducted under natural and unoccupied conditions. In other words, no one was able to enter the rooms and open or close the doors and windows; therefore, no mechanical heating or cooling was provided in the spaces.

In addition, the 6th Tinytag® datalogger was placed outside of the survey building, where there is no direct sunlight effect, to record the external temperature and relative humidity data for observations and comparisons. In this context, these data sets were uploaded in the Tinytag Explorer® software tool to produce tables and analyze comparison graphs.

3.2.2. Simulation of the Survey Building

In this part, at first the existing situation of the case study building (as input parameters through simulation) was described to the simulation tool in terms of its external opaque components (walls and roofs), glazed surfaces, internal partitions, floor and operational data, internal gains, calculation period, natural ventilation data, mechanical ventilation data and buried pipes data. In addition, climatic characteristic of the region, where the case study building is situated, was also defined to the simulation tool as daily inputs of weather data from 1st to 15th August 2007 (Appendix C). Through this procedure, the daily weather data was entered in terms of temperature, temperature amplitude, relative humidity, sunshine hours, wind speed and direction (Figure 3.05).

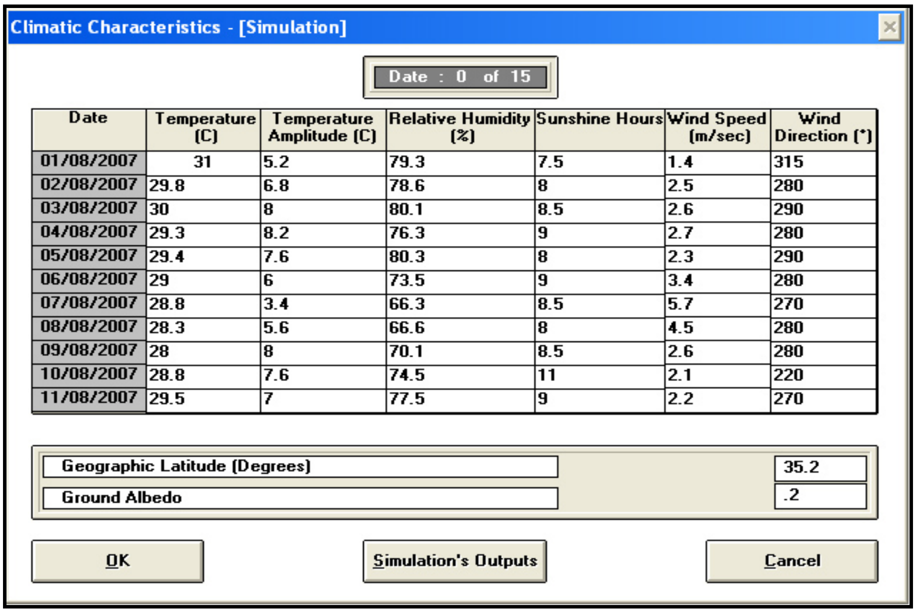

Figure 3.05 1-15 August daily weather data input parameters

In this context, all the exterior and interior materials; floor and roof constructions, wall types and window configurations were defined from the materials, glazings and opaque elements library of the simulation tool in terms of their material layers, thicknesses, areas and other properties (Figure 3.06, 3.07). Besides, as the vertical envelope elements (exterior walls and windows) of the building differ on four facades of the case study building, description of these elements to the simulation tool were done independently for north, south, east, and west facades of the existing building.

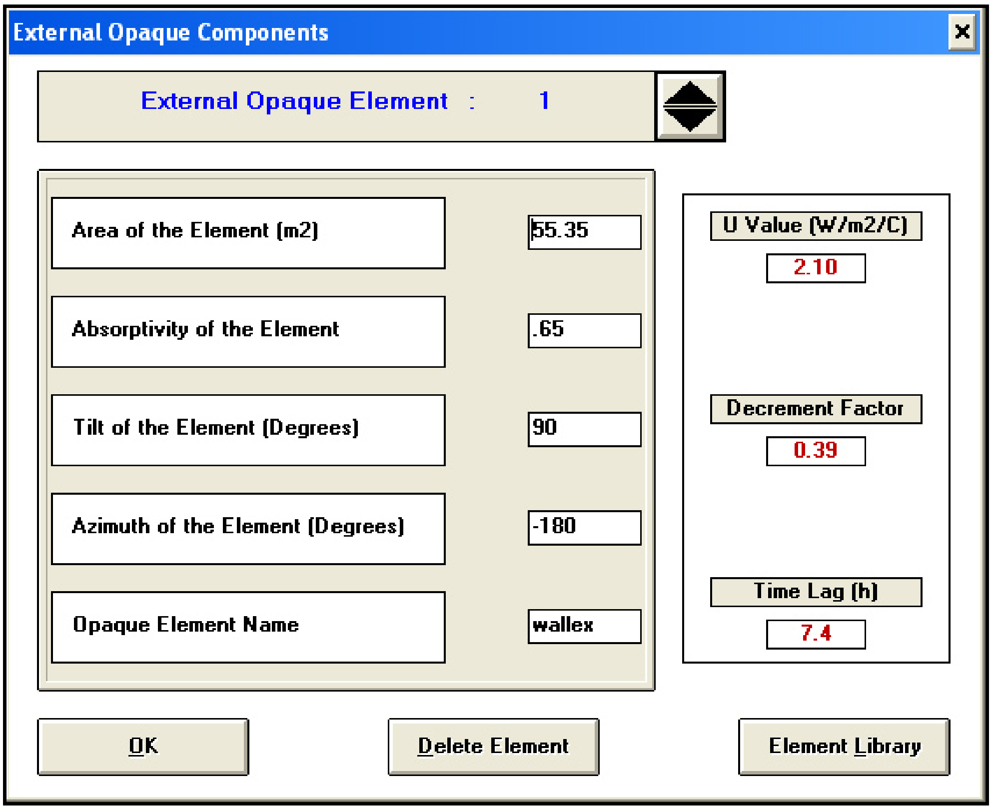

Figure 3.06 External opaque components dialogue box

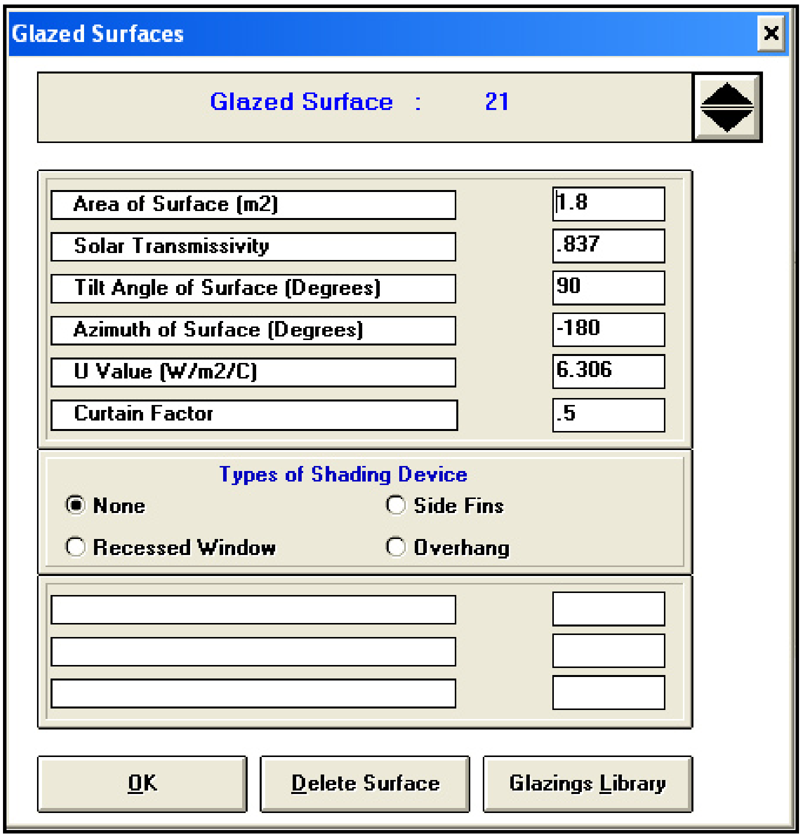

Figure 3.07 Glazed surfaces dialogue box

In addition to these examples, other specified input parameters that some were referred from the Summer-Building® software manual, are presented in Appendix D.

After all these input parameters, investigations of the case study building were evaluated by the passive cooling simulation tool, aiming to improve the energy performance of the existing building. In other words, after this description process (building characteristics and other necessary data) to the program, the calculations of the simulation tool (according to the building type) were performed as in Figure 3.08.

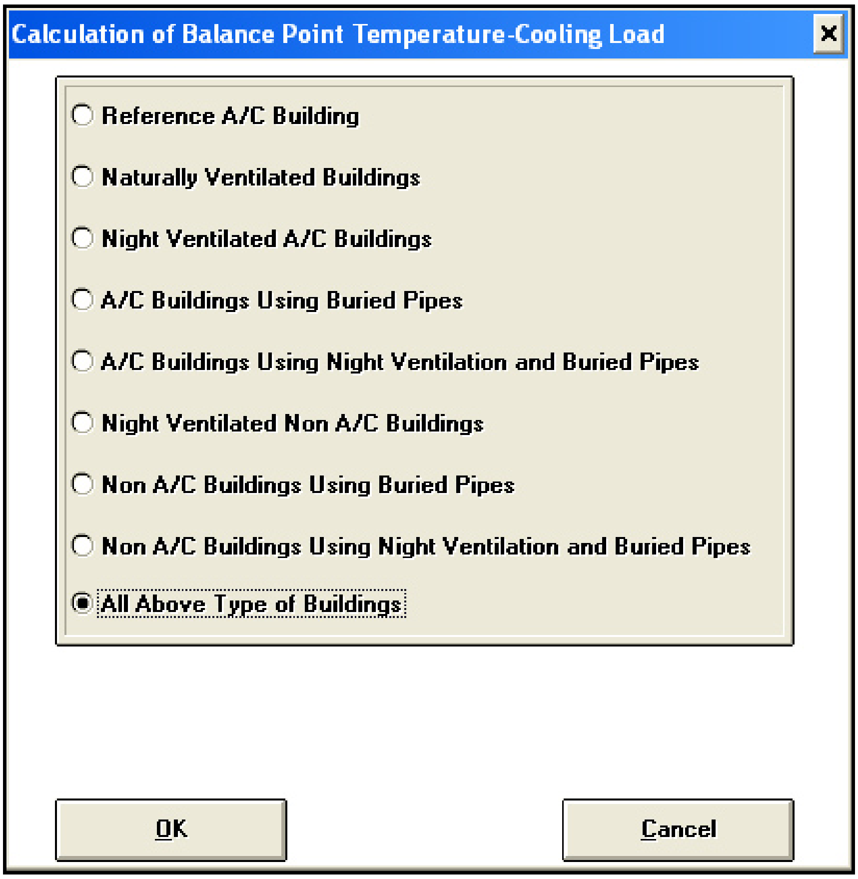

Figure 3.08 Calculation of different cooling loads dialogue box

In the light of these, to evaluate and discover the effects of each feasible passive cooling strategy independently, the daily outputs were presented in both tabular and graphical forms including; hourly balance point temperatures, over heating hours and cooling loads of the building. Then, an estimated percentage of energy conservation, compared to a fully A/C building, was also presented.

In addition, two different types of proposed shading devices (side fins and overhang) for the glazed surfaces of the building were selected within the simulation program to improve the solar control and heat avoidance in the building. In this context, compared to the existing conditions (without any shading device), both of the proposed shading principles were tested and analyzed on all facades of the building by considering various depths of overhang and side fin shading devices (Figure 3.09).

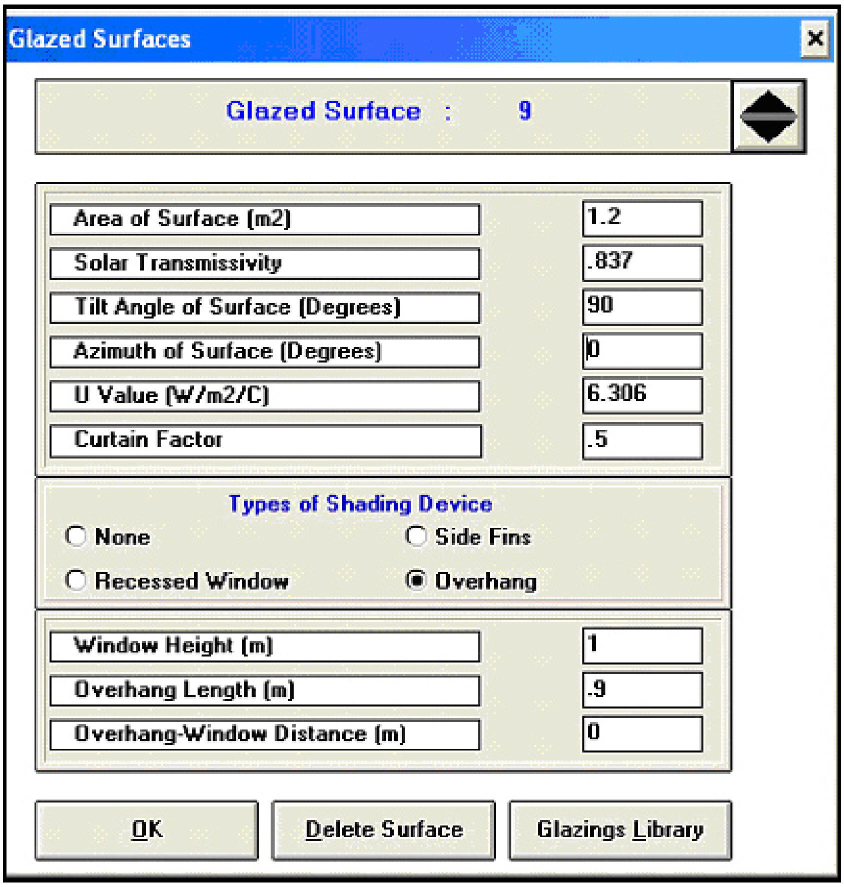

Figure 3.09 Glazed surfaces dialogue box with overhang shading device

CHAPTER 4

RESULTS AND DISCUSSIONS

This chapter presents the results, analyses and discussions on the outcomes of the data collection and computer simulation of the case study building for one of the hottest periods of the season for Cyprus which is August.

In this context, first is presented the results and the analyses of temperature and relative humidity data that were collected from the selected building for assessment. Then, the computer simulation of the survey building in terms of cooling energy performance, by means of the effect of appropriate passive cooling strategies and the effect of appropriate shading strategies, were analyzed and presented according to their various cooling loads and energy savings.

4.1. Analyses of Data from the Survey Building

In this section, temperature and relative humidity data (Appendix B), which were collected from 5^{th} to 9^{th} of August 2007, for assessment of the case study building, are analyzed and discussed in parallel with relevant charts and tables.

In order to collect data 6 dataloggers (five indoor and one outdoor), were placed about a meter high above the floors. The location of these dataloggers can be seen in the plans given in Figure 4.01 and 4.02. In addition, sky and wind conditions on the days that the temperature and the relative humidity data were recorded, are presented in Table 4.01.

The 2nd-4th columns were used to indicate whether the sky was clear or cloudy in the morning (9:00 am), afternoon (3:00 pm) and night (9.00 pm). In addition, the wind conditions were recorded in columns 5-7 to indicate whether it was calm or windy.

Table 4.01 Sky conditions on days that data were recorded

	Cloudiness			Wind		
	9:00 am	3:00 pm	9:00 pm	9:00 am	3:00 pm	9:00 pm
05.08.07	clear	clear	clear	calm	calm	calm
06.08.07	partial	partial	clear	calm	breeze	wind
07.08.07	partial	clear	clear	breeze	breeze	breeze
08.08.07	clear	clear	clear	calm	calm	breeze
09.08.07	partial	clear	clear	calm	breeze	calm

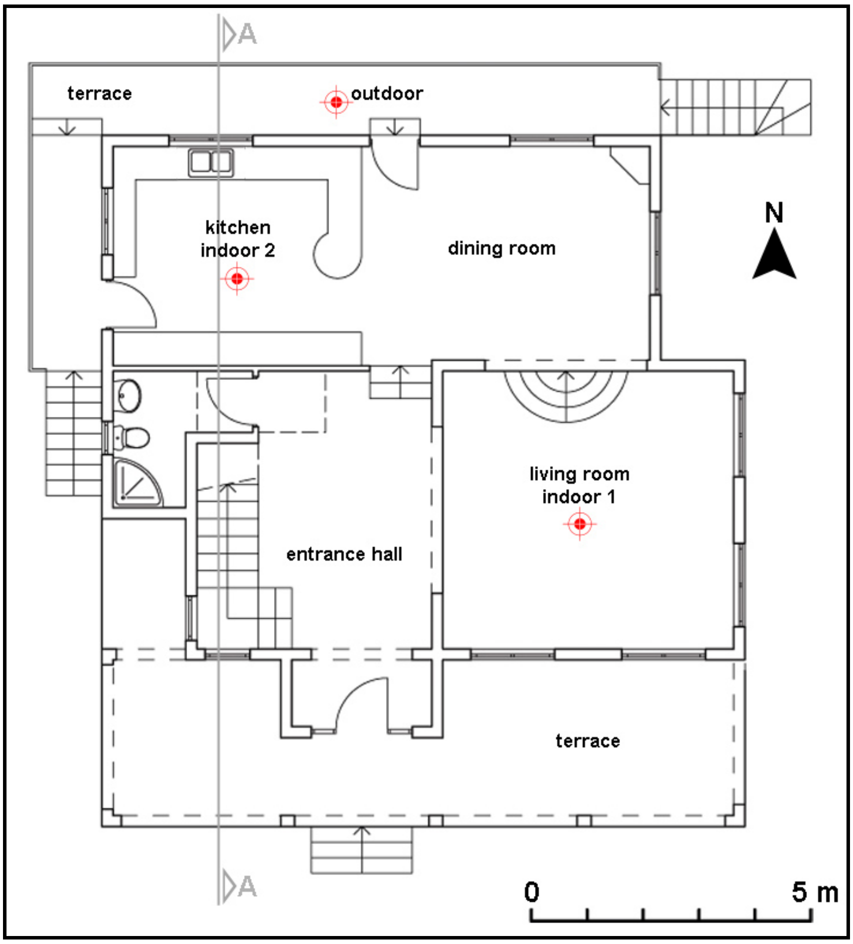

Figure 4.01 Ground floor plan of the case study building

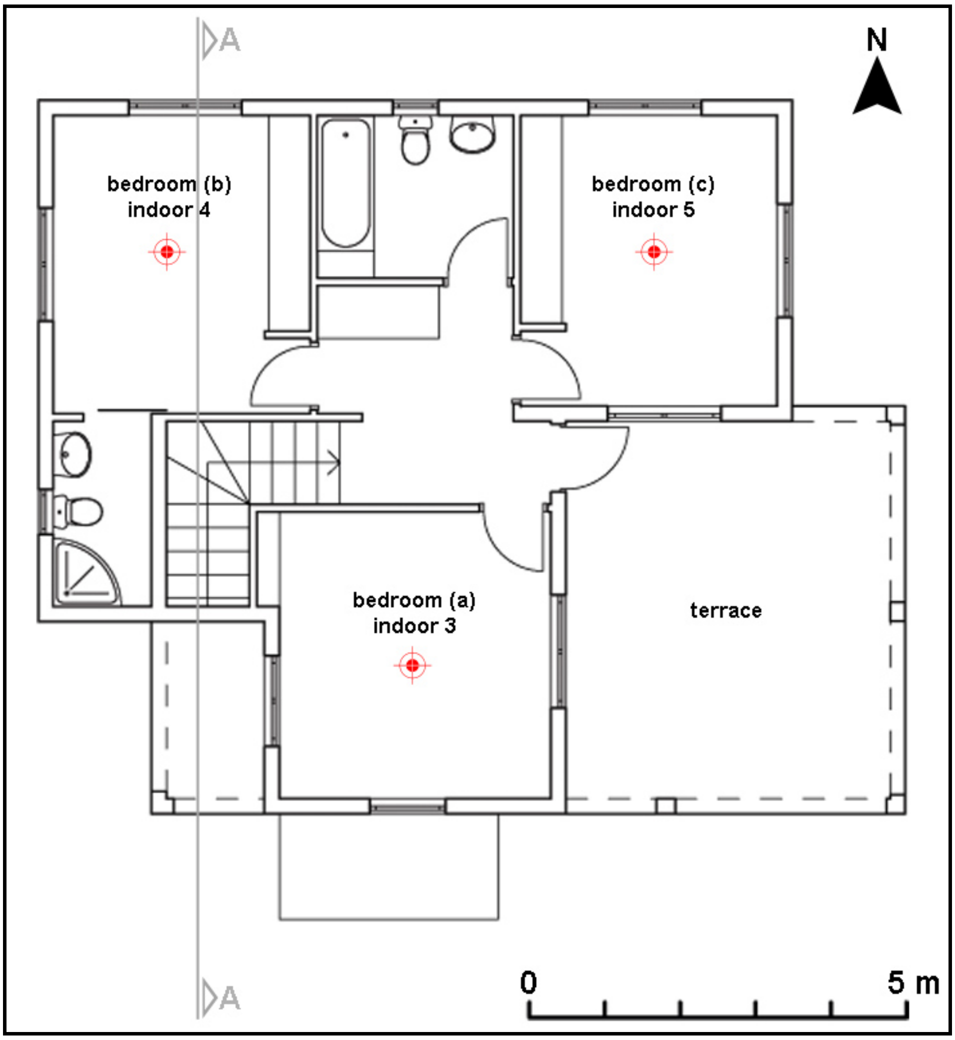

Figure 4.02 First floor plan of the case study building

4.1.1. Temperature Data Analyses

This data set includes the temperature data of five different indoor points and an outdoor point concurrently; under ventilated and unventilated conditions in the case study building for five days. However, data for the initial and final few hours were not taken into consideration, to counter discrepancies that may creep in due to the time spent on opening-closing doors and windows and placing the dataloggers.

In this context, there is a combined, temperature chart for comparisons that is illustrated on Figures 4.03 where the abscissa shows the time of recording in hours and the ordinate, the temperature in degrees centigrade.

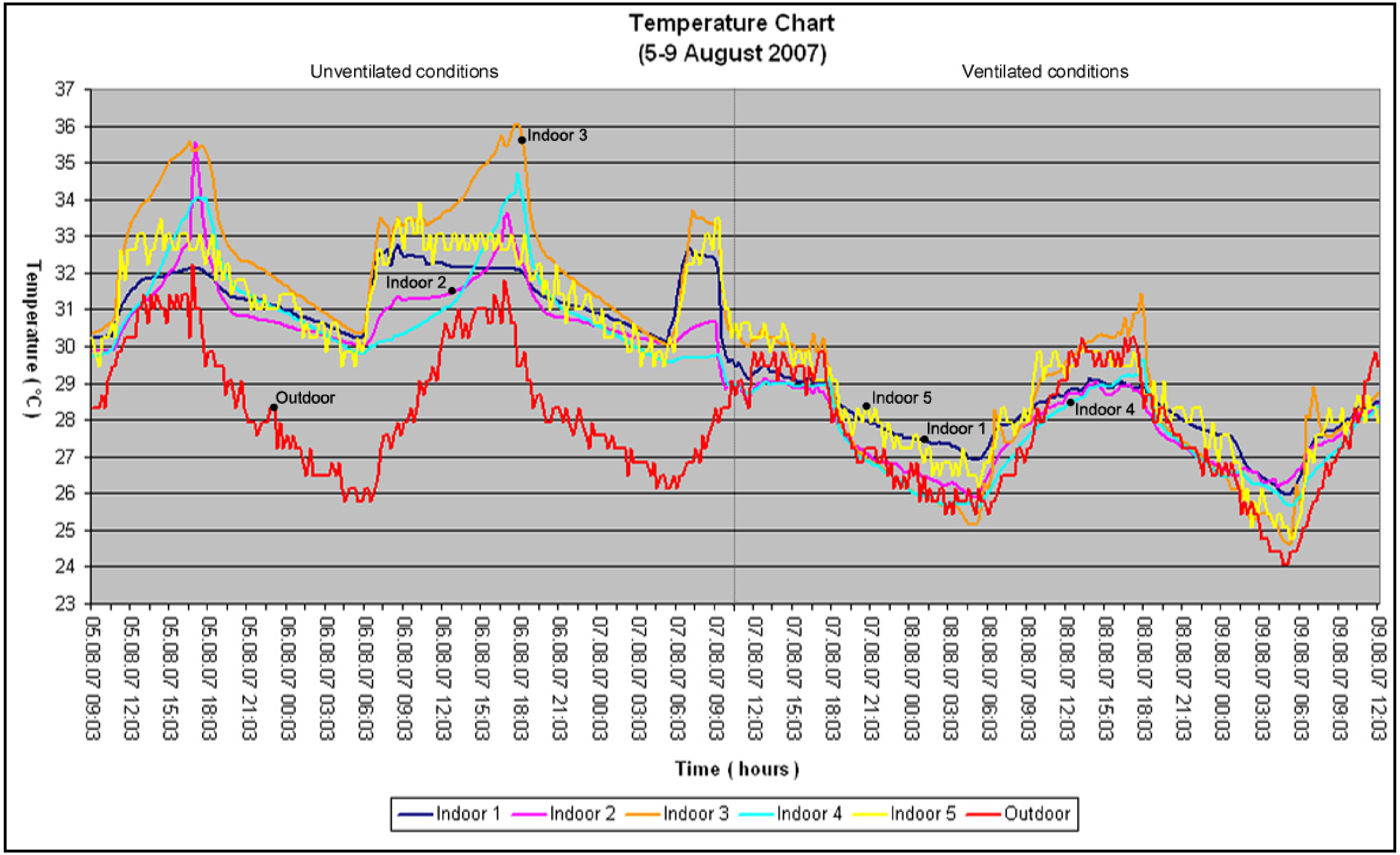

Figure 4.03 Combined temperature chart for comparison

In addition to the above combined temperature chart, minimum, maximum and average temperatures of the rooms were presented in tabular forms including maximum-minimum temperature differences and indoor-outdoor temperature differences, as in Table 4.02 and 4.03.

Table 4.02 Indoor-outdoor temperatures under unventilated conditions (5-7 August 2007)

	Indoor1 (S/E)	Indoor 2 (N/W)	Indoor 3 (S/E/W)	Indoor 4 (N/W)	Indoor 5 (N/S/E)	Outdoor
T_{min} (ºC)	30.1	30.0	30.0	29.6	29.4	25.8
ΔT_{in-out}	4.3	4.2	4.2	3.8	3.6	
T_{max} (ºC)	32.8	34.6	36.1	34.7	33.9	32.2
ΔT_{in-out}	0.6	2.4	3.9	2.5	1.7	
T_{avg} (ºC)	31.5	31.1	32.7	31.2	31.7	28.4
$\Delta T_{max-min}$	2.7	4.6	6.1	5.1	4.5	6.4

On the first half of the data collection, as all windows were closed and there was no ventilation, the interior temperature minimum average was 29.8 ˚C while the exterior minimum was 25.8 ˚C (Table 4.02). However, as seen from the Table 4.03, on the second half, after opening all windows, the interior temperature minimum average decreased to 25.4 ˚C while the exterior minimum was 24.1 ˚C.

Table 4.03 Indoor-outdoor temperatures under ventilated conditions (7-9 August 2007)

	Indoor1 (S/E)	Indoor 2 (N/W)	Indoor 3 (S/E/W)	Indoor 4 (N/W)	Indoor 5 (N/S/E)	Outdoor
T_{min} (ºC)	26.0	25.9	24.6	25.6	24.7	24.1
ΔT_{in-out}	1.9	1.8	0.5	1.5	0.6	
T_{max} (ºC)	29.6	29.2	31.4	29.6	30.6	30.2
ΔT_{in-out}	-0.6	-1	1.2	-0.6	0.4	
T_{avg} (ºC)	28.1	27.5	27.9	27.4	28.1	27.4
$\Delta T_{max-min}$	3.6	3.3	6.8	4	5.9	6.1

In the light of these recorded temperature data, it is observed that indoor temperature maximum average, which was similar with the outdoor maximum temperature as 30.2 ˚C under ventilated conditions (Table 4.03), was significantly uncomfortable with undesirable thermal stress, causing important cooling loads.

Besides, it can be seen from above tables and Figure 4.04 that indoor 3 which has south, east and west facing windows, was the hottest room with records of 36.1 ˚C and 31.4 ˚C maximum temperatures and had the biggest maximum temperature difference with outside, compared to the other rooms under both unventilated and ventilated conditions.

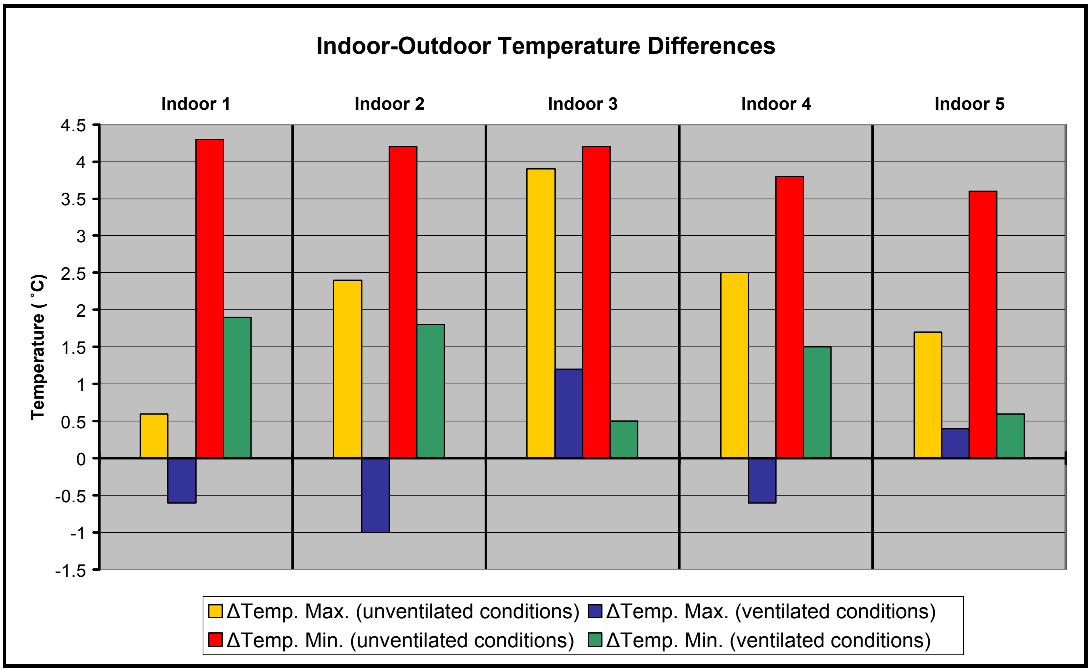

Figure 4.04 Indoor-outdoor temperature difference charts

As the indoor maximum temperatures, under ventilated conditions, were less than the outside maximum temperatures of indoor 1, indoor 2 and indoor 4, the maximum temperature differences of these rooms with outside were below 0 ˚C (Figure 4.04) which means that these rooms were more comfortable than the exterior conditions. In addition, indoor 2 which is on the ground floor and has only north and west openings had the biggest maximum temperature difference with outside as -1 ˚C.

On the other hand, Figure 4.05 shows the temperature chart of two identical first floor rooms; room 4, having additional west facing and the other room 5, having additional east and south facing window, under unventilated conditions.

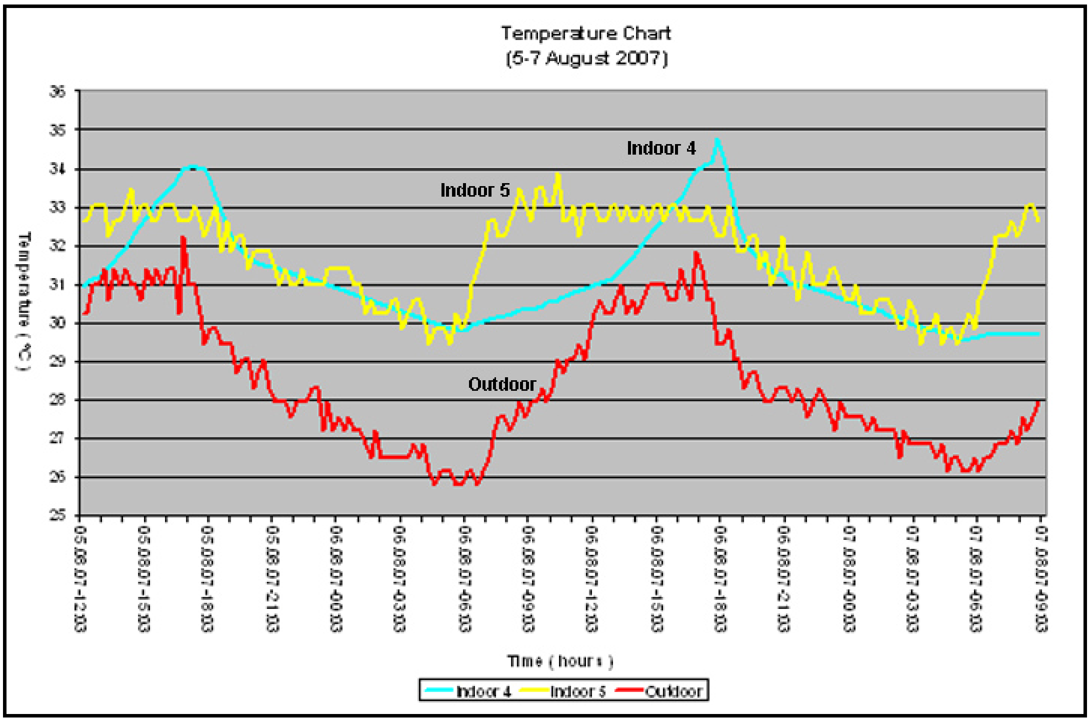

Figure 4.05 Temperature chart of indoor 4 and indoor 5 under unventilated conditions

In both rooms the interior temperature averages were similar with 31.2 ˚C and 31.7 ˚C. However, it can be seen from their different temperature patterns that room 4 was mainly influenced from the west (afternoon) solar energy penetration and room 5 was mainly influenced from the east (morning) solar energy penetration through different oriented windows.

Similarly, also Figure 4.06 shows the temperature chart of two identical ground floor rooms; room 1, having south and east facing and the other room 2, having north and west facing windows, under unventilated conditions.

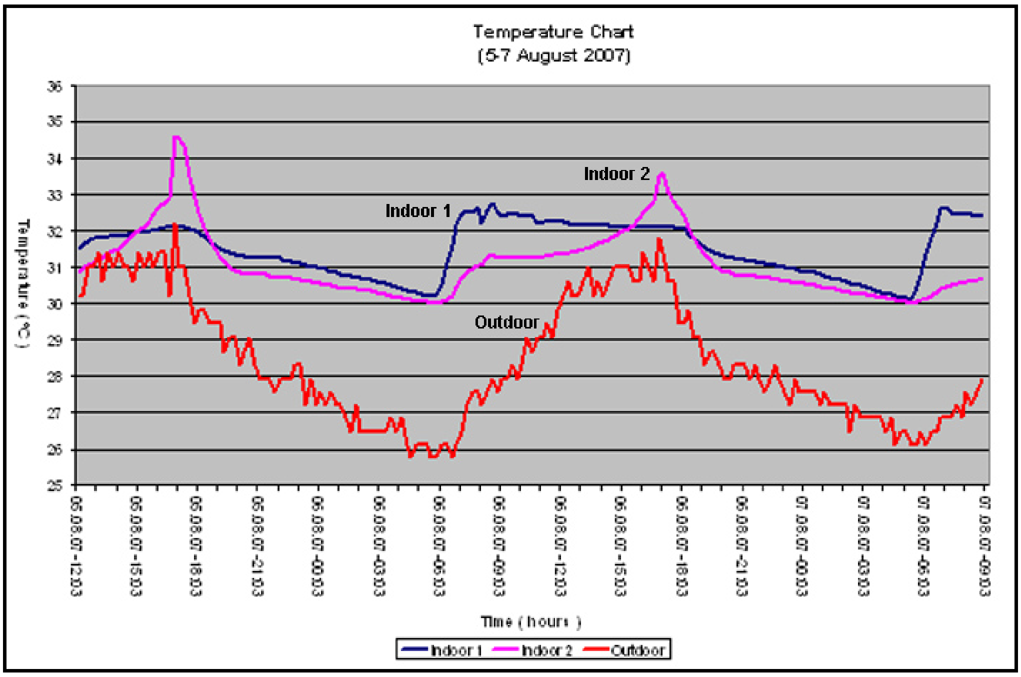

Figure 4.06 Temperature chart of indoor 1 and indoor 2 under unventilated conditions

In both rooms the interior temperature averages were similar with 31.5 ˚C and 31.1 ˚C. However, it can be seen from their different temperature patterns that room 1 was mainly influenced from the east (morning) and room 2 was mainly influenced from the west (afternoon) solar energy penetration through differently oriented windows.

In this context, it can be examined that the potential of solar penetration through windows and its effect on the elevation of the indoor temperature depends greatly on the orientation of the windows. In other words, solar energy penetration through un-shaded windows in summer can elevate a building's indoor temperature high above the outdoor daytime level and this cause significant thermal stress, as well as increasing the building's cooling load.

4.1.2. Humidity Data Analyses

This data set includes the relative humidity data of five different indoor points and an outdoor point concurrently; under unventilated and ventilated conditions for five days. In this context, there is a combined, comparison relative humidity chart that is illustrated on Figure 4.07 where the abscissa shows the time of recording and the ordinate the relative humidity in % RH.

On the first two days as all windows were closed, the interior relative humidity average was 59.5 % while the exterior average was 70.3 % (Table 4.04). However, on the third and the fourth days, after opening all the windows, the relative humidity averages were closer to each other as 58.6 % inside and 62.5 % exterior (Table 4.05).

As presented in tables below, it is observed that the indoor relative humidity maximum average, which was 68.4 % under ventilated conditions, was significantly uncomfortable with undesirable moisture stress. In this context, evaporative cooling strategies which provide additional humidity are not appropriate to the existing undesirable humid conditions. In addition, it can be seen that indoor 2 and indoor 4, which don't have any south facing window, were the most humid rooms with peak relative humidity records on both under unventilated and ventilated conditions.

Table 4.04 Indoor-outdoor relative humidity under unventilated conditions

	Indoor1 (S/E)	Indoor 2 (N/W)	Indoor 3 (S/E/W)	Indoor 4 (N/W)	Indoor 5 (N/S/E)	Outdoor
RH_{min} (%)	48.8	49.0	43.7	49.1	49.1	53.2
RH_{max} (%)	65.0	68.3	63.8	67.2	67.6	86.1
RH_{avg} (%)	59.0	61.0	55.2	61.8	60.3	70.3
$\Delta RH_{max-min}$	16.2	19.3	20.1	18.1	18.5	32.9

Table 4.05 Indoor-outdoor relative humidity under ventilated conditions

	Indoor1 (S/E)	Indoor 2 (N/W)	Indoor 3 (S/E/W)	Indoor 4 (N/W)	Indoor 5 (N/S/E)	Outdoor
RH_{min} (%)	48.5	50.2	46.5	49.8	49.5	51.3
RH_{max} (%)	66.8	69.8	68.5	69.6	67.1	73.0
RH_{avg} (%)	57.4	59.4	57.7	60.3	58.0	62.5
$\Delta RH_{max-min}$	18.3	19.6	22	19.8	17.6	21.7

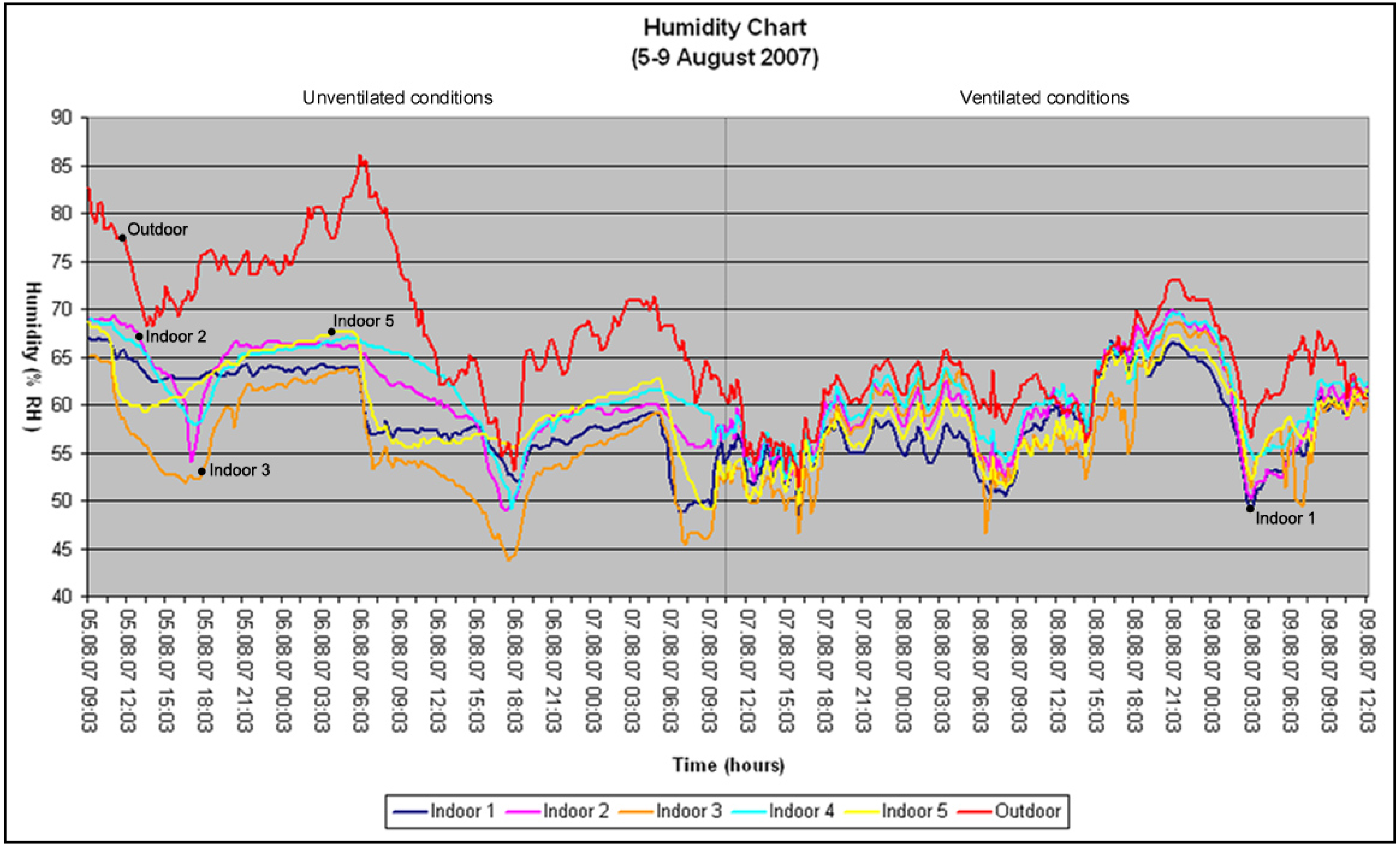

Figure 4.07 Combined humidity chart for comparison

4.2. Results and Analyses of the Simulation Process

After the simulation process of the survey building, firstly the effect of appropriate passive cooling strategies and then the effect of appropriate shading strategies for glazed surfaces were analyzed and presented according to their daily energy cooling loads and energy savings, for 15 day period.

In this context, to evaluate and discover the effects of each feasible passive cooling and shading strategy independently, the daily outputs were presented and discussed in parallel with both tabular and graphical forms including; hourly balance point temperatures, over heating hours and cooling loads of the building (Appendix E). Besides, estimated percentages of energy saving, compared to a fully A/C building, were also presented.

4.2.1. Passive Cooling Effectiveness Analyses

In this section, results of the energy simulation of the selected residential building under appropriate passive cooling strategies for the main hottest 15 day summer period, which is from 1st to 15th August 2007, are presented and analyzed both individually and collectively. Thereafter the description process of the building characteristics and other necessary input data to the program, the cooling load calculations of the simulation were performed according to different building types for 15 day period. In this context, hourly values of balance point temperature (BPT) and daily values of cooling loads under different passive cooling strategies were calculated as in Figure 4.08 and 4.09.

The BPT is the critical point at which the external ambient temperature would cause the internal temperature to be uncomfortable. In more detail, BPT will vary from building to building depending on the strategies that have been adopted for protecting the simulated building from external and internal gains.

For example, a high BPT indicates that the building is efficient and capable of providing comfortable internal conditions despite high external ambient temperatures. On the other hand, a low BPT indicates that the building is too easily influenced by external conditions. Therefore, as presented in eight daily graphs (Figure 4.08), the BPT varies from hour to hour, due to the combined influence of the amount of gain from solar radiation, occupancy and use of equipment.

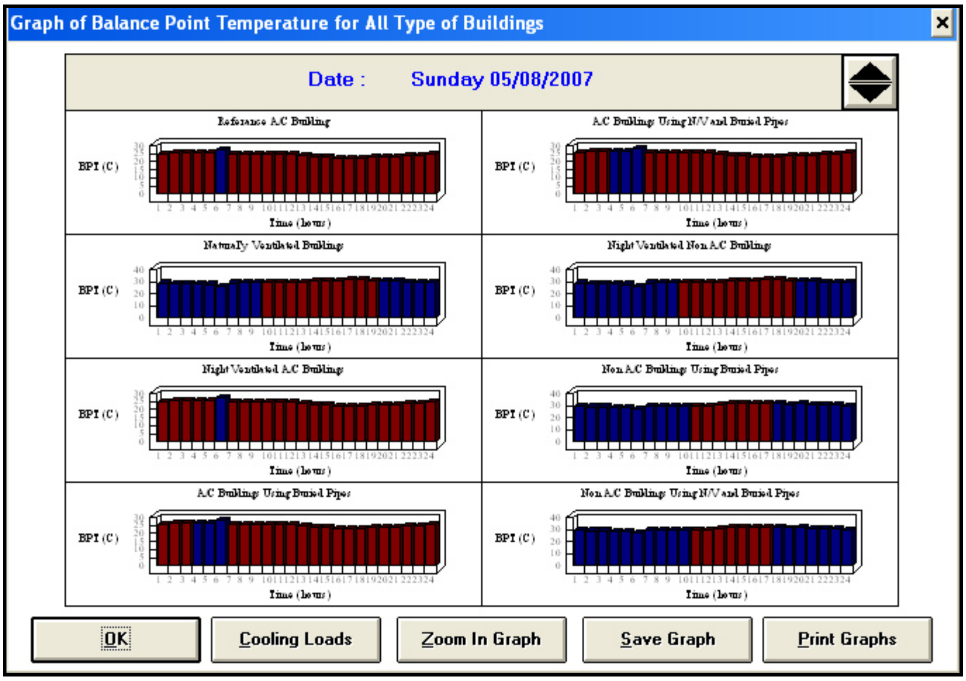

Figure 4.08 Graph of balance point temperature for all type of buildings (5 August 2007)

Referance A/C Building	Daily Cooling Load : 187.3 kWh/Day
Naturally Ventilated Buildings	Daily Cooling Load : 136.2 kWh/Day Energy Conservation : 27 %
Night Ventilated A/C Buildings	Daily Cooling Load : 187.3 kWh/Day Energy Conservation : 0 %
A/C Buildings Using Buried Pipes	Daily Cooling Load : 161.5 kWh/Day Energy Conservation : 13 %
A/C Buildings Using Night Ventilation and Buried Pipes	Daily Cooling Load : 161.5 kWh/Day Energy Conservation : 13 %
Night Ventilated Non A/C Buildings	Daily Cooling Load : 162.2 kWh/Day Energy Conservation : 13 %
Non A/C Buildings Using Buried Pipes	Daily Cooling Load : 106.6 kWh/Day Energy Conservation : 43 %
Non A/C Buildings Using Night Ventilation and Buried Pipes	Daily Cooling Load : 106.6 kWh/Day Energy Conservation : 43 %

OK

Figure 4.09 Results of daily cooling loads for all type of buildings (5 August 2007)

In addition, Figure 4.10 displays the balance point temperature and the external ambient temperature (outdoor temperature) for each hourly period of the day, under natural ventilation. In the light of these, as an example day, the values of BPT for 5 August 2007 are illustrated with red color when they are lower than the external ambient temperature values which are the overheating hours. It is during these over heating hours that the energy had to be provided to increase the cooling. In other words, when the external ambient temperature exceeds the BPT, the building will need to be cooled mechanically to maintain comfort. Furthermore, percentage of daily energy conservation relative to the complete air conditioned building is also given at the bottom of the example figure as 27 %.

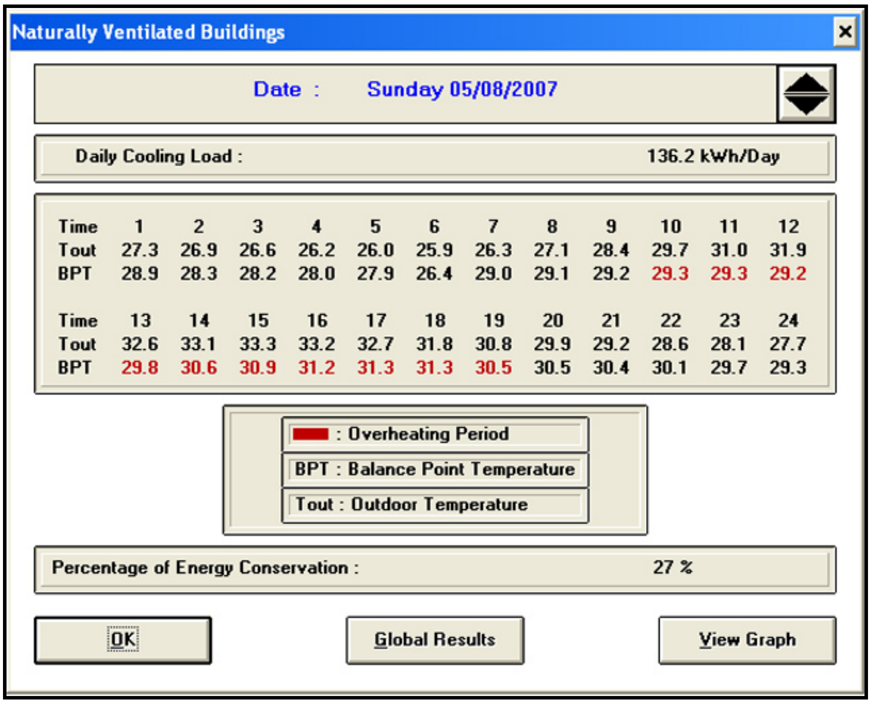

Figure 4.10 Hourly balance point temperatures under natural ventilation (5 August 2007)

According to Figure 4.10, in addition to natural ventilation, the amount of extra energy that was needed to cool the building mechanically on 5 August 2007, to comfort level, was 136.2 kWh/day, between 9:00 and 20:00. In this context, a building with high balance point temperature will have a low cooling load since the number of hours that the outdoor temperature exceeds balance point temperature will be fewer and since the building will have to be cooled through a smaller temperature range.

Moreover, 15 day period hourly balance point temperature data, hourly over heating period data, daily cooling load data and daily energy conservation data for all different type of building conditions are presented in Appendix E.

In the light of these data, Table 4.06 was illustrated according to their daily energy consumption and energy conservation for all different building types, as; naturally ventilated building, A/C building using night ventilation, A/C building using buried pipes, A/C building using night ventilation and buried pipes, non A/C building using night ventilation, non A/C building using buried pipes, non A/C building using night ventilation and buried pipes and reference A/C building.

From the data presented on Table 4.06, it is given that the daily cooling loads of the reference A/C building for 15 day period changes from 131.0 kWh/day (8 August 2007) to 221.4 kWh/day (1 August 2007) according to different weather conditions with a daily average of 165.3 kWh/day.

In addition, these 15 day period average results of the simulation showed that the best type of building for energy conservation was the non A/C building using night ventilation and buried pipes with an average of 44.6 % energy save, relative to reference complete A/C building type.

As presented on the same tables, it can be seen that 8 August 2007, with the minimum cooling load of all, undergoes the maximum wind speed average, 5.7 m/s. Besides, it is also observed that 1 August 2007, with the peak cooling load of all, was the hottest and calmest day with 31 ˚C average temperature and 1.4 m/s average wind speed. In addition, as this day exceeded the acceptable weather limits and became undesirable, it was the only day that the A/C building types were more efficient than the non A/C building types.

In this context, it is clear that daily wind and temperature conditions were the main factors that affected the daily cooling loads and energy efficiency of the survey building.

Table 4.06a Results of daily c ooling loads and energy conservation (1-8 August 2007)

		01.08.07	02.08.07	03.08.07	04.08.07	05.08.07	06.08.07	07.08.07	08.08.07
-Reference A/C building	Cooling load (kWh/Day)	221.4	182.2	191.8	188.7	187.3	157.6	147.0	131.0
-Naturally ventilated building	Cooling load (kWh/Day)	230.8	146.2	157.3	140.2	136.2	115.6	39.2	62.8
	Energy saving (%)	0.0	19.8	17.9	25.7	27.3	26.6	73.3	52.1
-A/C building using night	Cooling load (kWh/Day)	221.4	182.2	191.8	187.3	187.3	157.6	147.0	130.0
ventilation	Energy saving (%)	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.8
-A/C building using buried	Cooling load (kWh/Day)	190.1	155.1	164.4	163.7	161.5	134.6	124.2	111.8
pipes	Energy saving (%)	14.1	14.9	14.3	13.2	13.8	14.6	15.6	14.7
-A/C building using night	Cooling load (kWh/Day)	190.1	155.1	164.4	162.4	161.5	134.6	124.2	110.8
ventilation and buried pipes	Energy saving (%)	14.1	14.9	14.3	13.9	13.8	14.6	15.6	15.4
-Non A/C building using night	Cooling load (kWh/Day)	267.7	172.2	183.6	165.6	162.2	139.3	45	75.1
ventilation	Energy saving (%)	0.0	5.5	4.3	12.2	13.4	11.6	69.4	42.7
-Non A/C building using	Cooling load (kWh/Day)	210.1	133.6	143.3	110.4	106.6	75.6	8.4	45.5
buried pipes	Energy saving (%)	5.1	26.7	25.3	41.5	43.1	52.0	94.3	65.3
-Non A/C building using night	Cooling load (kWh/Day)	210.1	133.6	143.3	109.2	106.6	75.6	8.4	31.1
ventilation and buried pipes	Energy saving (%)	5.1	26.7	25.3	42.1	43.1	52.0	94.3	76.3

Table 4.06b Results of daily cooling loads and energy conservation (9-15 August 2007)

		09.08.07	10.08.07	11.08.07	12.08.07	13.08.07	14.08.07	15.08.07	**15 day average**
-Reference A/C building	Cooling load (kWh/Day)	132.1	160.7	193.9	165.0	134.0	133.6	152.5	**165.3**
-Naturally ventilated building	Cooling load (kWh/Day)	82.6	114.0	137.0	91.7	78.9	82.0	119.5	**115.6**
	Energy saving (%)	37.5	29.1	29.3	44.4	41.1	38.6	21.6	**30.1**
-A/C building using night	Cooling load (kWh/Day)	130.0	159.2	193.9	163.6	132.6	131.8	151.1	**164.5**
ventilation	Energy saving (%)	1.6	0.9	0.0	0.8	1.0	1.3	0.9	**0.5**
-A/C building using buried	Cooling load (kWh/Day)	114.6	139.3	167.1	143.0	115.2	115.1	131.7	**142.1**
pipes	Energy saving (%)	13.2	13.3	13.8	13.3	14.0	13.8	13.6	**14.0**
-A/C building using night	Cooling load (kWh/Day)	112.7	138.0	167.1	141.7	113.9	113.5	130.4	**141.4**
ventilation and buried pipes	Energy saving (%)	14.7	14.1	13.8	14.1	15.0	15.0	14.5	**14.5**
-Non A/C building using night	Cooling load (kWh/Day)	96.4	109.7	164.3	92.0	93.8	95.7	140.3	**133.5**
ventilation	Energy saving (%)	27.0	31.7	15.3	44.2	30.0	28.4	8.0	**19.2**
-Non A/C building using	Cooling load (kWh/Day)	72.4	99.1	108.0	56.5	69.9	86.4	93.6	**94.6**
buried pipes	Energy saving (%)	45.2	38.3	44.3	65.8	47.8	35.3	38.6	**42.8**
-Non A/C building using night	Cooling load (kWh/Day)	70.6	97.8	108.0	55.8	61.5	70.0	92.2	**91.6**
ventilation and buried pipes	Energy saving (%)	46.6	39.1	44.3	66.2	54.1	47.6	39.5	**44.6**

Lastly, it is observed from the results of the simulation that by applying the passive cooling strategies such as, natural ventilation, night ventilation and ground cooling (buried pipes); the daily energy conservation performance was improved significantly in the simulated case study building.

4.2.2. Shading Effectiveness Analyses

After the simulation process of the case study building, the additional effect of appropriate shading strategies for the windows were also simulated and analyzed, to obtain daily cooling loads and energy savings.

In order to improve solar control through the glazed surfaces, two types of shading devices namely side fins and overhangs were examined on all the 4 facades of the selected building. In this context, 50 cm deep side fin shading devices and 50 cm deep overhang shading devices were simulated and tested on all the windows of the north, south, east and west facades, separately.

In this context, to evaluate and discover the effects of each feasible shading strategy independently, the fortnightly average cooling load outputs are presented and discussed here parallel to the table Tables 4.07. In addition, estimated percentages of average energy savings, compared to an un-shaded fully A/C building, are presented.

Table 4.07 Cooling loads and energy savings with use of shading devices for 15 day period

		Overhang shading device	Side fin shading device
-Shading device on only north facade	C. load (kWh/Day)	164.5	164.0
	E. save (%)	0.5	0.8
-Shading device on only south facade	C. load (kWh/Day)	162.2	162.7
	E. save (%)	1.9	1.5
-Shading device on only east facade	C. load (kWh/Day)	163.5	163.9
	E. save (%)	1.1	0.8
-Shading device on only west facade	C. load (kWh/Day)	163.6	164.0
	E. save (%)	1.0	0.8

C= Cooling E= Energy

In the light of the table above, from 1st to 15th August 2007, the overhang shading devices provided more energy conservation compared to the side fins on all facades of the survey building except the north. In other words, it is clear that the 50 cm proposed overhangs were more efficient on south, east and west where the 50 cm proposed side fins were more efficient on north oriented windows of the case study building.

As a result of these analyses, the overhang and side fin shading devices were retested on appropriate facades of the survey building collectively, as overhangs for south, east west and side fins for north facades, for overall satisfaction. Then, these collectively applied simulation results are presented on Table 4.08.

Table 4.08 Cooling loads and energy savings with use of shading devices on all facades

	Reference A/C building	Appropriate shading devices	
	Cooling load (kWh/Day)	C. load	E. save (%)
01.08.07	221.4	214.1	3.3
02.08.07	182.2	174.7	4.1
03.08.07	191.8	184.1	4.0
04.08.07	188.7	180.8	4.2
05.08.07	187.3	179.8	4.0
06.08.07	157.6	149.7	5.0
07.08.07	147.0	139.2	5.3
08.08.07	131.0	123.4	5.8
09.08.07	132.1	124.7	5.6
10.08.07	160.7	152.0	5.4
11.08.07	193.9	185.9	4.1
12.08.07	165.0	156.7	5.0
13.08.07	134.0	126.1	5.9
14.08.07	133.6	126.3	5.5
15.08.07	152.5	144.6	5.2
Average	**165.3**	**157.5**	**4.7**

C= Cooling E= Energy

According to Table 4.08, the results of the simulation showed that the collective use of appropriate 50 cm deep overhang and side fin shading devices on all facades (overhang on south, east and west and side fin on north) provided 4.7 % energy conservation for the 15 day period, relative to reference un-shaded A/C building.

In addition to the collective use of 50 cm shading devices, other depth and energy save relations of the shading devices were evaluated in more detail as presented in Figure 4.11. In the light of this chart, it can be observed that as depth increases the energy conservation is also increasing, under same shading device conditions. However, after 100 cm depth, the increase in energy saving is not proportional to the increase in depth.

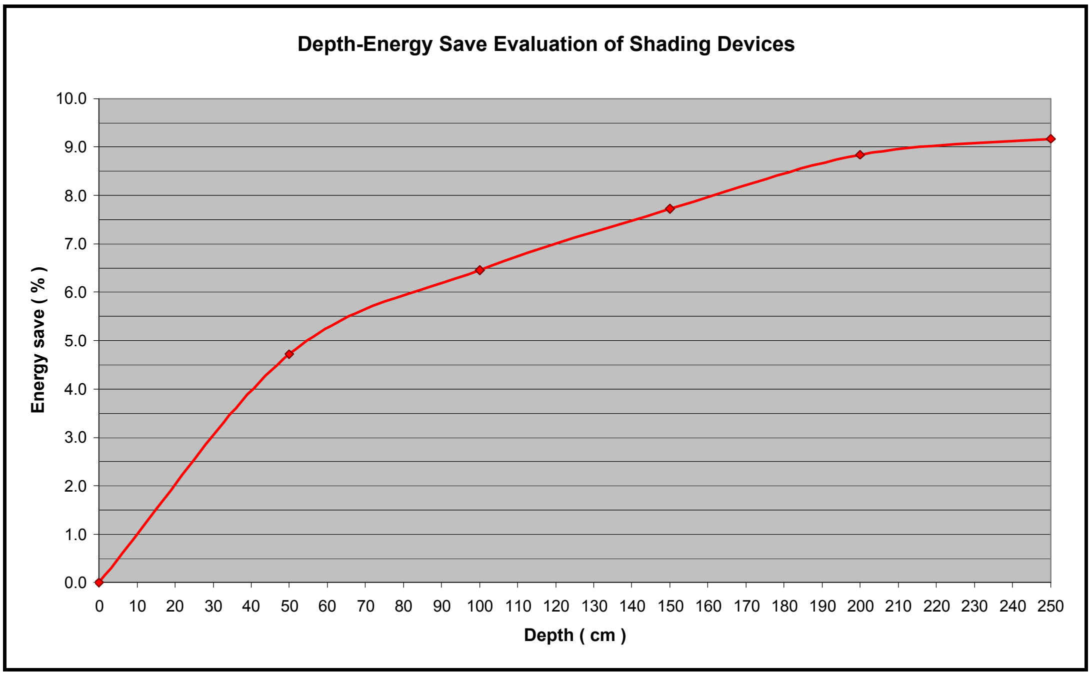

Figure 4.11 Depth vs. energy savings chart of shading devices

CHAPTER 5

CONCLUSION

According to many literature sources, passive cooling techniques in buildings have been proved successful through numerous demonstration and pilot projects. They exhibit a high potential for reducing the energy consumption for cooling in commercial and residential buildings, which represents a significant percentage of the total energy consumption in buildings.

Therefore, in the light of this study which was mainly aimed at discovering the outcomes of efficient passive cooling and heat avoidance strategies for hot climates like Cyprus, the following results were arrived;

- The potential of solar penetration and its effect on the elevation of the indoor temperature depends greatly on the orientation of the rooms and the windows.

- Taking into account high humidity of the region and some other limitations of the software tool, the selected building was evaluated under natural ventilation, night ventilation and ground cooling strategies, with 15 day period average results of 44.6 % energy saving, relative to the reference complete A/C building.

- In addition to the passive cooling, effect of additional appropriate solar control and shading strategies were also analyzed as obligatory basic heat avoidance strategies and with 15 day period average results of 6.2 % energy saving could be provided with the use of 90 cm deep overhang and side fin shading devices.

As a conclusion, these results show the importance of the proposed passive cooling strategies and basic heat avoidance concepts that could provide more than 50 % energy conservation, from 1st to 15th August 2007, on the selected case study building. In other words, it is observed that the cooling energy conservation potential can easily be improved significantly, in the simulated case study building with the use of the appropriate passive cooling strategies.

In this context, it is important to take care of passive cooling with the other aspects of architectural design and overall environmental design strategies. From such a view point, passive cooling processes should not be considered as an isolated event. In order to maximize passive cooling in hot climates, well designed and appropriate passive cooling strategies depending on the local conditions and main heat avoidance principles integrated into the design, are of vital of importance.

To sum up, these simple passive strategies which enable the indoor temperatures of buildings to be lowered, can be utilized as an effective cooling system that provides reducing the energy use by air conditioning systems in buildings of hot regions.

In addition, further researches can be necessary to improve the energy efficiency of the case study building by examining the effect of additional and longer buried pipes strategies, indirect evaporative cooling strategies, insulation strategies and vegetation around the building.

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APPENDIX A

DRAWINGS OF THE CASE STUDY BUILDING

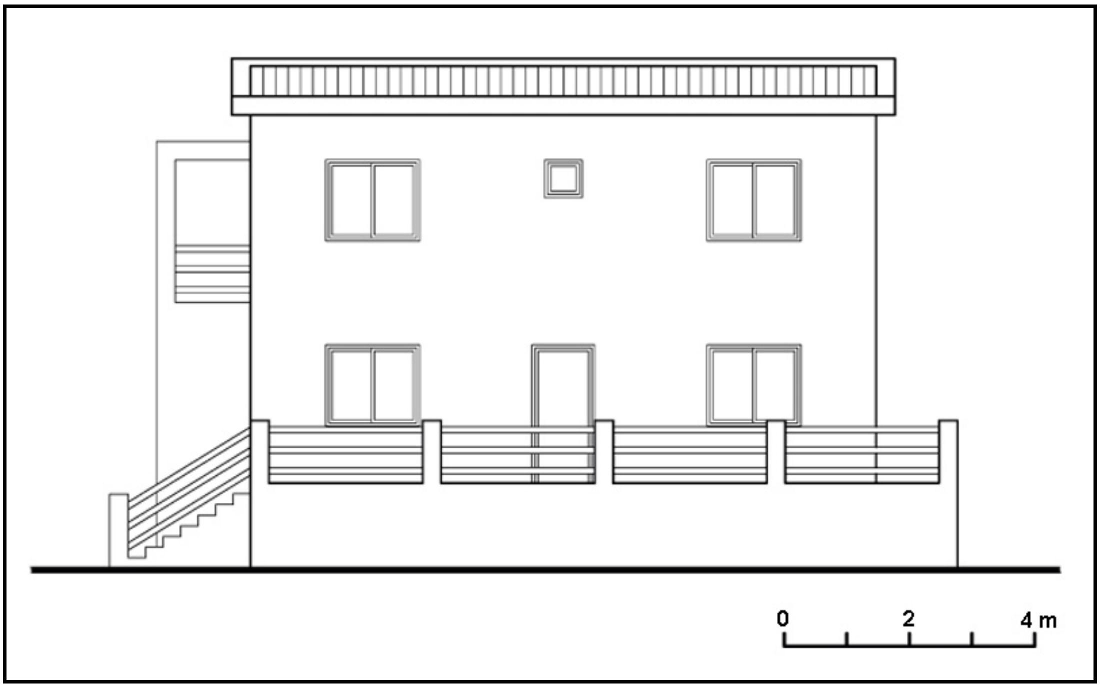

Figure A.01 North elevation of case study building

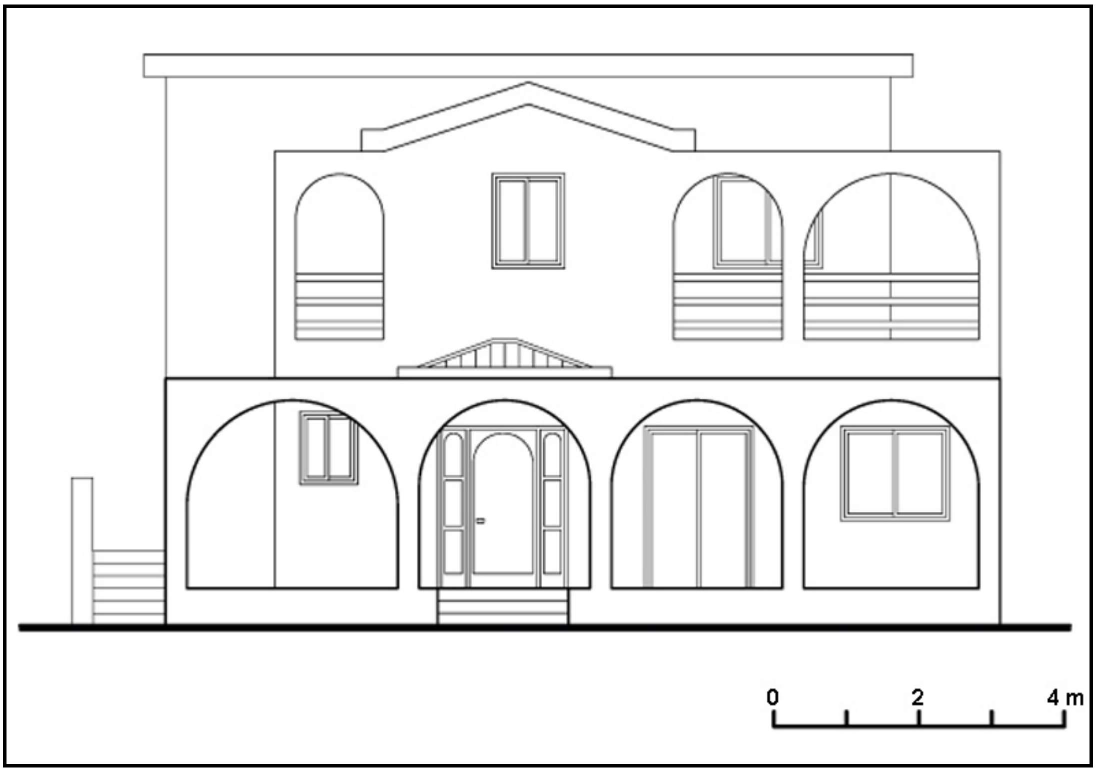

Figure A.02 South elevation of case study building

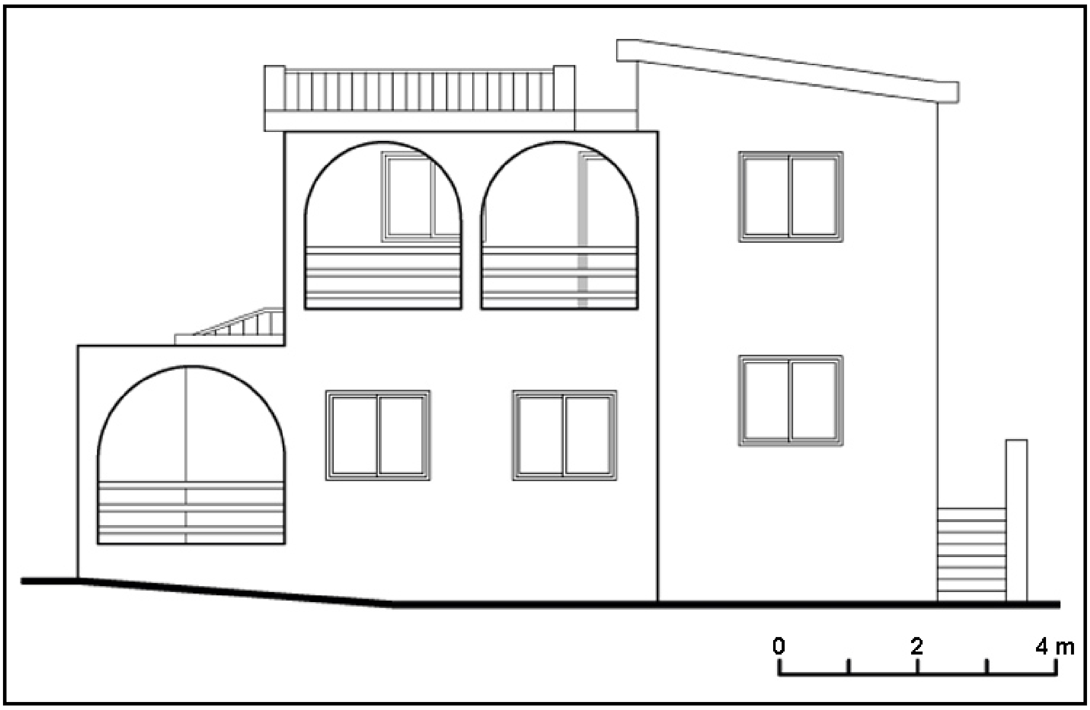

Figure A.03 East elevation of case study building

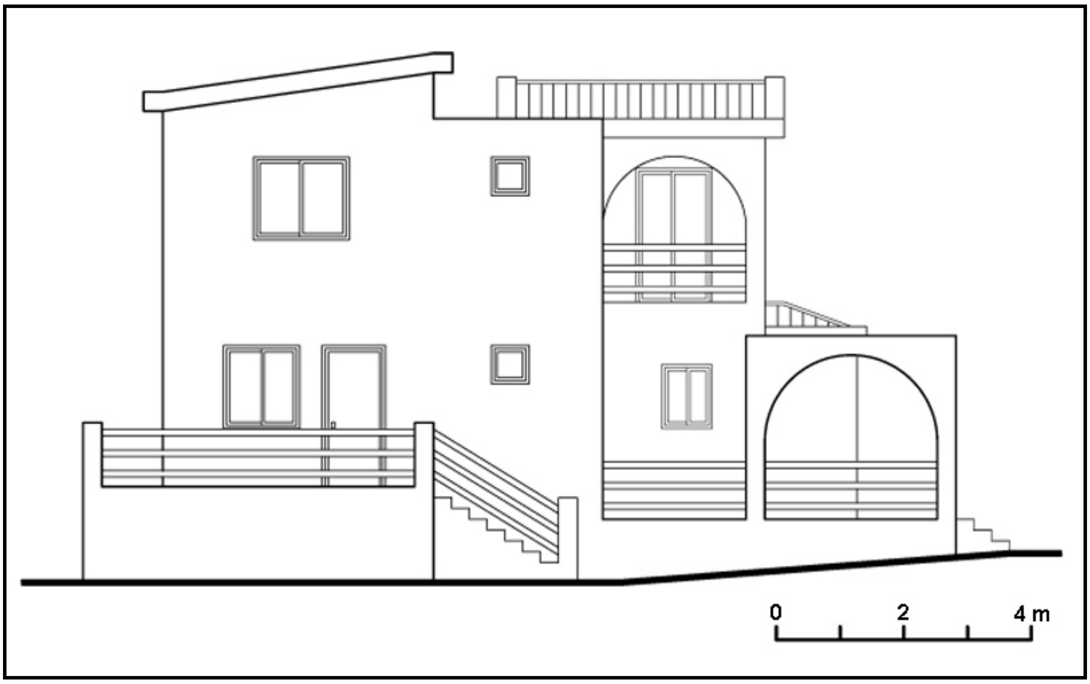

Figure A.04 West elevation of case study building

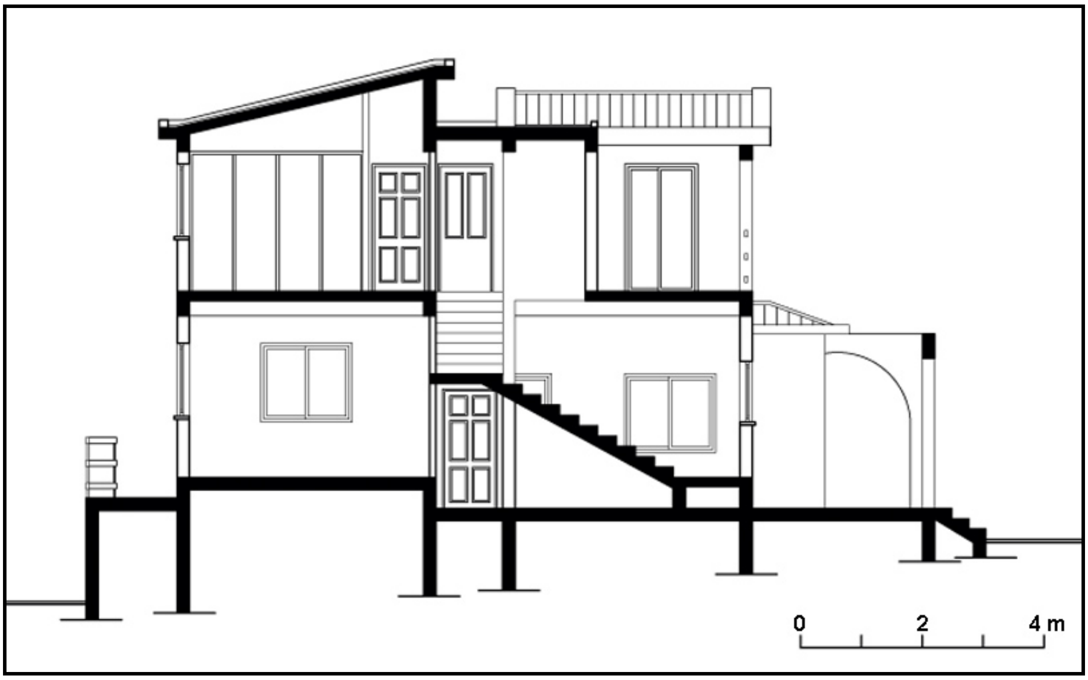

Figure A.05 Section A-A of case study building

APPENDIX B

MEASURED TEMPERATURE AND RELATIVE HUMIDITY DATA

Table B.01 Temperature measurements at 15 minute intervals, 5-9 August 2007, (ºC)

Date	Indoor 1	Indoor 2	Indoor 3	Indoor 4	Indoor 5	Outdoor
05.08.2007 09:03	30.25	29.88	30.37	29.71	30.22	28.31
05.08.2007 09:18	30.25	29.88	30.40	29.73	29.83	28.31
05.08.2007 09:33	30.24	29.88	30.44	29.76	29.45	28.31
05.08.2007 09:48	30.25	29.88	30.48	29.79	30.22	28.69
05.08.2007 10:03	30.26	29.88	30.53	29.82	30.22	28.31
05.08.2007 10:18	30.28	29.88	30.59	29.86	30.22	29.07
05.08.2007 10:33	30.29	29.89	30.66	29.91	30.61	29.45
05.08.2007 10:48	30.55	29.94	30.82	30.06	30.22	29.45
05.08.2007 11:03	30.83	30.16	31.78	30.33	31.01	29.83
05.08.2007 11:18	31.11	30.38	32.35	30.51	32.63	29.83
05.08.2007 11:33	31.26	30.56	32.76	30.67	31.81	30.22
05.08.2007 11:48	31.41	30.73	33.08	30.82	32.63	30.22
05.08.2007 12:03	31.53	30.85	33.37	30.94	32.63	30.22
05.08.2007 12:18	31.61	30.96	33.57	31.04	32.63	30.22
05.08.2007 12:33	31.74	31.07	33.69	31.12	33.05	31.01
05.08.2007 12:48	31.81	31.14	33.82	31.20	33.05	31.01
05.08.2007 13:03	31.84	31.20	33.91	31.32	33.05	31.41
05.08.2007 13:18	31.84	31.28	34.00	31.46	32.22	30.61
05.08.2007 13:33	31.88	31.36	34.10	31.61	32.63	31.41
05.08.2007 13:48	31.88	31.44	34.22	31.78	32.63	31.01
05.08.2007 14:03	31.88	31.54	34.39	31.95	33.05	31.41
05.08.2007 14:18	31.88	31.65	34.56	32.14	33.47	31.01
05.08.2007 14:33	31.92	31.77	34.74	32.34	32.63	31.01
05.08.2007 14:48	31.96	31.90	34.88	32.55	33.05	30.61
05.08.2007 15:03	31.99	32.03	35.03	32.75	33.05	31.41
05.08.2007 15:18	31.98	32.13	35.11	32.93	32.63	31.01
05.08.2007 15:33	32.02	32.29	35.19	33.11	32.63	31.41
05.08.2007 15:48	32.04	32.47	35.25	33.28	33.05	31.01
05.08.2007 16:03	32.09	32.66	35.30	33.43	33.05	31.41
05.08.2007 16:18	32.10	32.76	35.45	33.57	33.05	31.41
05.08.2007 16:33	32.11	32.90	35.61	33.80	32.63	30.22
05.08.2007 16:48	32.13	34.60	35.34	33.96	32.63	32.22
05.08.2007 17:03	32.12	35.55	35.30	34.01	32.63	31.01

Table B.01 continued

05.08.2007 17:18	32.09	34.36	35.45	34.08	33.05	31.01
05.08.2007 17:33	32.08	33.52	35.48	33.98	32.63	30.22
05.08.2007 17:48	32.01	32.94	35.32	34.05	32.22	29.45
05.08.2007 18:03	31.95	32.51	35.12	33.74	32.63	29.83
05.08.2007 18:18	31.86	32.14	34.60	33.30	33.05	29.83
05.08.2007 18:33	31.74	31.80	33.97	32.89	31.81	29.45
05.08.2007 18:48	31.64	31.52	33.46	32.50	32.63	29.45
05.08.2007 19:03	31.53	31.29	33.11	32.21	31.81	29.45
05.08.2007 19:18	31.47	31.15	32.89	31.99	32.22	28.69
05.08.2007 19:33	31.42	31.04	32.73	31.84	32.22	29.07
05.08.2007 19:48	31.34	30.94	32.61	31.71	31.41	29.07
05.08.2007 20:03	31.32	30.85	32.50	31.59	31.81	28.31
05.08.2007 20:18	31.30	30.84	32.39	31.53	31.81	28.69
05.08.2007 20:33	31.28	30.82	32.31	31.47	31.81	29.07
05.08.2007 20:48	31.28	30.82	32.30	31.44	31.81	28.31
05.08.2007 21:03	31.26	30.81	32.32	31.42	31.41	27.94
05.08.2007 21:18	31.26	30.80	32.27	31.37	31.01	27.94
05.08.2007 21:33	31.29	30.77	32.22	31.32	31.41	27.94
05.08.2007 21:48	31.28	30.74	32.16	31.26	31.01	27.58
05.08.2007 22:03	31.25	30.71	32.11	31.23	31.01	27.94
05.08.2007 22:18	31.18	30.72	32.06	31.19	31.41	27.94
05.08.2007 22:33	31.15	30.69	32.01	31.15	31.01	27.94
05.08.2007 22:48	31.14	30.68	31.94	31.11	31.01	28.31
05.08.2007 23:03	31.11	30.66	31.88	31.07	31.01	28.31
05.08.2007 23:18	31.10	30.64	31.81	31.02	31.01	27.21
05.08.2007 23:33	31.04	30.61	31.75	30.98	31.41	27.94
05.08.2007 23:48	31.00	30.58	31.69	30.93	31.41	27.21
06.08.2007 00:03	30.96	30.56	31.63	30.89	31.41	27.58
06.08.2007 00:18	30.96	30.53	31.54	30.84	31.41	27.21
06.08.2007 00:33	30.90	30.50	31.48	30.79	31.41	27.58
06.08.2007 00:48	30.85	30.47	31.41	30.74	31.01	27.21
06.08.2007 01:03	30.80	30.44	31.36	30.69	31.01	27.21
06.08.2007 01:18	30.77	30.43	31.32	30.65	30.22	26.85
06.08.2007 01:33	30.77	30.42	31.26	30.60	30.61	26.49
06.08.2007 01:48	30.74	30.41	31.19	30.55	30.22	27.21
06.08.2007 02:03	30.70	30.39	31.12	30.50	30.22	26.49
06.08.2007 02:18	30.67	30.38	31.06	30.45	30.22	26.49
06.08.2007 02:33	30.65	30.35	31.00	30.40	30.61	26.49
06.08.2007 02:48	30.61	30.32	30.94	30.35	30.61	26.49
06.08.2007 03:03	30.58	30.29	30.88	30.29	29.83	26.49
06.08.2007 03:18	30.55	30.26	30.83	30.25	30.22	26.49
06.08.2007 03:33	30.51	30.22	30.76	30.18	30.61	26.85
06.08.2007 03:48	30.46	30.19	30.71	30.14	30.61	26.49
06.08.2007 04:03	30.42	30.16	30.65	30.08	30.22	26.85
06.08.2007 04:18	30.36	30.14	30.59	30.03	29.45	26.14
06.08.2007 04:33	30.33	30.12	30.54	29.99	29.83	25.78
06.08.2007 04:48	30.30	30.09	30.47	29.93	29.83	26.14
06.08.2007 05:03	30.27	30.07	30.41	29.88	29.83	26.14
06.08.2007 05:18	30.24	30.05	30.37	29.85	29.45	26.14
06.08.2007 05:33	30.22	30.04	30.35	29.82	30.22	25.78
06.08.2007 05:48	30.23	30.02	30.37	29.81	29.83	25.78

Table B.01 continued

06.08.2007 06:03	30.54	30.05	30.60	29.85	30.22	26.14
06.08.2007 06:18	31.11	30.13	31.12	29.93	31.01	26.14
06.08.2007 06:33	31.63	30.20	31.86	30.00	31.41	25.78
06.08.2007 06:48	32.17	30.48	32.53	30.06	31.81	26.14
06.08.2007 07:03	32.47	30.72	33.22	30.10	32.63	26.49
06.08.2007 07:18	32.55	30.85	33.51	30.13	32.63	27.21
06.08.2007 07:33	32.53	30.96	33.35	30.14	32.22	27.58
06.08.2007 07:48	32.64	31.05	33.24	30.17	32.22	27.58
06.08.2007 08:03	32.21	31.06	32.70	30.17	32.63	27.21
06.08.2007 08:18	32.56	31.26	33.24	30.26	33.05	27.58
06.08.2007 08:33	32.77	31.35	33.53	30.33	33.47	27.94
06.08.2007 08:48	32.53	31.29	33.28	30.33	33.05	27.58
06.08.2007 09:03	32.43	31.26	33.29	30.34	32.63	27.94
06.08.2007 09:18	32.48	31.28	33.40	30.40	33.47	27.94
06.08.2007 09:33	32.52	31.30	33.50	30.45	33.47	28.31
06.08.2007 09:48	32.46	31.29	33.41	30.52	33.05	27.94
06.08.2007 10:03	32.44	31.30	33.47	30.55	33.05	28.31
06.08.2007 10:18	32.45	31.29	33.32	30.58	33.90	29.07
06.08.2007 10:33	32.42	31.31	33.50	30.66	32.63	28.69
06.08.2007 10:48	32.24	31.29	33.30	30.69	32.63	29.07
06.08.2007 11:03	32.26	31.32	33.37	30.77	33.05	29.07
06.08.2007 11:18	32.26	31.33	33.41	30.83	32.22	29.45
06.08.2007 11:33	32.27	31.35	33.46	30.90	33.05	29.07
06.08.2007 11:48	32.25	31.35	33.53	30.95	33.05	29.83
06.08.2007 12:03	32.25	31.38	33.62	31.00	33.05	30.22
06.08.2007 12:18	32.23	31.41	33.68	31.06	32.63	30.61
06.08.2007 12:33	32.19	31.44	33.72	31.10	32.63	30.22
06.08.2007 12:48	32.17	31.48	33.79	31.16	33.05	30.22
06.08.2007 13:03	32.16	31.51	33.89	31.25	33.05	30.61
06.08.2007 13:18	32.16	31.54	33.96	31.39	32.63	31.01
06.08.2007 13:33	32.16	31.59	34.05	31.52	33.05	30.22
06.08.2007 13:48	32.16	31.65	34.14	31.67	32.63	30.61
06.08.2007 14:03	32.16	31.73	34.29	31.85	32.63	30.22
06.08.2007 14:18	32.16	31.78	34.48	32.04	33.05	30.61
06.08.2007 14:33	32.13	31.88	34.64	32.22	32.63	31.01
06.08.2007 14:48	32.11	31.93	34.79	32.42	33.05	31.01
06.08.2007 15:03	32.11	31.99	34.88	32.58	33.05	31.01
06.08.2007 15:18	32.11	32.08	34.97	32.75	32.63	31.01
06.08.2007 15:33	32.11	32.18	35.06	32.91	33.05	30.61
06.08.2007 15:48	32.10	32.34	35.15	33.07	33.05	30.61
06.08.2007 16:03	32.12	32.53	35.24	33.21	32.63	31.41
06.08.2007 16:18	32.10	32.68	35.55	33.39	33.05	31.01
06.08.2007 16:33	32.12	32.80	35.74	33.74	32.63	30.61
06.08.2007 16:48	32.13	33.53	35.46	33.91	32.63	31.81
06.08.2007 17:03	32.13	33.63	35.45	34.03	32.63	31.41
06.08.2007 17:18	32.11	33.08	35.81	34.14	33.05	30.61
06.08.2007 17:33	32.10	32.82	36.01	34.13	32.63	30.61
06.08.2007 17:48	32.09	32.63	36.06	34.75	32.22	29.45
06.08.2007 18:03	32.06	32.40	35.96	34.31	32.22	29.45
06.08.2007 18:18	31.94	32.12	35.22	33.67	33.05	29.83
06.08.2007 18:33	31.81	31.80	34.32	33.04	32.22	29.07

Table B.01 continued

06.08.2007 18:48	31.69	31.55	33.63	32.53	31.81	29.07
06.08.2007 19:03	31.58	31.35	33.19	32.17	31.81	28.31
06.08.2007 19:18	31.49	31.21	32.91	31.91	32.22	28.69
06.08.2007 19:33	31.41	31.09	32.73	31.72	32.22	28.69
06.08.2007 19:48	31.36	30.98	32.57	31.59	31.41	28.31
06.08.2007 20:03	31.31	30.90	32.48	31.49	31.81	27.94
06.08.2007 20:18	31.29	30.86	32.39	31.39	31.01	27.94
06.08.2007 20:33	31.26	30.82	32.29	31.31	31.41	28.31
06.08.2007 20:48	31.24	30.78	32.20	31.23	32.22	28.31
06.08.2007 21:03	31.22	30.77	32.12	31.09	31.41	28.31
06.08.2007 21:18	31.18	30.77	32.03	31.01	31.41	27.94
06.08.2007 21:33	31.17	30.77	31.96	30.99	30.61	28.31
06.08.2007 21:48	31.14	30.74	31.89	30.95	31.41	27.94
06.08.2007 22:03	31.11	30.72	31.82	30.91	31.81	27.58
06.08.2007 22:18	31.10	30.70	31.75	30.87	31.01	27.94
06.08.2007 22:33	31.06	30.69	31.69	30.83	31.01	28.31
06.08.2007 22:48	31.03	30.66	31.63	30.80	31.01	27.94
06.08.2007 23:03	31.01	30.64	31.56	30.73	31.41	27.58
06.08.2007 23:18	30.97	30.62	31.50	30.69	31.41	27.21
06.08.2007 23:33	30.95	30.59	31.43	30.64	31.01	27.94
06.08.2007 23:48	30.92	30.56	31.37	30.60	30.61	27.58
07.08.2007 00:03	30.90	30.55	31.31	30.55	30.61	27.58
07.08.2007 00:18	30.88	30.52	31.24	30.51	31.01	27.58
07.08.2007 00:33	30.84	30.50	31.18	30.45	30.22	27.58
07.08.2007 00:48	30.80	30.47	31.12	30.41	30.22	27.21
07.08.2007 01:03	30.76	30.43	31.05	30.36	30.22	27.58
07.08.2007 01:18	30.71	30.41	30.98	30.32	30.61	27.21
07.08.2007 01:33	30.69	30.40	30.93	30.27	30.61	27.21
07.08.2007 01:48	30.66	30.37	30.87	30.22	30.61	27.21
07.08.2007 02:03	30.63	30.34	30.79	30.16	30.22	27.21
07.08.2007 02:18	30.58	30.32	30.73	30.12	29.83	26.49
07.08.2007 02:33	30.54	30.28	30.66	30.07	29.83	27.21
07.08.2007 02:48	30.51	30.27	30.59	30.02	30.61	26.85
07.08.2007 03:03	30.47	30.25	30.52	29.97	30.22	26.85
07.08.2007 03:18	30.43	30.21	30.46	29.91	29.45	26.85
07.08.2007 03:33	30.39	30.19	30.40	29.86	29.83	26.85
07.08.2007 03:48	30.34	30.18	30.34	29.81	29.83	26.85
07.08.2007 04:03	30.29	30.15	30.27	29.77	30.22	26.49
07.08.2007 04:18	30.27	30.13	30.23	29.72	29.45	26.85
07.08.2007 04:33	30.23	30.10	30.18	29.68	29.83	26.14
07.08.2007 04:48	30.19	30.08	30.12	29.64	29.83	26.49
07.08.2007 05:03	30.15	30.06	30.06	29.61	29.45	26.49
07.08.2007 05:18	30.14	30.04	30.03	29.57	29.83	26.14
07.08.2007 05:33	30.49	30.05	30.17	29.58	30.22	26.14
07.08.2007 05:48	30.79	30.10	30.39	29.62	29.83	26.49
07.08.2007 06:03	31.37	30.14	30.66	29.65	30.61	26.14
07.08.2007 06:18	31.80	30.24	31.09	29.68	31.01	26.49
07.08.2007 06:33	32.22	30.33	31.96	29.69	31.41	26.49
07.08.2007 06:48	32.60	30.40	32.41	29.69	32.22	26.85
07.08.2007 07:03	32.69	30.46	33.26	29.71	32.22	26.85
07.08.2007 07:18	32.49	30.50	33.73	29.71	32.22	26.85

Table B.01 continued

07.08.2007 07:33	32.47	30.56	33.52	29.71	32.63	27.21
07.08.2007 07:48	32.47	30.59	33.49	29.71	32.22	26.85
07.08.2007 08:03	32.46	30.62	33.48	29.69	32.63	27.58
07.08.2007 08:18	32.47	30.64	33.41	29.71	33.05	27.21
07.08.2007 08:33	32.44	30.67	33.36	29.72	33.05	27.58
07.08.2007 08:48	32.42	30.68	33.31	29.74	32.63	27.94
07.08.2007 09:03	32.36	30.68	33.28	29.75	33.47	28.31
07.08.2007 09:18	32.02	29.65	33.21	29.77	33.47	27.94
07.08.2007 09:33	30.24	29.17	31.82	29.54	31.81	28.31
07.08.2007 09:48	29.76	28.84	30.80	29.11	31.01	28.31
07.08.2007 10:03	29.57	28.98	30.48	28.96	31.01	28.31
07.08.2007 10:18	29.66	29.07	30.38	28.99	30.22	29.07
07.08.2007 10:33	29.46	28.88	30.39	28.95	30.61	28.69
07.08.2007 10:48	29.58	29.02	30.40	28.95	30.22	29.07
07.08.2007 11:03	29.41	28.80	30.13	28.85	30.61	29.07
07.08.2007 11:18	29.26	28.65	30.06	28.79	30.61	28.69
07.08.2007 11:33	29.12	28.52	30.01	28.70	30.61	28.31
07.08.2007 11:48	29.22	28.74	30.17	28.75	30.22	29.45
07.08.2007 12:03	29.30	28.87	30.19	28.81	30.22	29.83
07.08.2007 12:18	29.32	28.96	30.23	28.88	30.22	29.45
07.08.2007 12:33	29.44	29.03	30.48	28.99	30.22	29.83
07.08.2007 12:48	29.45	29.16	30.39	29.03	30.61	29.45
07.08.2007 13:03	29.44	29.05	30.25	29.02	30.22	29.45
07.08.2007 13:18	29.31	29.04	30.26	28.95	29.83	29.45
07.08.2007 13:33	29.34	29.01	30.23	29.01	30.22	29.83
07.08.2007 13:48	29.28	29.01	30.12	28.99	30.22	29.07
07.08.2007 14:03	29.24	29.02	30.07	28.98	30.22	29.45
07.08.2007 14:18	29.19	29.07	30.02	28.98	30.61	29.83
07.08.2007 14:33	29.16	28.99	30.10	28.98	30.22	29.45
07.08.2007 14:48	29.13	28.93	30.07	28.97	29.83	29.45
07.08.2007 15:03	29.10	28.86	30.03	28.93	29.45	29.07
07.08.2007 15:18	29.05	28.85	29.92	28.92	29.83	29.45
07.08.2007 15:33	29.02	28.86	29.89	28.94	29.83	29.45
07.08.2007 15:48	29.06	28.89	29.87	28.95	29.45	29.45
07.08.2007 16:03	29.12	28.87	29.92	28.96	29.83	28.69
07.08.2007 16:18	29.14	28.87	29.85	28.94	29.83	29.45
07.08.2007 16:33	29.02	28.72	30.35	28.92	29.07	29.07
07.08.2007 16:48	29.05	28.98	29.84	28.96	29.07	29.45
07.08.2007 17:03	28.99	28.79	29.92	28.95	29.07	29.83
07.08.2007 17:18	29.01	28.76	30.23	28.98	29.07	29.83
07.08.2007 17:33	28.96	28.61	29.61	28.94	29.07	29.07
07.08.2007 17:48	28.87	28.46	29.41	29.16	29.45	28.69
07.08.2007 18:03	28.69	28.21	28.90	28.59	29.07	27.94
07.08.2007 18:18	28.56	27.98	28.42	28.10	29.07	28.31
07.08.2007 18:33	28.45	27.78	28.05	27.79	28.31	27.94
07.08.2007 18:48	28.38	27.63	27.81	27.61	27.94	27.94
07.08.2007 19:03	28.32	27.55	27.71	27.50	28.31	27.58
07.08.2007 19:18	28.24	27.45	27.57	27.37	27.94	27.58
07.08.2007 19:33	28.20	27.41	27.43	27.25	27.58	27.21
07.08.2007 19:48	28.08	27.31	27.29	27.13	27.94	27.21
07.08.2007 20:03	28.05	27.26	27.14	27.05	28.31	26.85

Table B.01 continued

07.08.2007 20:18	28.00	27.18	27.05	26.96	27.94	26.85
07.08.2007 20:33	27.96	27.12	26.98	26.91	28.31	27.21
07.08.2007 20:48	27.98	27.07	26.92	26.87	28.31	27.21
07.08.2007 21:03	27.90	26.99	26.89	26.81	27.94	27.21
07.08.2007 21:18	27.92	26.92	26.81	26.76	28.31	27.21
07.08.2007 21:33	27.80	26.85	26.80	26.75	27.94	26.85
07.08.2007 21:48	27.80	26.82	26.72	26.69	27.94	26.85
07.08.2007 22:03	27.74	26.84	26.64	26.61	27.21	27.21
07.08.2007 22:18	27.73	26.83	26.60	26.57	27.94	26.49
07.08.2007 22:33	27.68	26.81	26.53	26.51	27.58	26.85
07.08.2007 22:48	27.60	26.80	26.42	26.44	27.21	26.14
07.08.2007 23:03	27.59	26.79	26.39	26.38	27.58	26.49
07.08.2007 23:18	27.60	26.69	26.32	26.31	27.21	26.14
07.08.2007 23:33	27.48	26.55	26.21	26.23	27.21	26.49
07.08.2007 23:48	27.51	26.60	26.17	26.16	27.21	26.14
08.08.2007 00:03	27.51	26.59	26.07	26.07	27.21	26.85
08.08.2007 00:18	27.48	26.61	26.02	26.02	27.58	26.49
08.08.2007 00:33	27.46	26.58	25.99	25.97	27.58	26.85
08.08.2007 00:48	27.45	26.51	25.95	25.95	27.21	25.78
08.08.2007 01:03	27.45	26.46	25.94	25.92	26.85	26.49
08.08.2007 01:18	27.42	26.45	25.89	25.91	27.21	25.78
08.08.2007 01:33	27.38	26.41	25.84	25.88	27.21	26.14
08.08.2007 01:48	27.35	26.35	25.80	25.82	26.49	25.78
08.08.2007 02:03	27.37	26.32	25.76	25.79	26.85	25.78
08.08.2007 02:18	27.38	26.28	25.71	25.75	26.49	26.14
08.08.2007 02:33	27.34	26.21	25.67	25.70	26.85	26.14
08.08.2007 02:48	27.33	26.21	25.67	25.66	26.85	25.43
08.08.2007 03:03	27.32	26.28	25.74	25.74	26.85	25.78
08.08.2007 03:18	27.26	26.29	25.77	25.79	26.49	25.43
08.08.2007 03:33	27.28	26.26	25.71	25.73	26.85	26.14
08.08.2007 03:48	27.21	26.16	25.59	25.69	26.49	25.78
08.08.2007 04:03	27.13	26.10	25.42	25.68	27.21	25.78
08.08.2007 04:18	27.05	26.03	25.27	25.72	26.85	25.78
08.08.2007 04:33	26.96	25.97	25.16	25.72	26.49	26.14
08.08.2007 04:48	26.95	25.93	25.15	25.69	26.49	25.78
08.08.2007 05:03	26.91	25.87	25.14	25.60	26.49	25.43
08.08.2007 05:18	26.94	25.97	25.28	25.60	26.14	26.14
08.08.2007 05:33	26.99	26.13	25.75	25.75	26.49	25.78
08.08.2007 05:48	27.12	26.32	26.29	25.90	26.85	25.78
08.08.2007 06:03	27.26	26.51	26.15	26.04	26.85	25.43
08.08.2007 06:18	27.49	26.68	26.52	26.18	27.21	25.78
08.08.2007 06:33	27.65	26.84	28.28	26.33	27.21	25.78
08.08.2007 06:48	27.82	27.05	27.88	26.52	27.94	26.14
08.08.2007 07:03	27.87	27.18	27.72	26.67	28.31	26.49
08.08.2007 07:18	27.85	27.25	27.38	26.76	28.31	26.49
08.08.2007 07:33	27.88	27.33	27.37	26.88	27.94	26.49
08.08.2007 07:48	27.94	27.43	27.42	26.98	27.94	26.49
08.08.2007 08:03	27.98	27.54	27.53	27.06	27.58	26.49
08.08.2007 08:18	28.06	27.66	27.65	27.20	27.94	27.21
08.08.2007 08:33	28.14	27.79	27.81	27.33	27.94	27.21
08.08.2007 08:48	28.16	27.84	27.89	27.46	28.31	26.85

Table B.01 continued

08.08.2007 09:03	28.15	27.87	27.95	27.55	27.94	27.21
08.08.2007 09:18	28.21	27.91	28.02	27.64	28.31	27.21
08.08.2007 09:33	28.31	28.04	28.51	27.69	29.07	27.58
08.08.2007 09:48	28.49	28.13	28.88	27.82	29.83	28.31
08.08.2007 10:03	28.49	28.16	29.09	27.88	29.83	27.94
08.08.2007 10:18	28.46	28.20	29.13	27.93	29.07	27.94
08.08.2007 10:33	28.52	28.31	29.20	28.03	29.45	28.31
08.08.2007 10:48	28.62	28.36	29.23	28.14	29.45	28.69
08.08.2007 11:03	28.61	28.35	29.25	28.17	29.83	28.69
08.08.2007 11:18	28.67	28.44	29.30	28.24	29.83	28.69
08.08.2007 11:33	28.67	28.42	29.31	28.27	29.45	29.07
08.08.2007 11:48	28.64	28.46	29.45	28.31	29.45	29.07
08.08.2007 12:03	28.75	28.67	29.62	28.40	29.07	29.07
08.08.2007 12:18	28.83	28.74	29.67	28.49	29.45	29.83
08.08.2007 12:33	28.83	28.69	29.75	28.51	29.45	29.83
08.08.2007 12:48	28.85	28.77	29.77	28.56	29.45	29.45
08.08.2007 13:03	28.79	28.72	29.99	28.58	29.83	29.83
08.08.2007 13:18	28.82	28.65	29.96	28.61	29.83	30.22
08.08.2007 13:33	28.93	28.91	30.10	28.70	29.83	29.83
08.08.2007 13:48	29.12	28.99	30.13	28.88	29.83	29.83
08.08.2007 14:03	29.04	28.90	30.17	28.88	29.83	29.83
08.08.2007 14:18	29.06	29.06	30.25	28.91	29.83	29.45
08.08.2007 14:33	29.07	28.90	30.31	28.96	29.83	29.83
08.08.2007 14:48	29.01	28.81	30.30	28.96	29.45	29.45
08.08.2007 15:03	29.00	28.70	30.26	28.92	29.45	29.45
08.08.2007 15:18	28.88	28.68	30.26	28.90	29.83	29.83
08.08.2007 15:33	28.86	28.69	30.24	28.93	29.45	29.83
08.08.2007 15:48	28.99	28.77	30.29	29.02	29.45	29.45
08.08.2007 16:03	28.99	28.80	30.38	29.07	29.45	29.83
08.08.2007 16:18	29.04	28.94	30.32	29.16	29.45	29.45
08.08.2007 16:33	29.00	28.92	30.77	29.18	29.45	30.22
08.08.2007 16:48	28.95	28.99	30.29	29.24	29.45	29.83
08.08.2007 17:03	28.89	28.91	30.51	29.19	29.45	30.22
08.08.2007 17:18	28.87	28.80	30.90	29.23	29.83	30.22
08.08.2007 17:33	28.88	28.78	30.91	29.26	29.45	29.83
08.08.2007 17:48	28.93	28.71	31.44	29.59	29.07	29.07
08.08.2007 18:03	28.87	28.53	30.84	29.64	28.69	28.31
08.08.2007 18:18	28.76	28.26	29.44	28.85	28.69	28.69
08.08.2007 18:33	28.66	28.10	28.90	28.54	28.69	28.69
08.08.2007 18:48	28.54	27.92	28.45	28.25	29.07	27.94
08.08.2007 19:03	28.46	27.78	28.13	27.99	28.31	27.94
08.08.2007 19:18	28.41	27.66	27.99	27.88	27.94	28.31
08.08.2007 19:33	28.42	27.59	27.85	27.77	29.07	28.31
08.08.2007 19:48	28.27	27.49	27.76	27.67	27.94	27.94
08.08.2007 20:03	28.26	27.45	27.71	27.60	27.94	27.94
08.08.2007 20:18	28.18	27.44	27.64	27.54	28.31	27.58
08.08.2007 20:33	28.11	27.37	27.57	27.45	28.31	27.58
08.08.2007 20:48	28.05	27.31	27.54	27.41	28.31	27.58
08.08.2007 21:03	28.00	27.27	27.42	27.34	28.31	27.21
08.08.2007 21:18	27.96	27.23	27.33	27.25	27.94	27.21
08.08.2007 21:33	27.90	27.15	27.26	27.19	27.94	27.21

Table B.01 continued

08.08.2007 21:48	27.84	27.08	27.21	27.11	28.31	27.21
08.08.2007 22:03	27.80	27.04	27.11	27.03	28.31	27.21
08.08.2007 22:18	27.76	27.03	27.06	26.96	28.31	26.85
08.08.2007 22:33	27.75	27.00	26.99	26.92	27.94	26.49
08.08.2007 22:48	27.71	26.89	26.94	26.87	27.21	27.21
08.08.2007 23:03	27.70	26.89	26.83	26.77	27.21	26.85
08.08.2007 23:18	27.66	26.85	26.73	26.67	27.94	26.49
08.08.2007 23:33	27.63	26.77	26.62	26.58	27.21	26.49
08.08.2007 23:48	27.58	26.73	26.55	26.53	26.85	26.85
09.08.2007 00:03	27.58	26.69	26.55	26.49	27.58	26.49
09.08.2007 00:18	27.62	26.65	26.44	26.43	27.58	26.85
09.08.2007 00:33	27.58	26.58	26.32	26.51	27.58	26.49
09.08.2007 00:48	27.54	26.53	26.08	26.58	27.21	26.85
09.08.2007 01:03	27.42	26.50	26.11	26.61	26.85	26.49
09.08.2007 01:18	27.21	26.47	26.25	26.58	26.85	26.14
09.08.2007 01:33	27.04	26.62	26.05	26.60	26.49	25.43
09.08.2007 01:48	26.84	26.70	25.63	26.48	25.78	25.78
09.08.2007 02:03	26.73	26.62	25.42	26.39	26.14	25.43
09.08.2007 02:18	26.58	26.59	25.24	26.28	25.09	25.78
09.08.2007 02:33	26.56	26.56	25.31	26.26	25.78	25.43
09.08.2007 02:48	26.55	26.55	25.39	26.25	25.43	25.43
09.08.2007 03:03	26.43	26.31	25.48	26.24	26.14	24.74
09.08.2007 03:18	26.41	26.30	25.45	26.22	25.78	24.74
09.08.2007 03:33	26.34	26.33	25.42	26.18	25.43	24.74
09.08.2007 03:48	26.31	26.34	25.31	26.14	25.43	24.40
09.08.2007 04:03	26.23	26.39	25.15	26.03	25.09	24.40
09.08.2007 04:18	26.12	26.16	25.13	26.00	25.43	24.40
09.08.2007 04:33	26.07	26.24	24.89	25.90	25.43	24.40
09.08.2007 04:48	26.00	26.30	24.74	25.78	25.09	24.06
09.08.2007 05:03	25.99	26.33	24.64	25.71	25.09	24.06
09.08.2007 05:18	26.00	26.39	24.61	25.65	24.74	24.40
09.08.2007 05:33	26.11	26.49	25.37	25.70	24.74	24.40
09.08.2007 05:48	26.25	26.58	26.24	25.81	25.09	24.40
09.08.2007 06:03	26.48	26.69	25.69	25.95	25.43	24.74
09.08.2007 06:18	26.77	26.83	26.06	26.11	26.14	25.09
09.08.2007 06:33	26.93	26.97	28.14	26.28	26.49	25.09
09.08.2007 06:48	27.17	27.16	28.03	26.44	27.21	25.43
09.08.2007 07:03	27.42	27.30	28.91	26.58	26.85	25.78
09.08.2007 07:18	27.58	27.33	28.53	26.69	27.58	25.78
09.08.2007 07:33	27.56	27.29	27.94	26.75	27.58	26.14
09.08.2007 07:48	27.59	27.33	27.67	26.80	27.58	26.14
09.08.2007 08:03	27.72	27.42	27.59	26.96	27.94	26.85
09.08.2007 08:18	27.70	27.42	27.54	27.01	28.31	26.49
09.08.2007 08:33	27.70	27.42	27.58	27.08	27.94	26.85
09.08.2007 08:48	27.73	27.51	27.65	27.15	27.94	26.85
09.08.2007 09:03	27.83	27.58	27.74	27.27	27.94	27.21
09.08.2007 09:18	27.93	27.64	27.80	27.40	28.31	27.21
09.08.2007 09:33	28.00	27.78	27.89	27.49	27.58	27.58
09.08.2007 09:48	27.99	27.78	27.94	27.55	27.94	27.21
09.08.2007 10:03	28.09	27.89	28.03	27.68	27.94	27.94
09.08.2007 10:18	28.25	28.08	28.17	27.86	28.31	28.31

Table B.01 continued

09.08.2007 10:33	28.32	28.15	28.28	27.99	28.69	27.94
09.08.2007 10:48	28.35	28.21	28.35	28.05	28.31	28.31
09.08.2007 11:03	28.31	28.17	28.39	28.08	27.94	29.07
09.08.2007 11:18	28.31	28.18	28.44	28.08	28.69	29.07
09.08.2007 11:33	28.36	28.25	28.51	28.16	28.31	29.45
09.08.2007 11:48	28.48	28.31	28.62	28.27	28.31	29.83
09.08.2007 12:03	28.53	28.42	28.74	28.40	27.94	29.45

Table B.02 Humidity measurements at 15 minute intervals, 5-9 August 2007, (% RH)

Date	Indoor 1	Indoor 2	Indoor 3	Indoor 4	Indoor 5	Outdoor
05.08.2007 09:03	67.02	69.08	65.05	68.90	68.59	82.75
05.08.2007 09:18	66.76	68.82	65.05	68.90	68.09	80.00
05.08.2007 09:33	66.76	68.82	65.05	68.65	68.09	78.90
05.08.2007 09:48	67.02	68.82	64.80	68.65	68.09	81.09
05.08.2007 10:03	66.76	69.08	64.55	68.40	67.59	81.09
05.08.2007 10:18	66.76	68.82	64.55	68.40	67.59	78.36
05.08.2007 10:33	66.76	68.82	64.55	68.40	67.10	78.36
05.08.2007 10:48	66.25	69.08	64.30	68.65	66.11	78.90
05.08.2007 11:03	65.48	69.33	61.30	67.91	63.17	78.36
05.08.2007 11:18	64.71	68.82	59.80	67.66	61.71	77.27
05.08.2007 11:33	65.74	68.32	58.55	67.16	60.75	77.27
05.08.2007 11:48	65.74	68.57	58.55	66.91	60.27	77.27
05.08.2007 12:03	64.97	68.07	57.55	66.66	60.27	76.19
05.08.2007 12:18	64.71	68.32	56.83	66.66	59.79	74.59
05.08.2007 12:33	64.46	67.81	56.83	66.41	59.79	72.99
05.08.2007 12:48	64.46	67.56	56.59	66.16	59.79	71.93
05.08.2007 13:03	63.95	66.80	56.35	66.16	59.79	70.87
05.08.2007 13:18	63.44	65.79	55.87	65.41	59.31	69.30
05.08.2007 13:33	62.93	65.04	55.63	65.16	59.31	68.26
05.08.2007 13:48	62.67	64.78	54.91	64.42	59.79	69.30
05.08.2007 14:03	62.41	64.03	54.43	63.67	59.79	68.26
05.08.2007 14:18	62.41	63.77	53.71	63.17	59.79	70.35
05.08.2007 14:33	62.41	63.77	53.23	62.42	60.27	69.30
05.08.2007 14:48	62.67	63.27	52.99	62.42	60.27	69.83
05.08.2007 15:03	62.67	63.27	52.75	61.67	60.27	72.46
05.08.2007 15:18	62.93	63.01	52.75	61.17	60.75	70.87
05.08.2007 15:33	62.93	62.51	52.75	60.92	60.75	70.87
05.08.2007 15:48	62.67	61.75	52.75	60.43	60.75	70.35
05.08.2007 16:03	62.67	61.25	52.51	59.93	60.75	69.30
05.08.2007 16:18	62.67	60.74	52.03	59.68	60.75	70.87
05.08.2007 16:33	62.67	59.98	51.79	59.18	61.23	70.87
05.08.2007 16:48	62.67	56.25	52.51	58.43	61.71	71.93
05.08.2007 17:03	62.67	54.07	52.51	58.18	61.71	70.87
05.08.2007 17:18	62.67	56.01	52.27	57.93	62.20	71.93
05.08.2007 17:33	62.67	57.96	52.27	58.18	62.20	74.59
05.08.2007 17:48	62.93	59.98	52.75	58.18	62.20	75.66
05.08.2007 18:03	63.18	61.25	53.47	58.93	62.68	75.66
05.08.2007 18:18	63.44	62.26	54.67	59.93	63.17	76.19
05.08.2007 18:33	63.44	63.27	56.59	60.68	63.17	76.19
05.08.2007 18:48	63.44	63.77	57.55	61.92	63.65	75.66
05.08.2007 19:03	62.93	64.03	58.30	62.67	63.65	74.05
05.08.2007 19:18	62.93	64.78	58.80	63.42	64.14	75.12
05.08.2007 19:33	62.93	65.29	59.55	63.67	64.14	75.66
05.08.2007 19:48	63.44	65.29	59.80	63.92	64.63	74.59
05.08.2007 20:03	63.18	66.05	59.55	63.92	64.14	73.52
05.08.2007 20:18	63.18	66.55	57.55	64.17	64.14	73.52
05.08.2007 20:33	63.44	66.55	59.30	64.17	64.14	74.05
05.08.2007 20:48	63.95	66.05	60.80	65.16	64.63	74.59
05.08.2007 21:03	64.20	66.30	61.55	65.16	65.12	75.66

Table B.02 continued

05.08.2007 21:18	64.20	66.30	62.05	65.16	65.12	76.19
05.08.2007 21:33	63.44	66.05	62.30	65.16	65.61	73.52
05.08.2007 21:48	62.93	65.79	61.55	65.16	65.61	73.52
05.08.2007 22:03	63.44	66.05	61.55	65.16	65.61	73.52
05.08.2007 22:18	63.95	65.79	61.80	65.41	65.61	74.59
05.08.2007 22:33	63.95	66.30	61.80	65.41	65.61	75.12
05.08.2007 22:48	63.69	66.55	61.55	65.41	65.61	75.66
05.08.2007 23:03	64.20	66.55	61.80	65.41	65.61	74.59
05.08.2007 23:18	63.95	66.55	61.80	65.41	65.61	75.12
05.08.2007 23:33	63.95	66.55	62.05	65.66	66.11	74.05
05.08.2007 23:48	63.95	66.55	62.30	65.66	66.11	73.52
06.08.2007 00:03	63.69	66.30	62.05	65.66	66.11	74.05
06.08.2007 00:18	63.44	66.30	61.80	65.91	66.11	75.66
06.08.2007 00:33	63.69	66.30	62.30	65.66	66.11	74.59
06.08.2007 00:48	63.44	66.30	62.55	65.66	66.11	74.59
06.08.2007 01:03	63.95	66.30	62.80	65.91	66.60	76.19
06.08.2007 01:18	63.95	66.30	62.55	65.91	66.60	76.73
06.08.2007 01:33	63.69	66.30	62.55	65.91	66.60	76.73
06.08.2007 01:48	63.18	66.30	62.30	65.91	66.60	78.36
06.08.2007 02:03	63.69	66.30	62.55	65.91	66.60	80.54
06.08.2007 02:18	63.69	66.30	62.55	66.16	66.60	79.45
06.08.2007 02:33	63.69	66.30	62.30	65.91	66.60	80.54
06.08.2007 02:48	64.20	66.55	62.80	66.16	67.10	80.54
06.08.2007 03:03	64.20	66.30	63.05	66.41	67.10	80.54
06.08.2007 03:18	64.20	66.55	63.05	66.41	67.10	80.00
06.08.2007 03:33	63.95	66.30	63.30	66.66	67.10	78.36
06.08.2007 03:48	63.95	66.05	63.30	66.41	67.59	77.27
06.08.2007 04:03	63.95	66.05	63.30	66.66	67.59	77.27
06.08.2007 04:18	63.69	66.05	63.55	66.66	67.59	78.36
06.08.2007 04:33	63.95	66.05	63.55	66.91	67.59	80.00
06.08.2007 04:48	63.95	65.79	63.80	66.91	67.59	81.64
06.08.2007 05:03	63.95	66.05	63.80	67.16	67.59	81.64
06.08.2007 05:18	63.95	66.05	63.30	66.91	67.59	81.64
06.08.2007 05:33	63.95	66.05	63.55	66.91	67.59	82.75
06.08.2007 05:48	63.95	66.05	63.55	66.91	67.10	83.86
06.08.2007 06:03	62.41	65.54	62.30	66.66	65.61	86.10
06.08.2007 06:18	60.37	65.29	60.55	66.41	63.65	84.98
06.08.2007 06:33	58.58	65.29	57.55	66.41	61.71	85.54
06.08.2007 06:48	57.07	64.28	55.87	66.16	60.27	81.64
06.08.2007 07:03	56.83	64.03	53.23	66.16	58.83	81.64
06.08.2007 07:18	57.07	63.52	53.71	65.91	58.36	82.20
06.08.2007 07:33	57.07	63.27	53.71	66.16	57.41	81.09
06.08.2007 07:48	57.07	63.01	54.91	65.91	57.41	80.00
06.08.2007 08:03	58.32	62.76	55.63	65.66	57.88	80.54
06.08.2007 08:18	57.32	62.26	54.19	65.66	56.94	78.36
06.08.2007 08:33	56.58	62.00	53.47	65.41	55.99	77.27
06.08.2007 08:48	57.32	62.26	54.43	65.41	56.46	76.73
06.08.2007 09:03	57.56	62.26	54.19	65.41	55.99	75.12
06.08.2007 09:18	57.32	62.26	54.19	65.41	55.99	73.52
06.08.2007 09:33	57.32	61.75	53.71	65.16	55.52	72.99
06.08.2007 09:48	57.32	61.75	54.19	65.16	55.52	72.99

Table B.02 continued

06.08.2007 10:03	57.32	61.75	53.95	64.91	55.52	70.87
06.08.2007 10:18	57.32	61.50	54.19	64.66	55.99	70.87
06.08.2007 10:33	57.07	61.25	53.47	64.42	55.52	68.26
06.08.2007 10:48	57.56	60.99	54.19	64.17	56.46	69.83
06.08.2007 11:03	57.32	60.74	53.71	64.17	56.46	67.22
06.08.2007 11:18	57.32	60.74	53.71	63.92	55.99	67.22
06.08.2007 11:33	57.32	60.49	53.47	63.42	56.46	66.19
06.08.2007 11:48	57.32	60.74	53.23	63.42	56.46	65.68
06.08.2007 12:03	57.32	59.98	52.99	63.17	56.46	64.14
06.08.2007 12:18	56.58	60.49	52.75	62.92	56.46	62.11
06.08.2007 12:33	57.07	59.73	52.51	62.92	55.99	62.11
06.08.2007 12:48	56.83	59.98	52.27	62.42	55.99	62.62
06.08.2007 13:03	56.34	59.48	52.03	61.92	55.99	62.62
06.08.2007 13:18	57.07	59.23	52.03	61.92	56.46	62.11
06.08.2007 13:33	57.07	58.72	51.55	61.17	55.99	62.62
06.08.2007 13:48	56.83	58.72	51.55	60.68	55.99	63.63
06.08.2007 14:03	57.32	58.72	51.31	60.18	56.46	63.63
06.08.2007 14:18	57.32	58.97	50.83	59.68	56.46	63.13
06.08.2007 14:33	57.56	58.47	50.59	59.18	56.46	65.17
06.08.2007 14:48	57.81	58.47	50.11	58.93	56.94	64.65
06.08.2007 15:03	57.81	58.22	49.87	58.43	56.94	64.65
06.08.2007 15:18	57.56	57.22	49.39	58.18	56.94	62.62
06.08.2007 15:33	57.32	56.49	48.67	57.45	56.94	61.10
06.08.2007 15:48	56.83	54.80	48.67	56.73	56.94	59.60
06.08.2007 16:03	55.85	53.34	47.47	55.29	56.46	58.11
06.08.2007 16:18	55.36	52.38	46.27	54.81	56.46	58.11
06.08.2007 16:33	54.87	51.89	46.03	54.33	56.46	58.60
06.08.2007 16:48	54.63	50.92	46.51	53.37	56.46	56.62
06.08.2007 17:03	54.38	49.47	45.31	52.41	55.99	54.66
06.08.2007 17:18	53.65	48.99	44.63	51.45	55.99	55.15
06.08.2007 17:33	52.67	49.23	43.71	51.21	55.52	56.13
06.08.2007 17:48	52.67	49.47	44.17	49.05	55.52	54.66
06.08.2007 18:03	52.18	49.95	44.17	50.49	55.52	53.20
06.08.2007 18:18	51.94	51.16	45.79	51.45	55.99	57.12
06.08.2007 18:33	52.67	52.38	47.47	52.89	56.46	60.10
06.08.2007 18:48	53.65	53.83	49.15	54.57	56.46	64.65
06.08.2007 19:03	54.63	55.52	50.59	55.53	56.94	65.68
06.08.2007 19:18	55.60	56.49	51.55	56.49	57.41	65.68
06.08.2007 19:33	55.85	56.73	52.51	56.97	57.88	64.65
06.08.2007 19:48	55.60	57.46	52.99	57.45	58.36	63.63
06.08.2007 20:03	55.36	57.22	52.75	57.69	58.36	63.63
06.08.2007 20:18	55.60	57.71	53.47	57.93	58.83	64.14
06.08.2007 20:33	55.60	57.96	53.23	58.18	58.83	65.68
06.08.2007 20:48	55.85	58.47	53.23	58.43	58.83	66.71
06.08.2007 21:03	56.58	58.97	53.47	57.21	58.36	66.71
06.08.2007 21:18	56.34	58.72	53.71	58.43	58.83	65.17
06.08.2007 21:33	56.34	58.97	53.71	58.68	59.31	64.14
06.08.2007 21:48	56.09	58.72	53.23	58.68	59.31	63.13
06.08.2007 22:03	55.85	58.22	53.47	58.68	59.31	63.63
06.08.2007 22:18	56.09	58.72	53.71	58.68	59.31	65.17
06.08.2007 22:33	56.58	59.23	54.67	58.93	59.79	66.71

Table B.02 continued

06.08.2007 22:48	56.58	59.48	54.43	58.93	59.31	67.74
06.08.2007 23:03	56.83	59.73	54.91	59.18	59.79	68.26
06.08.2007 23:18	57.07	59.73	55.15	59.43	59.79	68.26
06.08.2007 23:33	57.32	59.73	55.63	59.68	60.27	68.26
06.08.2007 23:48	57.56	59.73	55.63	59.68	60.27	68.78
07.08.2007 00:03	57.81	59.73	55.87	59.68	60.27	67.22
07.08.2007 00:18	57.81	59.73	55.87	59.93	60.75	67.22
07.08.2007 00:33	57.56	59.48	56.11	59.93	60.75	67.22
07.08.2007 00:48	57.56	59.48	56.11	59.93	60.75	65.68
07.08.2007 01:03	57.32	58.97	55.87	59.93	60.75	66.19
07.08.2007 01:18	57.32	58.97	56.35	60.18	61.23	67.22
07.08.2007 01:33	57.56	58.97	56.35	60.18	61.23	67.74
07.08.2007 01:48	57.56	59.48	56.59	60.18	61.23	69.30
07.08.2007 02:03	57.81	59.48	56.83	60.18	61.23	68.26
07.08.2007 02:18	58.07	59.23	56.83	60.18	61.23	69.30
07.08.2007 02:33	58.07	59.23	56.83	60.43	61.23	69.83
07.08.2007 02:48	58.07	59.23	57.07	60.43	61.23	70.87
07.08.2007 03:03	58.32	59.48	57.31	60.68	61.71	70.87
07.08.2007 03:18	58.32	59.73	57.55	60.68	61.71	70.87
07.08.2007 03:33	58.58	59.73	57.80	60.68	61.71	70.87
07.08.2007 03:48	58.84	59.73	57.80	61.17	62.20	70.87
07.08.2007 04:03	58.84	59.98	58.30	61.17	62.20	70.35
07.08.2007 04:18	59.09	59.98	58.55	61.42	62.20	70.87
07.08.2007 04:33	59.09	59.98	58.80	61.42	62.20	69.83
07.08.2007 04:48	59.09	59.98	59.05	61.42	62.68	71.40
07.08.2007 05:03	59.09	59.98	59.30	61.67	62.68	69.83
07.08.2007 05:18	58.84	59.48	59.05	61.42	62.68	67.74
07.08.2007 05:33	56.83	59.48	58.05	61.42	61.71	68.26
07.08.2007 05:48	56.09	58.97	57.07	61.17	60.27	68.26
07.08.2007 06:03	52.42	58.72	55.63	61.17	58.83	68.26
07.08.2007 06:18	51.20	57.71	53.71	60.92	57.41	68.26
07.08.2007 06:33	49.98	57.71	49.63	60.68	56.46	66.71
07.08.2007 06:48	48.76	57.22	49.15	60.43	54.59	65.68
07.08.2007 07:03	48.76	56.73	45.79	60.43	54.12	66.71
07.08.2007 07:18	49.00	56.49	45.31	60.18	53.19	64.65
07.08.2007 07:33	49.49	55.77	46.51	59.93	52.26	64.65
07.08.2007 07:48	49.73	56.01	46.51	59.93	51.80	63.13
07.08.2007 08:03	49.98	55.52	46.75	59.93	50.88	60.10
07.08.2007 08:18	49.73	55.52	46.51	59.68	49.97	61.10
07.08.2007 08:33	49.73	55.52	46.27	59.43	49.51	62.62
07.08.2007 08:48	49.98	55.77	46.03	59.18	49.06	64.65
07.08.2007 09:03	49.98	56.49	46.27	59.18	49.06	64.14
07.08.2007 09:18	49.25	55.52	46.75	58.93	49.06	62.62
07.08.2007 09:33	53.16	57.22	49.15	55.77	49.51	63.13
07.08.2007 09:48	55.36	57.96	52.51	57.69	54.12	62.62
07.08.2007 10:03	56.09	56.25	52.27	57.93	53.19	61.10
07.08.2007 10:18	53.89	57.96	51.79	56.49	52.26	61.10
07.08.2007 10:33	54.63	56.98	52.99	56.97	54.12	60.10
07.08.2007 10:48	55.85	58.47	51.79	57.45	52.26	62.11
07.08.2007 11:03	55.36	56.49	53.71	56.97	53.65	60.60
07.08.2007 11:18	57.07	59.73	53.23	58.93	54.12	62.62

Table B.02 continued

07.08.2007 11:33	56.09	57.71	53.23	57.93	54.12	60.10
07.08.2007 11:48	54.87	54.55	51.55	56.97	53.19	56.62
07.08.2007 12:03	51.94	54.55	50.83	54.33	50.43	54.66
07.08.2007 12:18	51.94	53.59	49.87	53.61	49.97	56.13
07.08.2007 12:33	51.69	51.89	49.63	53.85	51.34	53.69
07.08.2007 12:48	52.67	53.59	49.63	54.09	50.88	54.66
07.08.2007 13:03	52.67	55.04	50.83	53.61	50.43	56.13
07.08.2007 13:18	54.14	55.77	51.55	55.29	52.73	57.12
07.08.2007 13:33	56.09	56.25	52.51	57.21	54.12	56.13
07.08.2007 13:48	54.63	55.52	52.27	56.01	53.19	56.62
07.08.2007 14:03	51.94	53.10	50.35	54.33	51.80	54.66
07.08.2007 14:18	53.65	54.31	51.07	55.29	53.19	56.13
07.08.2007 14:33	55.36	54.80	51.07	56.01	54.12	55.64
07.08.2007 14:48	52.42	54.80	50.35	53.37	51.80	56.13
07.08.2007 15:03	50.96	52.13	48.91	52.17	50.88	53.20
07.08.2007 15:18	51.94	54.31	50.11	52.65	52.26	55.64
07.08.2007 15:33	55.11	52.62	50.35	56.01	54.12	54.18
07.08.2007 15:48	52.67	52.62	50.35	54.09	52.73	53.69
07.08.2007 16:03	48.51	50.92	46.51	49.77	49.51	51.27
07.08.2007 16:18	52.18	52.62	49.39	53.37	52.26	55.15
07.08.2007 16:33	55.85	56.73	53.47	56.97	56.46	58.60
07.08.2007 16:48	55.11	56.25	52.51	56.01	55.05	56.62
07.08.2007 17:03	53.16	55.28	48.67	53.85	53.19	56.13
07.08.2007 17:18	53.89	54.55	50.59	54.81	53.65	56.13
07.08.2007 17:33	55.11	56.49	53.23	55.29	55.05	57.61
07.08.2007 17:48	55.85	57.22	53.47	56.25	55.99	59.10
07.08.2007 18:03	57.32	60.49	56.83	58.43	56.94	61.61
07.08.2007 18:18	57.81	59.23	57.07	59.43	57.41	61.10
07.08.2007 18:33	57.56	60.24	58.55	60.18	57.88	62.11
07.08.2007 18:48	57.32	59.73	58.30	60.18	57.41	62.11
07.08.2007 19:03	58.84	60.99	60.05	61.92	59.31	63.13
07.08.2007 19:18	57.32	59.98	58.80	60.43	57.88	62.11
07.08.2007 19:33	56.58	59.23	58.30	60.18	57.41	61.61
07.08.2007 19:48	55.36	58.22	57.80	58.93	56.46	61.10
07.08.2007 20:03	54.87	57.22	56.83	58.43	55.99	60.10
07.08.2007 20:18	54.87	57.71	57.55	58.68	55.52	60.60
07.08.2007 20:33	54.87	57.71	57.80	58.93	55.99	60.60
07.08.2007 20:48	54.87	57.71	57.55	58.93	55.99	60.10
07.08.2007 21:03	54.87	58.22	57.55	58.68	55.52	61.10
07.08.2007 21:18	55.60	58.97	58.55	59.68	56.46	61.61
07.08.2007 21:33	56.34	59.73	59.30	59.93	56.94	62.11
07.08.2007 21:48	57.56	62.26	61.80	62.42	58.83	63.63
07.08.2007 22:03	58.58	61.75	61.55	62.67	59.31	64.14
07.08.2007 22:18	57.56	60.99	61.05	61.92	58.83	63.63
07.08.2007 22:33	57.81	60.99	61.30	62.42	58.83	64.14
07.08.2007 22:48	58.07	61.50	62.05	62.92	59.31	64.65
07.08.2007 23:03	58.32	61.25	62.05	62.92	59.79	64.65
07.08.2007 23:18	57.81	60.99	61.30	62.17	58.83	63.63
07.08.2007 23:33	56.83	59.98	60.30	61.42	58.36	62.62
07.08.2007 23:48	55.60	58.72	59.30	60.43	57.41	61.61
08.08.2007 00:03	54.87	57.71	58.80	59.93	56.46	61.10

Table B.02 continued

08.08.2007 00:18	54.63	57.71	59.05	59.68	56.94	61.10
08.08.2007 00:33	55.60	59.48	60.55	61.42	57.88	63.13
08.08.2007 00:48	56.34	59.98	61.05	61.92	58.36	63.63
08.08.2007 01:03	56.34	60.99	62.05	62.42	58.83	64.14
08.08.2007 01:18	57.81	61.75	62.80	63.92	60.27	64.65
08.08.2007 01:33	56.83	60.24	61.30	62.17	58.83	63.63
08.08.2007 01:48	55.11	57.46	58.80	60.18	57.41	61.61
08.08.2007 02:03	53.89	57.46	58.80	59.43	56.46	61.61
08.08.2007 02:18	53.89	57.96	59.05	59.93	56.46	62.11
08.08.2007 02:33	54.38	58.47	59.55	60.43	56.94	62.11
08.08.2007 02:48	54.87	59.23	60.30	60.92	57.41	62.62
08.08.2007 03:03	56.34	60.99	62.30	62.67	58.83	64.65
08.08.2007 03:18	57.81	62.26	63.30	63.67	60.27	65.68
08.08.2007 03:33	58.07	62.51	63.55	63.92	60.75	65.68
08.08.2007 03:48	57.32	60.74	62.30	62.92	59.79	64.65
08.08.2007 04:03	56.58	60.49	62.30	62.17	58.83	64.14
08.08.2007 04:18	56.58	60.99	63.30	61.92	58.83	64.14
08.08.2007 04:33	57.32	61.25	63.55	62.17	59.79	64.65
08.08.2007 04:48	56.58	59.98	62.05	61.17	58.83	63.13
08.08.2007 05:03	56.34	59.73	61.55	61.42	58.83	63.13
08.08.2007 05:18	54.63	58.72	60.30	60.43	57.88	62.62
08.08.2007 05:33	54.63	57.46	57.80	59.18	56.46	61.61
08.08.2007 05:48	52.91	56.01	54.67	57.45	55.05	60.60
08.08.2007 06:03	51.94	54.31	54.91	56.49	53.65	59.60
08.08.2007 06:18	51.94	54.55	54.19	56.73	53.19	60.60
08.08.2007 06:33	51.45	54.31	46.51	56.25	52.26	60.10
08.08.2007 06:48	50.71	53.10	50.11	56.01	52.26	59.10
08.08.2007 07:03	53.40	56.98	53.23	57.45	54.59	63.63
08.08.2007 07:18	50.96	52.62	51.31	55.05	52.26	58.60
08.08.2007 07:33	51.20	54.31	52.99	55.05	51.80	60.10
08.08.2007 07:48	50.96	52.86	52.51	54.81	51.80	58.60
08.08.2007 08:03	50.47	52.38	51.55	54.09	51.34	58.11
08.08.2007 08:18	51.45	53.83	53.47	55.05	51.80	58.60
08.08.2007 08:33	51.45	53.59	52.03	54.81	51.80	59.60
08.08.2007 08:48	52.67	55.52	53.95	55.77	53.19	60.60
08.08.2007 09:03	56.09	55.77	55.39	57.69	55.52	60.60
08.08.2007 09:18	56.83	56.73	55.87	58.43	55.52	62.11
08.08.2007 09:33	57.07	58.22	56.59	59.43	56.46	62.11
08.08.2007 09:48	57.32	59.23	55.63	59.68	55.05	62.62
08.08.2007 10:03	57.32	58.47	54.67	59.68	54.59	62.62
08.08.2007 10:18	58.07	59.73	56.83	60.18	56.46	63.13
08.08.2007 10:33	57.81	59.48	55.87	60.18	56.46	63.13
08.08.2007 10:48	57.32	58.72	55.39	59.93	55.52	61.61
08.08.2007 11:03	58.32	59.48	55.87	59.93	55.99	61.61
08.08.2007 11:18	58.58	58.72	55.87	61.17	56.94	60.60
08.08.2007 11:33	59.35	60.74	55.39	59.93	55.05	60.60
08.08.2007 11:48	59.60	61.75	56.83	60.92	56.94	61.10
08.08.2007 12:03	60.11	59.98	56.83	61.67	58.36	60.10
08.08.2007 12:18	58.84	59.98	56.35	60.92	56.94	60.10
08.08.2007 12:33	59.86	59.73	56.83	62.17	58.83	59.10
08.08.2007 12:48	58.84	58.72	54.91	59.93	56.46	59.60

Table B.02 continued

08.08.2007 13:03	59.35	60.99	55.63	60.68	57.41	59.10
08.08.2007 13:18	59.35	60.99	55.39	59.43	56.46	60.10
08.08.2007 13:33	58.07	60.49	56.11	60.18	58.36	60.10
08.08.2007 13:48	59.09	58.47	54.43	59.18	56.46	58.60
08.08.2007 14:03	59.09	57.46	54.43	60.18	57.88	58.11
08.08.2007 14:18	55.60	56.01	52.27	56.97	54.59	56.13
08.08.2007 14:33	58.07	57.71	54.19	59.18	57.41	57.12
08.08.2007 14:48	61.65	60.24	55.63	61.92	59.79	60.10
08.08.2007 15:03	61.65	63.52	58.30	62.42	61.23	63.63
08.08.2007 15:18	63.18	64.03	58.80	64.66	62.68	63.13
08.08.2007 15:33	63.18	64.28	58.30	63.92	62.68	64.14
08.08.2007 15:48	63.95	65.79	59.05	64.66	64.14	65.17
08.08.2007 16:03	65.23	65.54	60.80	65.91	65.61	65.17
08.08.2007 16:18	66.76	65.79	61.30	66.41	65.61	66.19
08.08.2007 16:33	64.97	65.79	59.80	65.41	64.14	66.19
08.08.2007 16:48	65.23	66.05	60.80	65.16	64.63	67.22
08.08.2007 17:03	65.99	65.29	58.30	65.41	65.12	65.17
08.08.2007 17:18	65.74	66.55	59.55	65.16	65.12	66.19
08.08.2007 17:33	63.44	64.53	54.91	62.17	62.68	65.68
08.08.2007 17:48	64.46	65.04	55.87	62.67	64.14	66.71
08.08.2007 18:03	64.71	67.06	58.55	62.67	64.63	68.26
08.08.2007 18:18	65.99	68.32	64.30	66.41	65.61	69.83
08.08.2007 18:33	65.74	67.81	64.05	66.66	65.61	68.78
08.08.2007 18:48	64.71	67.06	64.55	66.16	64.63	68.26
08.08.2007 19:03	63.18	65.79	63.30	64.91	63.17	67.22
08.08.2007 19:18	62.93	66.30	64.55	65.41	63.65	67.74
08.08.2007 19:33	63.69	67.81	65.55	66.66	64.63	68.78
08.08.2007 19:48	64.46	67.81	66.05	67.16	64.63	69.30
08.08.2007 20:03	64.20	68.07	66.05	66.91	64.63	70.35
08.08.2007 20:18	65.23	68.57	67.55	68.15	66.11	70.87
08.08.2007 20:33	65.99	69.58	68.30	69.15	66.60	72.46
08.08.2007 20:48	66.25	69.83	68.30	69.15	67.10	72.99
08.08.2007 21:03	66.50	69.83	68.55	69.65	67.10	72.99
08.08.2007 21:18	66.25	69.58	68.55	69.40	67.10	72.99
08.08.2007 21:33	66.25	69.58	68.55	69.65	67.10	72.99
08.08.2007 21:48	65.99	69.33	68.30	69.15	66.60	72.46
08.08.2007 22:03	65.74	68.57	67.55	68.65	66.11	71.40
08.08.2007 22:18	64.97	68.07	67.05	68.40	65.61	70.87
08.08.2007 22:33	64.97	68.57	67.30	68.65	65.61	71.40
08.08.2007 22:48	64.97	68.57	67.80	68.65	66.11	70.87
08.08.2007 23:03	64.46	67.81	67.05	68.40	65.61	70.87
08.08.2007 23:18	64.46	67.81	67.55	68.65	65.61	70.87
08.08.2007 23:33	64.20	68.32	67.55	68.65	65.61	70.87
08.08.2007 23:48	63.95	67.56	67.30	68.15	65.12	70.87
09.08.2007 00:03	63.44	67.06	66.55	67.91	64.63	69.83
09.08.2007 00:18	62.41	66.30	66.30	67.41	64.14	68.26
09.08.2007 00:33	61.90	66.05	66.30	66.91	63.65	68.26
09.08.2007 00:48	60.63	64.78	65.05	65.66	62.68	66.71
09.08.2007 01:03	60.11	63.77	64.30	64.17	62.20	67.22
09.08.2007 01:18	59.86	63.27	63.05	64.17	61.23	66.71
09.08.2007 01:33	58.84	61.25	62.05	62.42	61.71	65.68

Table B.02 continued

09.08.2007 01:48	57.56	58.97	61.55	61.17	61.23	64.65
09.08.2007 02:03	56.83	57.46	60.80	60.18	60.75	63.63
09.08.2007 02:18	54.14	54.55	57.07	57.93	57.41	60.60
09.08.2007 02:33	52.42	52.86	54.67	56.97	55.52	60.60
09.08.2007 02:48	49.98	50.92	53.23	56.01	53.65	58.11
09.08.2007 03:03	49.00	50.20	51.31	55.05	52.26	56.62
09.08.2007 03:18	49.98	51.16	53.47	54.33	52.73	58.60
09.08.2007 03:33	51.20	51.89	54.67	54.81	54.59	59.60
09.08.2007 03:48	51.20	51.89	54.67	54.81	54.59	60.10
09.08.2007 04:03	51.94	51.89	55.15	54.81	55.52	60.60
09.08.2007 04:18	52.91	53.34	56.11	55.53	56.46	61.61
09.08.2007 04:33	52.91	52.86	56.35	55.05	56.94	60.60
09.08.2007 04:48	53.16	52.86	57.07	55.77	56.94	61.10
09.08.2007 05:03	53.16	52.62	57.31	55.53	57.41	61.10
09.08.2007 05:18	52.91	52.38	57.55	55.53	57.41	61.10
09.08.2007 05:33	53.16	52.38	54.67	55.53	57.41	61.61
09.08.2007 05:48	53.89	53.59	51.31	56.01	58.36	63.13
09.08.2007 06:03	55.11	55.28	57.80	56.97	58.83	65.17
09.08.2007 06:18	55.11	55.04	56.83	57.45	57.88	64.65
09.08.2007 06:33	54.87	55.28	50.11	57.45	57.41	65.68
09.08.2007 06:48	55.60	55.52	49.87	58.18	56.94	65.68
09.08.2007 07:03	54.63	56.73	49.39	58.43	56.46	67.22
09.08.2007 07:18	54.87	56.98	52.03	58.18	56.46	65.68
09.08.2007 07:33	57.07	58.22	55.15	59.68	57.41	65.68
09.08.2007 07:48	54.38	55.28	53.95	57.69	55.05	63.13
09.08.2007 08:03	57.81	60.49	57.80	60.68	58.36	65.68
09.08.2007 08:18	60.37	61.25	59.80	62.42	60.27	67.74
09.08.2007 08:33	60.88	61.75	59.80	62.67	60.27	67.22
09.08.2007 08:48	59.86	60.24	59.30	62.17	59.79	65.68
09.08.2007 09:03	59.35	60.99	59.80	61.92	60.75	66.19
09.08.2007 09:18	60.88	62.26	60.30	62.17	60.27	66.71
09.08.2007 09:33	59.86	61.50	60.05	62.17	60.75	66.19
09.08.2007 09:48	60.37	60.49	59.55	62.17	59.79	64.14
09.08.2007 10:03	60.11	60.74	59.80	62.17	60.27	64.14
09.08.2007 10:18	59.09	61.25	59.55	61.42	59.79	64.65
09.08.2007 10:33	60.37	58.47	58.80	61.92	58.83	60.60
09.08.2007 10:48	59.86	61.50	59.55	61.92	60.27	63.13
09.08.2007 11:03	61.39	62.76	60.80	62.42	61.71	63.13
09.08.2007 11:18	61.90	59.98	60.05	62.67	60.75	61.61
09.08.2007 11:33	61.39	61.75	60.30	62.67	61.23	61.61
09.08.2007 11:48	60.63	60.74	59.30	61.92	60.75	60.60
09.08.2007 12:03	61.39	62.00	60.30	62.42	61.71	60.60

APPENDIX C

WEATHER DATA FROM THE METEOROLOGY DEPARTMENT

One of the main parameter affecting the energy loads of a building is the local climate which mainly includes; temperature, solar radiation, humidity and wind. In this context, Cyprus has a strong Mediterranean climate mainly with hot summers and relatively warm winters with fairly rain as yearly average of 402.8 mm.[4].

The yearly average temperature of Cyprus is about 19 ˚C, where the hottest months are usually July and August (changes between 37-40 ˚C, daytime temperature under shadow) and coldest month is January (changes between 9-12 ˚C, daytime temperature)[4]. Figure 3.6 shows the monthly average outdoor air temperatures in Cyprus.

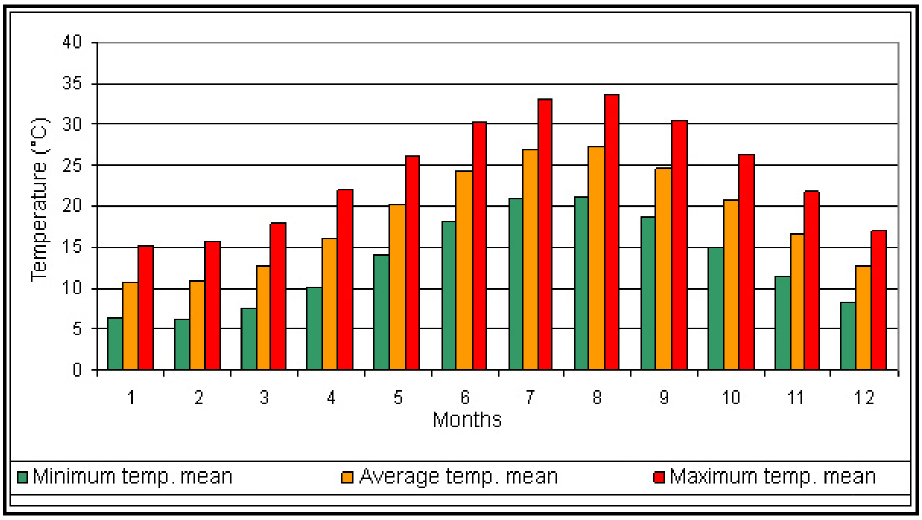

Figure C.01 Mean monthly air temperatures of Cyprus

Source: http://www.kktcmeteor.org

[4] http://www.kktcmeteor.org

Table C.01 Daily air temperature data (ºC) of Kyrenia (1st to 15th August 2007)

	Hours									Daily	
Day	00	03	06	09	12	15	18	21	Avg.	Max.	Min
1	30.0	29.0	28.0	31.5	33.2	33.6	32.5	30.0	31.0	33.6	28.0
2	29.0	28.2	27.0	29.6	32.0	32.2	31.0	29.0	29.8	33.2	27.0
3	28.0	27.0	27.0	30.5	32.5	34.0	31.5	29.5	30.0	34.0	27.0
4	28.0	25.6	26.5	29.5	32.0	33.0	31.0	29.0	29.3	33.4	25.6
5	27.5	27.0	26.0	29.0	32.0	33.0	31.5	29.0	29.4	33.2	26.0
6	27.9	26.2	25.9	28.0	31.0	32.0	31.0	30.0	29.0	32.0	25.5
7	28.0	27.2	26.0	28.5	30.5	30.5	29.5	30.0	28.8	30.5	25.0
8	27.0	26.5	25.0	28.0	30.5	30.6	30.0	28.5	28.3	31.1	24.0
9	26.5	25.0	24.5	28.0	30.0	32.0	30.0	28.3	28.0	32.0	23.0
10	27.0	26.0	24.6	29.0	31.0	32.6	31.0	29.5	28.8	32.6	24.6
11	28.0	27.5	26.0	29.0	31.5	33.0	31.0	30.2	29.5	33.0	24.0
12	28.0	27.6	25.0	28.4	31.0	30.6	30.0	28.5	28.6	32.0	25.0
13	27.0	26.0	25.0	28.0	31.0	31.5	30.0	28.0	28.3	31.5	24.0
14	27.8	25.5	24.0	28.2	30.6	31.2	30.2	28.0	28.2	32.0	24.0
15	27.0	26.0	25.2	29.0	31.8	31.3	31.3	28.6	28.8	32.6	25.0

Table C.02 Daily relative humidity data (% RH) of Kyrenia (1st to 15th August 2007)

	Hours									Daily	
Day	00	03	06	09	12	15	18	21	Avg.	Max.	Min
1	80.0	75.0	77.4	73.0	72.0	72.0	70.0	75.0	74.3	91.0	70.0
2	83.0	87.0	79.0	70.0	65.0	67.0	68.0	70.0	73.6	90.0	64.0
3	79.0	85.0	83.0	74.0	72.0	70.0	72.0	90.0	78.1	91.0	65.0
4	85.0	75.0	67.0	65.0	66.0	65.0	70.0	77.0	71.3	90.0	64.0
5	78.0	88.0	85.0	78.0	65.0	67.0	70.0	79.0	76.3	93.0	63.0
6	80.0	75.0	84.0	77.0	65.0	61.0	60.0	70.0	71.5	90.0	59.0
7	75.0	77.0	80.0	61.0	59.0	55.0	56.0	67.0	66.3	81.0	55.0
8	60.0	73.0	65.0	56.0	55.0	56.0	58.0	78.0	62.6	85.0	54.0
9	72.0	75.0	72.0	58.0	55.0	56.0	61.0	72.0	65.1	82.0	55.0
10	78.0	85.0	72.0	64.0	60.0	63.0	64.0	78.0	68.5	91.0	60.0
11	76.0	87.0	80.0	76.0	66.0	64.0	65.0	71.0	72.5	93.0	63.0
12	57.0	50.0	60.0	75.0	66.0	63.0	68.0	85.0	65.5	87.0	41.0
13	87.0	88.0	86.0	70.0	63.0	67.0	72.0	90.0	77.9	90.0	62.0
14	87.0	90.0	87.0	73.0	65.0	62.0	66.0	86.0	77.0	91.0	61.0
15	76.0	70.0	76.0	67.0	62.0	67.0	68.0	86.0	71.5	88.0	62.0

Table C.03 Hourly wind speed (m/s) and direction data of Kyrenia, (1st to 15 th August 2007)

Hour / Day	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	avg. speed (m/s)	max. speed (m/s)
1	1.3 W	2.2 W	0.6 SW	C	C	0.6 SW	C	C	C	0.7 NNW	1.0 N	C	0.8 N	1.2 N	1.1 N	0.6 N	0.8 NW	1.9 NW	3.3 WNW	3.9 WNW	4.7 WNW	3.5 W	2.6 W	2.8 W	1.4	7.2 NW
2	C	C	0.2 W	C	1.9 WSW	1.4 W	0.7 WSW	C	C	C	1.9 NW	2.5 NW	2.5 NW	3.3 WNW	4.4 WNW	4.4 WNW	6.1 WNW	6.7 WNW	6.9 WNW	4.2 WNW	3.1 W	1.4 W	1.1 W	1.1 S	2.5	10.0 WNW
3	1.4 S	0.4 SW	1.2 SW	1.4 SW	1.4 S	1.7 S	1.4 S	0.8 S	C	0.6 NNW	1.0 NNW	1.5 NNW	1.4 NNW	1.9 NNW	3.1 WNW	4.7 WNW	5.3 WNW	6.7 WNW	8.0 WNW	7.1 WNW	4.4 WNW	3.6 WNW	2.6 WSW	1.2 WSW	2.6	11.7 WNW
4	7.4 S	0.8 SSW	0.8 SSW	1.5 S	1.8 SE	1.8 S	1.7 S	1.7 SE	0.7 E	0.6 E	0.8 NW	1.4 NW	1.7 NW	2.8 NW	3.3 NW	3.9 WNW	5.8 WNW	6.1 WNW	6.8 WNW	6.7 WNW	5.3 W	3.6 W	2.5 S	1.7 S	2.7	10.0 WNW
5	C	C	1.4 S	1.4 S	0.8 S	C	C	C	C	1.4 NNW	1.9 NNW	2.1 NNW	2.1 NW	3.1 WNW	3.1 NW	4.0 WNW	4.6 WNW	5.1 WNW	6.2 WNW	7.4 WNW	5.0 WNW	2.6 WNW	3.1 S	1.1 S	2.3	10.1 WNW
6	0.7 SW	0.8 SW	C	0.8 SW	1.8 SW	1.9 WSW	1.0 WSW	C	C	1.4 NNW	2.2 NNW	2.2 NW	3.1 NW	3.9 WNW	4.2 WNW	5.0 WNW	7.2 WNW	8.0 WNW	7.5 WNW	7.5 W	6.4 W	5.8 W	5.0 W	5.3 W	3.4	13.0 W
7	4.2 WSW	3.6 WSW	1.4 WSW	3.6 WSW	1.4 WSW	0.6 WSW	0.8 W	2.5 W	3.1 WSW	5.3 WNW	6.4 WNW	6.7 WNW	7.5 WNW	9.2 WNW	8.9 WNW	8.3 WNW	9.2 WNW	9.7 WNW	10.6 W	9.2 W	8.0 WSW	6.1 WSW	5.3 WSW	4.7 WSW	5.7	17.0 W
8	5.0 WSW	3.1 WSW	3.6 WSW	2.2 WSW	2.5 WSW	1.5 SW	1.5 SW	1.4 SW	1.1 NW	4.2 WNW	4.4 WNW	6.1 WNW	5.0 WNW	5.3 WNW	5.3 WNW	6.1 WNW	6.9 WNW	6.4 WNW	7.8 WNW	6.9 W	6.7 W	6.9 W	5.0 W	4.4 WSW	4.5	18.0 W
9	4.4 WSW	3.1 WSW	1.7 SSW	1.4 S	0.8 S	1.7 S	1.4 S	0.6 S	C	1.8 NW	2.4 NW	2.5 NW	2.8 NW	2.8 NW	3.1 WNW	3.3 WNW	4.2 WNW	5.4 WNW	6.4 WNW	6.4 WNW	2.8 W	0.7 W	0.8 W	2.1 S	2.6	9.9 WNW
10	1.9 S	1.1 S	0.6 S	C	1.1 S	1.2 S	1.0 S	1.1 S	1.8 E	1.7 ENE	1.7 N	1.9 N	1.9 NW	1.9 NW	1.9 NW	3.3 NW	3.1 WNW	3.9 WNW	4.2 WNW	4.4 WNW	2.8 W	1.4 W	2.5 SSE	3.3 SSE	2.1	7.5 WNW
11	2.8 SSE	1.9 S	1.7 S	2.2 S	2.2 S	3.8 S	1.4 S	0.8 SSW	1.4 WNW	1.4 NW	1.2 NW	1.7 NW	1.9 NW	1.7 NW	2.1 NW	1.5 NW	3.5 WNW	4.9 WNW	3.9 WNW	3.9 WNW	3.9 WNW	1.7 S	1.1 S	1.1 WSW	2.2	8.5 WNW
12	2.4 WSW	1.9 WSW	1.0 SW	0.8 WSW	1.4 WSW	1.4 SW	1.1 WSW	1.4 WSW	3.3 WNW	2.6 WNW	2.8 NW	2.6 NW	3.1 WNW	4.7 WNW	6.1 WNW	6.7 WNW	6.7 WNW	5.6 WNW	6.1 WNW	6.5 WNW	5.6 W	3.3 W	3.1 W	2.5 W	3.4	6.7 WNW
13	2.5 WSW	1.9 WSW	0.4 WSW	1.2 SW	1.2 SW	1.1 S	1.1 S	1.9 WSW	3.1 WNW	3.6 WNW	3.1 WNW	3.1 NW	3.1 NW	3.1 WNW	4.0 WNW	5.1 WNW	5.0 WNW	5.8 WNW	6.1 WNW	6.1 WNW	4.7 W	4.4 W	1.9 W	1.8 W	3.2	10.6 W
14	0.6 SW	1.1 SW	0.8 SW	1.1 SW	1.1 S	1.1 S	1.4 S	C	0.6 NW	1.4 NW	1.9 NW	2.2 NW	2.4 NW	2.8 NW	3.1 NW	3.5 WNW	4.0 NNW	3.8 WNW	4.0 WNW	3.3 WNW	2.5 W	1.0 WSW	0.8 WSW	1.4 WSW	1.9	7.2 WNW
15	1.2 WSW	1.4 WSW	1.9 WSW	1.7 WSW	1.4 WSW	1.4 WSW	1.5 WSW	C	C	1.1 N	1.1 N	1.4 N	1.9 N	1.7 NNW	1.9 NNW	2.2 NNW	2.1 WNW	2.6 WNW	2.2 WNW	3.5 WNW	2.1 WNW	0.8 W	0.8 WNW	2.1 WNW	1.6	5.6 W

APPENDIX D

INPUT PARAMETERS FOR THE SIMULATION TOOL

NUMBER OF EXTERNAL OPAQUE COMPONENTS: 10

*External Opaque Element: 1

Area of the element (m2) 55.35
Absorptivity of the Element 0.65
Tilt of the Element (Degrees) 90
Azimuth of the Element (Degrees) -180
Opaque Element Name wallex
Overall Heat Transfer Coefficient (W/m2/C) 2.1
Decrement Factor 0.39
Time Lag (h) 7.36

*External Opaque Element: 2

Area of the element (m2) 50.61
Absorptivity of the Element 0.65
Tilt of the Element (Degrees) 90
Azimuth of the Element (Degrees) -90
Opaque Element Name wallex
Overall Heat Transfer Coefficient (W/m2/C) 2.1
Decrement Factor 0.39
Time Lag (h) 7.36

*External Opaque Element: 3

Area of the element (m2) 53.5
Absorptivity of the Element 0.65
Tilt of the Element (Degrees) 90
Azimuth of the Element (Degrees) 0
Opaque Element Name wallex
Overall Heat Transfer Coefficient (W/m2/C) 2.1
Decrement Factor 0.39
Time Lag (h) 7.36

*External Opaque Element: 4

Area of the element (m2) 52.37
Absorptivity of the Element 0.65
Tilt of the Element (Degrees) 90
Azimuth of the Element (Degrees) 90
Opaque Element Name wallex
Overall Heat Transfer Coefficient (W/m2/C) 2.1
Decrement Factor 0.39
Time Lag (h) 7.36

*External Opaque Element: 5

Area of the element (m2) 2.1
Absorptivity of the Element 0.7
Tilt of the Element (Degrees) 90
Azimuth of the Element (Degrees) 0
Opaque Element Name wood
Overall Heat Transfer Coefficient (W/m2/C) 1.73
Decrement Factor 0.94
Time Lag (h) 1.92

*External Opaque Element: 6

Area of the element (m2) 42.5
Absorptivity of the Element 0.6
Tilt of the Element (Degrees) 12
Azimuth of the Element (Degrees) -180
Opaque Element Name roof2
Overall Heat Transfer Coefficient (W/m2/C) 2.04
Decrement Factor 0.45
Time Lag (h) 5.82

*External Opaque Element: 7

Area of the element (m2) 8.2
Absorptivity of the Element 0.6
Tilt of the Element (Degrees) 12
Azimuth of the Element (Degrees) 90
Opaque Element Name roof2
Overall Heat Transfer Coefficient (W/m2/C) 2.04
Decrement Factor 0.45
Time Lag (h) 5.82

*External Opaque Element: 8

Area of the element (m2) 8.2
Absorptivity of the Element 0.6
Tilt of the Element (Degrees) 12
Azimuth of the Element (Degrees) -90
Opaque Element Name roof2
Overall Heat Transfer Coefficient (W/m2/C) 2.04
Decrement Factor 0.45
Time Lag (h) 5.82

*External Opaque Element: 9

Area of the element (m2) 12.1
Absorptivity of the Element 0.6
Tilt of the Element (Degrees) 0
Azimuth of the Element (Degrees) 0
Opaque Element Name floor2
Overall Heat Transfer Coefficient (W/m2/C) 3.18
Decrement Factor 0.69
Time Lag (h) 4.25

*External Opaque Element: 10

Area of the element (m2) 27.05
Absorptivity of the Element 0.5
Tilt of the Element (Degrees) 0
Azimuth of the Element (Degrees) 0
Opaque Element Name floor3
Overall Heat Transfer Coefficient (W/m2/C) 2.95
Decrement Factor 0.54
Time Lag (h) 5.7

NUMBER OF GLAZED SURFACES: 25

*Glazed Surface : 1

Area of Surface (m2) 1.89
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) -180
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 2

Area of Surface (m2) 1.89
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) -90
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 3

Area of Surface (m2) 1.8
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) 0
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 4

Area of Surface (m2) 2.52
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) 90
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 5

Area of Surface (m2) 3.3
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) 0
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 6

Area of Surface (m2) 1
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) 0
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 7

Area of Surface (m2) 1.8
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) 0
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 8

Area of Surface (m2) 1.8
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) 0
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 9

Area of Surface (m2) 1.2
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) 0
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 10

Area of Surface (m2) 1.8
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) -90
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 11

Area of Surface (m2) 1.8
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) -90
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 12

Area of Surface (m2) 1.8
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) -90
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 13

Area of Surface (m2) 1.8
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) -90
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 14

Area of Surface (m2) 1.8
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) -90
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 15

Area of Surface (m2) 0.36
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) 90
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 16

Area of Surface (m2) 0.36
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) 90
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 17

Area of Surface (m2) 1
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) 90
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 18

Area of Surface (m2) 1.2
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) 90
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 19

Area of Surface (m2) 1.89
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) 90
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 20

Area of Surface (m2) 1.8
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) 90
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 21

Area of Surface (m2) 1.8
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) -180
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 22

Area of Surface (m2) 1.8
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) -180
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 23

Area of Surface (m2) 1.8
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) -180
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 24

Area of Surface (m2) 0.36
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) -180
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

*Glazed Surface : 25

Area of Surface (m2) 1.5
Solar Transmissivity 0.837
Tilt Angle of Surface (Degrees) 90
Azimuth of Surface (Degrees) -180
U Value, (W/m2/C) 6.306
Curtain Factor 0.5

NUMBER OF INTERNAL PARTITIONS: 3

*Internal Partition : 1

Area of the element (m2) 99.09
Opaque Element Name int_wall

*Internal Partition : 2

Area of the element (m2) 11.34
Opaque Element Name wood

*Internal Partition : 3

Area of the element (m2) 60
Opaque Element Name floor2

FLOOR AND OPERATIONAL DATA

Start Day of Calculations 01/08/2007
End Day of Calculations 15/08/2007
Floor Area of the Building (m2) 170
Volume of the Building (m3) 510
Absorptivity of the Floor 0.6
Infiltration Rate (Air Changes/Hour) 0.6
Design Indoor Temperature for Cooling (C) 27
Design Indoor Temperature for Heating (C) 24
Deep Well Ground Temperature During Calculations (C) 20
Opaque Element Name of the Floor floor3
Week-Day Occupancy Pattern 24 Hours
Saturday Occupancy Pattern 24 Hours
Sunday Occupancy Pattern 24 Hours

NATURAL VENTILATION DATA

Air Changes per hour During Day Period : 4
Air Changes per hour During the Night Period : 3

MECHANICAL VENTILATION DATA

Air Changes per hour During Daytime Period : 3
Air Changes per hour During the Night Period : 2

INTERNAL GAINS

Total Horizontal Area of the Building (m2) 170

*Week-Day
Number of Persons in the Building 4
Load due to Lighting (W/m2) 10
Load due to Electr. Equipment (W/m2) 10
Any Other Load (W/m2) 0

Saturday
Number of Persons in the Building 6
Load due to Lighting (W/m2) 12
Load due to Electr. Equipment (W/m2) 12
Any Other Load (W/m2) 0

*Sunday
Number of Persons in the Building 6
Load due to Lighting (W/m2) 12
Load due to Electr. Equipment (W/m2) 12
Any Other Load (W/m2) 0

NUMBER OF BURIED PIPES : 1

Length of the Exchanger (m) 40
Radius of the Exchanger (m) .15
Air Velocity through the Pipe (m/sec) 2
Depth of the Exchanger (m) 4
Average Annual Temperature of the Soil Surface (C) 22
Amplitude of Surface Temperature Variation (C) 8
Thermal Diffusivity of the Ground (m2/hour) .0011

SOLAR CONTROL DATA

*Glazed Surface : 1
Type of Shading Device : Side Fins
Window Width (m) 2.1
Side Fin Length (m) 0.9
Window-Side Fin Distance (m) 0

*Glazed Surface : 2
Type of Shading Device : Overhang
Window Height (m) 2.1
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 3
Type of Shading Device : Overhang
Window Height (m) 1.2
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 4
Type of Shading Device : Overhang
Window Height (m) 2.1
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 5
Type of Shading Device : Overhang
Window Height (m) 2.1
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 6
Type of Shading Device : Overhang
Window Height (m) 1
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 7
Type of Shading Device : Overhang
Window Height (m) 1.2
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 8
Type of Shading Device : Overhang
Window Height (m) 1.2
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 9
Type of Shading Device : Overhang
Window Height (m) 1
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 10
Type of Shading Device : Overhang
Window Height (m) 1.2
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 11
Type of Shading Device : Overhang
Window Height (m) 1.2
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 12
Type of Shading Device : Overhang
Window Height (m) 1.2
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 13
Type of Shading Device : Overhang
Window Height (m) 1.2
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 14
Type of Shading Device : Overhang
Window Height (m) 1.2
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 15
Type of Shading Device : Overhang
Window Height (m) .6
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 16
Type of Shading Device : Overhang
Window Height (m) .6
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 17
Type of Shading Device : Overhang
Window Height (m) 1
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 18
Type of Shading Device : Overhang
Window Height (m) 1
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 19
Type of Shading Device : Overhang
Window Height (m) 2.1
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 20
Type of Shading Device : Overhang
Window Height (m) 1.2
Overhang Length (m) 0.9
Overhang-Window Distance (m) 0

*Glazed Surface : 21
Type of Shading Device : Side Fins
Window Width (m) 1.2
Side Fin Length (m) 0.9
Window-Side Fin Distance (m) 0

*Glazed Surface : 22
Type of Shading Device : Side Fins
Window Width (m) 1.2
Side Fin Length (m) 0.9
Window-Side Fin Distance (m) 0

*Glazed Surface : 23
Type of Shading Device : Side Fins
Window Width (m) 1.2
Side Fin Length (m) 0.9
Window-Side Fin Distance (m) 0

*Glazed Surface : 24
Type of Shading Device : Side Fins
Window Width (m) .6
Side Fin Length (m) 0.9
Window-Side Fin Distance (m) 0

*Glazed Surface : 25
Type of Shading Device : Side Fins
Window Width (m) 1
Side Fin Length (m) 0.9
Window-Side Fin Distance (m) 0

APPENDIX E

BALANCE POINT TEMPERATURE AND COOLING LOADS

Period: 01/08/2007 - 15/08/2007
Date: Wednesday 1/ 8/ 2007
REFERENCE A/C BUILDING
DAILY COOLING LOAD : 221.4kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF A/C IS USED
TIME 1* 2* 3* 4* 5* 6* 7* 8* 9* 10* 11* 12*
Tout 29.5 29.3 29.0 28.8 28.6 28.6 28.9 29.4 30.3 31.2 32.1 32.7
BPT 25.6 26.2 26.2 26.3 26.4 28.1 25.3 25.2 25.0 25.0 24.9 25.0
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 33.2 33.5 33.7 33.6 33.2 32.6 32.0 31.3 30.8 30.5 30.1 29.8
BPT 24.4 23.7 23.4 23.2 23.1 23.2 24.1 24.1 24.2 24.5 24.9 25.2
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature

Date: Thursday 2/ 8/ 2007
REFERENCE A/C BUILDING
DAILY COOLING LOAD : 182.2kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF A/C IS USED
TIME 1* 2* 3* 4* 5* 6 7* 8* 9* 10* 11* 12*
Tout 27.9 27.6 27.2 27.0 26.7 26.7 27.0 27.8 28.9 30.1 31.2 32.1
BPT 25.5 26.1 26.2 26.3 26.4 28.1 25.3 25.2 25.1 25.0 25.0 25.1
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.7 33.1 33.3 33.2 32.7 31.9 31.1 30.3 29.6 29.1 28.7 28.3
BPT 24.5 23.7 23.3 23.1 22.9 23.0 23.9 23.8 24.0 24.3 24.7 25.1
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature

Date: Friday 3/ 8/ 2007
REFERENCE A/C BUILDING
DAILY COOLING LOAD : 191.8kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF A/C IS USED
TIME 1* 2* 3* 4* 5* 6 7* 8* 9* 10* 11* 12*
Tout 27.8 27.4 27.0 26.7 26.4 26.3 26.7 27.6 28.9 30.4 31.7 32.7
BPT 25.4 26.1 26.2 26.3 26.4 28.1 25.4 25.3 25.1 25.1 25.1 25.1
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 33.4 33.9 34.1 34.0 33.4 32.5 31.5 30.5 29.8 29.2 28.7 28.2
BPT 24.5 23.7 23.3 23.0 22.8 22.9 23.7 23.7 23.8 24.1 24.5 25.0
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature

Date: Saturday 4/ 8/ 2007
REFERENCE A/C BUILDING
DAILY COOLING LOAD : 188.7kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF A/C IS USED
TIME 1* 2* 3* 4* 5 6 7* 8* 9* 10* 11* 12*
Tout 27.0 26.6 26.2 25.9 25.6 25.5 25.9 26.9 28.2 29.7 31.0 32.0
BPT 24.8 25.5 25.6 25.8 25.9 27.5 24.8 24.7 24.5 24.5 24.5 24.5
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.8 33.3 33.6 33.4 32.8 31.9 30.8 29.9 29.1 28.5 27.9 27.5
BPT 23.9 23.0 22.6 22.4 22.2 22.2 23.1 23.1 23.2 23.5 23.9 24.4
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature

Date: Sunday 5/ 8/ 2007
REFERENCE A/C BUILDING
DAILY COOLING LOAD : 187.3kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF A/C IS USED
TIME 1* 2* 3* 4* 5* 6 7* 8* 9* 10* 11* 12*
Tout 27.3 26.9 26.6 26.2 26.0 25.9 26.3 27.1 28.4 29.7 31.0 31.9
BPT 24.9 25.6 25.7 25.8 25.9 27.6 24.9 24.7 24.6 24.5 24.5 24.6
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.6 33.1 33.3 33.2 32.7 31.8 30.8 29.9 29.2 28.6 28.1 27.7
BPT 24.0 23.2 22.8 22.6 22.4 22.4 23.3 23.2 23.4 23.7 24.1 24.5
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature

Date: Monday 6/ 8/ 2007
REFERENCE A/C BUILDING
DAILY COOLING LOAD : 157.6kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF A/C IS USED
TIME 1* 2* 3* 4* 5 6 7* 8* 9* 10* 11* 12*
Tout 27.3 27.0 26.7 26.5 26.3 26.2 26.5 27.2 28.2 29.3 30.2 31.0
BPT 25.5 26.1 26.2 26.3 26.4 28.0 25.2 25.1 24.9 24.8 24.8 24.9
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.5 31.9 32.1 32.0 31.6 30.9 30.1 29.4 28.8 28.4 28.0 27.6
BPT 24.3 23.4 23.1 22.9 22.8 22.9 23.8 23.8 24.0 24.3 24.7 25.1
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature

Date: Tuesday 7/ 8/ 2007
REFERENCE A/C BUILDING
DAILY COOLING LOAD : 147.0kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF A/C IS USED
TIME 1* 2* 3* 4* 5* 6 7* 8* 9* 10* 11* 12*
Tout 27.8 27.7 27.5 27.4 27.2 27.2 27.4 27.8 28.3 28.9 29.5 29.9
BPT 25.6 26.2 26.2 26.3 26.3 27.9 25.1 25.0 24.8 24.7 24.6 24.7
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 30.2 30.4 30.5 30.5 30.2 29.8 29.4 29.0 28.7 28.4 28.2 28.0
BPT 24.1 23.3 23.1 22.9 22.9 23.1 24.1 24.1 24.3 24.6 24.9 25.3
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature

Date: Wednesday 8/ 8/ 2007
REFERENCE A/C BUILDING
DAILY COOLING LOAD : 131.0kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF A/C IS USED
TIME 1* 2* 3* 4 5 6 7* 8* 9* 10* 11* 12*
Tout 26.7 26.4 26.2 25.9 25.8 25.7 26.0 26.6 27.5 28.5 29.4 30.2
BPT 25.6 26.2 26.2 26.3 26.4 28.0 25.3 25.1 25.0 24.9 24.9 24.9
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 30.7 31.0 31.2 31.1 30.7 30.1 29.3 28.7 28.1 27.7 27.4 27.0
BPT 24.3 23.5 23.2 23.0 22.9 23.1 23.9 23.9 24.1 24.4 24.8 25.2
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature

Date: Thursday 9/ 8/ 2007
REFERENCE A/C BUILDING
DAILY COOLING LOAD : 132.1kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF A/C IS USED

TIME	1*	2	3	4	5	6	7	8*	9*	10*	11*	12*
Tout	25.8	25.4	25.0	24.7	24.4	24.3	24.7	25.6	26.9	28.4	29.7	30.7
BPT	25.4	26.1	26.2	26.3	26.4	28.0	25.4	25.2	25.1	25.0	25.0	25.1
TIME	13*	14*	15*	16*	17*	18*	19*	20*	21*	22*	23*	24*
Tout	31.4	31.9	32.1	32.0	31.4	30.5	29.5	28.5	27.8	27.2	26.7	26.2
BPT	24.5	23.6	23.2	23.0	22.8	22.9	23.7	23.7	23.8	24.1	24.5	25.0

* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature

Date: Friday 10/ 8/ 2007
REFERENCE A/C BUILDING
DAILY COOLING LOAD : 160.7kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF A/C IS USED

TIME	1*	2*	3	4	5	6	7*	8*	9*	10*	11*	12*
Tout	26.7	26.3	26.0	25.6	25.4	25.3	25.7	26.5	27.8	29.1	30.4	31.3
BPT	25.3	26.0	26.1	26.2	26.3	27.9	25.2	25.0	24.8	24.7	24.7	24.8
TIME	13*	14*	15*	16*	17*	18*	19*	20*	21*	22*	23*	24*
Tout	32.0	32.5	32.7	32.6	32.1	31.2	30.2	29.3	28.6	28.0	27.5	27.1
BPT	24.1	23.2	22.8	22.6	22.5	22.6	23.5	23.5	23.6	23.9	24.4	24.9

* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature

Date: Saturday 11/ 8/ 2007
REFERENCE A/C BUILDING
DAILY COOLING LOAD : 193.9kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF A/C IS USED

TIME	1*	2*	3*	4*	5*	6	7*	8*	9*	10*	11*	12*
Tout	27.5	27.2	26.9	26.6	26.3	26.3	26.6	27.4	28.6	29.8	30.9	31.8
BPT	24.9	25.6	25.7	25.8	25.9	27.5	24.8	24.6	24.4	24.4	24.3	24.4
TIME	13*	14*	15*	16*	17*	18*	19*	20*	21*	22*	23*	24*
Tout	32.5	32.9	33.1	33.0	32.5	31.7	30.8	30.0	29.3	28.8	28.3	27.9
BPT	23.8	23.0	22.6	22.4	22.3	22.4	23.2	23.2	23.3	23.6	24.1	24.5

* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature

Date: Sunday 12/ 8/ 2007
REFERENCE A/C BUILDING
DAILY COOLING LOAD : 165.0kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF A/C IS USED

TIME	1*	2*	3*	4*	5	6	7*	8*	9*	10*	11*	12*
Tout	26.7	26.4	26.0	25.8	25.5	25.5	25.8	26.6	27.7	28.9	30.0	30.9
BPT	24.9	25.5	25.6	25.7	25.8	27.4	24.7	24.5	24.3	24.3	24.3	24.3
TIME	13*	14*	15*	16*	17*	18*	19*	20*	21*	22*	23*	24*
Tout	31.5	31.9	32.1	32.0	31.5	30.7	29.9	29.1	28.4	27.9	27.5	27.1
BPT	23.7	22.9	22.5	22.2	22.2	22.3	23.1	23.1	23.3	23.6	24.0	24.5

* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature

Date: Monday 13/ 8/ 2007
REFERENCE A/C BUILDING
DAILY COOLING LOAD : 134.0kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF A/C IS USED

TIME	1*	2*	3	4	5	6	7*	8*	9*	10*	11*	12*
Tout	26.5	26.2	25.9	25.6	25.4	25.4	25.7	26.4	27.4	28.6	29.6	30.4
BPT	25.5	26.1	26.2	26.3	26.4	28.0	25.3	25.1	25.0	24.9	24.9	25.0
TIME	13*	14*	15*	16*	17*	18*	19*	20*	21*	22*	23*	24*
Tout	31.0	31.4	31.6	31.5	31.0	30.3	29.5	28.7	28.1	27.6	27.2	26.8
BPT	24.4	23.6	23.2	23.0	22.9	23.0	23.8	23.8	24.0	24.3	24.7	25.1

* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature

Date: Tuesday 14/ 8/ 2007
REFERENCE A/C BUILDING
DAILY COOLING LOAD : 133.6kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF A/C IS USED

TIME	1*	2	3	4	5	6	7	8*	9*	10*	11*	12*
Tout	26.1	25.7	25.4	25.0	24.8	24.7	25.1	25.9	27.2	28.5	29.8	30.7
BPT	25.5	26.1	26.2	26.4	26.5	28.0	25.4	25.3	25.1	25.0	25.0	25.1
TIME	13*	14*	15*	16*	17*	18*	19*	20*	21*	22*	23*	24*
Tout	31.4	31.9	32.1	32.0	31.5	30.6	29.6	28.7	28.0	27.4	26.9	26.5
BPT	24.5	23.7	23.3	23.1	23.0	23.0	23.8	23.8	23.9	24.2	24.6	25.1

* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature

Date: Wednesday 15/ 8/ 2007
REFERENCE A/C BUILDING
DAILY COOLING LOAD : 152.5kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF A/C IS USED
TIME 1* 2* 3 4 5 6 7* 8* 9* 10* 11* 12*
Tout 26.7 26.3 26.0 25.6 25.4 25.3 25.7 26.5 27.8 29.1 30.4 31.3
BPT 25.5 26.1 26.2 26.3 26.4 28.1 25.4 25.2 25.0 25.0 25.0 25.1
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.0 32.5 32.7 32.6 32.1 31.2 30.2 29.3 28.6 28.0 27.5 27.1
BPT 24.5 23.6 23.2 23.0 22.9 23.0 23.7 23.7 23.9 24.2 24.6 25.1
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature

Date: Wednesday 1/ 8/ 2007
NATURALLY VENTILATED BUILDINGS
DAILY COOLING LOAD : 230.8kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NATURAL VENTILATION IS USED
TIME 1* 2* 3* 4* 5* 6* 7* 8* 9* 10* 11* 12*
Tout 29.5 29.3 29.0 28.8 28.6 28.6 28.9 29.4 30.3 31.2 32.1 32.7
BPT 28.2 27.7 27.6 27.5 27.5 25.8 28.5 28.6 28.8 28.8 28.9 28.8
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 33.2 33.5 33.7 33.6 33.2 32.6 32.0 31.3 30.8 30.5 30.1 29.8
BPT 29.4 30.1 30.4 30.6 30.7 30.6 29.7 29.7 29.6 29.3 28.9 28.6
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF N/V IS USED : 0 %

Date: Thursday 2/ 8/ 2007
NATURALLY VENTILATED BUILDINGS
DAILY COOLING LOAD : 146.2kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NATURAL VENTILATION IS USED
TIME 1 2 3 4 5 6* 7 8 9* 10* 11* 12*
Tout 27.9 27.6 27.2 27.0 26.7 26.7 27.0 27.8 28.9 30.1 31.2 32.1
BPT 28.3 27.7 27.7 27.5 27.5 25.9 28.5 28.6 28.7 28.8 28.8 28.7
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21 22 23 24
Tout 32.7 33.1 33.3 33.2 32.7 31.9 31.1 30.3 29.6 29.1 28.7 28.3
BPT 29.3 30.1 30.4 30.7 30.8 30.7 29.9 29.9 29.8 29.5 29.1 28.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF N/V IS USED : 19 %

Date: Friday 3/ 8/ 2007
NATURALLY VENTILATED BUILDINGS
DAILY COOLING LOAD : 157.3kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NATURAL VENTILATION IS USED

TIME	1	2	3	4	5	6*	7	8	9*	10*	11*	12*
Tout	27.8	27.4	27.0	26.7	26.4	26.3	26.7	27.6	28.9	30.4	31.7	32.7
BPT	28.4	27.8	27.7	27.5	27.4	25.8	28.5	28.6	28.7	28.8	28.8	28.7
TIME	13*	14*	15*	16*	17*	18*	19*	20*	21	22	23	24
Tout	33.4	33.9	34.1	34.0	33.4	32.5	31.5	30.5	29.8	29.2	28.7	28.2
BPT	29.3	30.1	30.5	30.7	30.9	30.9	30.0	30.1	30.0	29.7	29.3	28.9

* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF N/V IS USED : 17 %

Date: Saturday 4/ 8/ 2007
NATURALLY VENTILATED BUILDINGS
DAILY COOLING LOAD : 140.2kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NATURAL VENTILATION IS USED

TIME	1	2	3	4	5	6	7	8	9	10*	11*	12*
Tout	27.0	26.6	26.2	25.9	25.6	25.5	25.9	26.9	28.2	29.7	31.0	32.0
BPT	29.0	28.3	28.2	28.1	28.0	26.4	29.0	29.1	29.3	29.3	29.3	29.3
TIME	13*	14*	15*	16*	17*	18*	19*	20	21	22	23	24
Tout	32.8	33.3	33.6	33.4	32.8	31.9	30.8	29.9	29.1	28.5	27.9	27.5
BPT	29.9	30.7	31.1	31.3	31.5	31.5	30.6	30.7	30.5	30.3	29.8	29.4

* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF N/V IS USED : 25 %

Date: Sunday 5/ 8/ 2007
NATURALLY VENTILATED BUILDINGS
DAILY COOLING LOAD : 136.2kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NATURAL VENTILATION IS USED

TIME	1	2	3	4	5	6	7	8	9	10*	11*	12*
Tout	27.3	26.9	26.6	26.2	26.0	25.9	26.3	27.1	28.4	29.7	31.0	31.9
BPT	28.9	28.3	28.2	28.0	27.9	26.4	29.0	29.1	29.2	29.3	29.3	29.2
TIME	13*	14*	15*	16*	17*	18*	19*	20	21	22	23	24
Tout	32.6	33.1	33.3	33.2	32.7	31.8	30.8	29.9	29.2	28.6	28.1	27.7
BPT	29.8	30.6	30.9	31.2	31.3	31.3	30.5	30.5	30.4	30.1	29.7	29.3

* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF N/V IS USED : 27 %

Date: Monday 6/ 8/ 2007
NATURALLY VENTILATED BUILDINGS
DAILY COOLING LOAD : 115.6kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NATURAL VENTILATION IS USED
TIME 1 2 3 4 5 6* 7 8 9 10* 11* 12*
Tout 27.3 27.0 26.7 26.5 26.3 26.2 26.5 27.2 28.2 29.3 30.2 31.0
BPT 28.4 27.7 27.7 27.6 27.5 26.0 28.6 28.7 28.9 29.0 29.0 28.9
TIME 13* 14* 15* 16* 17* 18* 19* 20 21 22 23 24
Tout 31.5 31.9 32.1 32.0 31.6 30.9 30.1 29.4 28.8 28.4 28.0 27.6
BPT 29.5 30.3 30.7 30.8 31.0 30.8 30.0 30.0 29.8 29.5 29.1 28.7
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF N/V IS USED : 26 %

Date: Tuesday 7/ 8/ 2007
NATURALLY VENTILATED BUILDINGS
DAILY COOLING LOAD : 39.2kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NATURAL VENTILATION IS USED
TIME 1 2* 3 4 5 6* 7 8 9 10 11* 12*
Tout 27.8 27.7 27.5 27.4 27.2 27.2 27.4 27.8 28.3 28.9 29.5 29.9
BPT 28.2 27.7 27.7 27.6 27.6 26.0 28.7 28.9 29.1 29.1 29.2 29.1
TIME 13* 14* 15 16 17 18 19 20 21 22 23 24
Tout 30.2 30.4 30.5 30.5 30.2 29.8 29.4 29.0 28.7 28.4 28.2 28.0
BPT 29.7 30.4 30.7 30.8 30.8 30.6 29.7 29.7 29.5 29.2 28.9 28.5
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF N/V IS USED : 73 %

Date: Wednesday 8/ 8/ 2007
NATURALLY VENTILATED BUILDINGS
DAILY COOLING LOAD : 62.8kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NATURAL VENTILATION IS USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 26.7 26.4 26.2 25.9 25.8 25.7 26.0 26.6 27.5 28.5 29.4 30.2
BPT 28.3 27.7 27.7 27.6 27.5 26.0 28.5 28.7 28.9 28.9 28.9 28.9
TIME 13* 14* 15* 16* 17 18 19 20 21 22 23 24
Tout 30.7 31.0 31.2 31.1 30.7 30.1 29.3 28.7 28.1 27.7 27.4 27.0
BPT 29.5 30.2 30.5 30.7 30.8 30.7 29.8 29.8 29.7 29.4 29.0 28.7
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF N/V IS USED : 52 %

Date: Thursday 9/ 8/ 2007
NATURALLY VENTILATED BUILDINGS
DAILY COOLING LOAD : 82.6kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NATURAL VENTILATION IS USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 25.8 25.4 25.0 24.7 24.4 24.3 24.7 25.6 26.9 28.4 29.7 30.7
BPT 28.4 27.8 27.7 27.6 27.4 26.0 28.5 28.6 28.8 28.8 28.8 28.7
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 31.4 31.9 32.1 32.0 31.4 30.5 29.5 28.5 27.8 27.2 26.7 26.2
BPT 29.3 30.2 30.5 30.8 30.9 30.9 30.1 30.1 30.0 29.7 29.3 28.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF N/V IS USED : 37 %

Date: Friday 10/ 8/ 2007
NATURALLY VENTILATED BUILDINGS
DAILY COOLING LOAD : 114.0kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NATURAL VENTILATION IS USED
TIME 1 2 3 4 5 6 7 8 9 10* 11* 12*
Tout 26.7 26.3 26.0 25.6 25.4 25.3 25.7 26.5 27.8 29.1 30.4 31.3
BPT 28.5 27.9 27.8 27.6 27.5 26.0 28.7 28.8 29.0 29.1 29.1 29.0
TIME 13* 14* 15* 16* 17* 18* 19 20 21 22 23 24
Tout 32.0 32.5 32.7 32.6 32.1 31.2 30.2 29.3 28.6 28.0 27.5 27.1
BPT 29.6 30.5 30.9 31.1 31.3 31.2 30.3 30.3 30.1 29.8 29.4 28.9
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF N/V IS USED : 29 %

Date: Saturday 11/ 8/ 2007
NATURALLY VENTILATED BUILDINGS
DAILY COOLING LOAD : 137.0kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NATURAL VENTILATION IS USED
TIME 1 2 3 4 5 6 7 8 9 10* 11* 12*
Tout 27.5 27.2 26.9 26.6 26.3 26.3 26.6 27.4 28.6 29.8 30.9 31.8
BPT 28.9 28.3 28.2 28.1 28.0 26.4 29.0 29.2 29.4 29.4 29.4 29.4
TIME 13* 14* 15* 16* 17* 18* 19* 20 21 22 23 24
Tout 32.5 32.9 33.1 33.0 32.5 31.7 30.8 30.0 29.3 28.8 28.3 27.9
BPT 30.0 30.8 31.1 31.4 31.5 31.4 30.5 30.6 30.4 30.1 29.7 29.3
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF N/V IS USED : 29 %

Date: Sunday 12/ 8/ 2007
NATURALLY VENTILATED BUILDINGS
DAILY COOLING LOAD : 91.7kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NATURAL VENTILATION IS USED

TIME	1	2	3	4	5	6	7	8	9	10	11*	12*
Tout	26.7	26.4	26.0	25.8	25.5	25.5	25.8	26.6	27.7	28.9	30.0	30.9
BPT	28.9	28.3	28.2	28.1	28.0	26.5	29.1	29.3	29.5	29.5	29.5	29.5
TIME	13*	14*	15*	16*	17*	18	19	20	21	22	23	24
Tout	31.5	31.9	32.1	32.0	31.5	30.7	29.9	29.1	28.4	27.9	27.5	27.1
BPT	30.1	30.9	31.2	31.5	31.5	31.4	30.6	30.6	30.5	30.2	29.7	29.3

* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF N/V IS USED : 44 %

Date: Monday 13/ 8/ 2007
NATURALLY VENTILATED BUILDINGS
DAILY COOLING LOAD : 78.9kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NATURAL VENTILATION IS USED

TIME	1	2	3	4	5	6	7	8	9	10	11*	12*
Tout	26.5	26.2	25.9	25.6	25.4	25.4	25.7	26.4	27.4	28.6	29.6	30.4
BPT	28.3	27.7	27.7	27.6	27.5	26.0	28.5	28.7	28.9	28.9	28.9	28.9
TIME	13*	14*	15*	16*	17*	18	19	20	21	22	23	24
Tout	31.0	31.4	31.6	31.5	31.0	30.3	29.5	28.7	28.1	27.6	27.2	26.8
BPT	29.4	30.2	30.6	30.8	30.8	30.7	29.9	29.9	29.8	29.5	29.1	28.7

* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF N/V IS USED : 41 %

Date: Tuesday 14/ 8/ 2007
NATURALLY VENTILATED BUILDINGS
DAILY COOLING LOAD : 82.0kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NATURAL VENTILATION IS USED

TIME	1	2	3	4	5	6	7	8	9	10	11*	12*
Tout	26.1	25.7	25.4	25.0	24.8	24.7	25.1	25.9	27.2	28.5	29.8	30.7
BPT	28.3	27.7	27.6	27.5	27.4	25.9	28.4	28.6	28.7	28.8	28.8	28.7
TIME	13*	14*	15*	16*	17*	18	19	20	21	22	23	24
Tout	31.4	31.9	32.1	32.0	31.5	30.6	29.6	28.7	28.0	27.4	26.9	26.5
BPT	29.3	30.1	30.4	30.7	30.8	30.7	30.0	30.0	29.9	29.6	29.2	28.7

* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF N/V IS USED : 38 %

Date: Tuesday 15/ 8/ 2007
NATURALLY VENTILATED BUILDINGS
DAILY COOLING LOAD : 119.5kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NATURAL VENTILATION IS USED
TIME 1 2 3 4 5 6 7 8 9 10* 11* 12*
Tout 26.7 26.3 26.0 25.6 25.4 25.3 25.7 26.5 27.8 29.1 30.4 31.3
BPT 28.4 27.8 27.7 27.5 27.4 25.9 28.4 28.6 28.8 28.8 28.8 28.8
TIME 13* 14* 15* 16* 17* 18* 19* 20 21 22 23 24
Tout 32.0 32.5 32.7 32.6 32.1 31.2 30.2 29.3 28.6 28.0 27.5 27.1
BPT 29.3 30.1 30.5 30.8 30.9 30.8 30.0 30.0 29.9 29.6 29.2 28.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF N/V IS USED : 21 %

Date: Wednesday 1/ 8/ 2007
NIGHT VENTILATED A/C BUILDINGS
DAILY COOLING LOAD : 221.4kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NIGHT VENTILATION IS APPLIED
TIME 1* 2* 3* 4* 5* 6* 7* 8* 9* 10* 11* 12*
Tout 29.5 29.3 29.0 28.8 28.6 28.6 28.9 29.4 30.3 31.2 32.1 32.7
BPT 25.6 26.2 26.2 26.3 26.4 28.1 25.3 25.2 25.0 25.0 24.9 25.0
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 33.2 33.5 33.7 33.6 33.2 32.6 32.0 31.3 30.8 30.5 30.1 29.8
BPT 24.4 23.7 23.4 23.2 23.1 23.2 24.1 24.1 24.2 24.5 24.9 25.2
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 0 %

Date: Thursday 2/ 8/ 2007
NIGHT VENTILATED A/C BUILDINGS
DAILY COOLING LOAD : 182.2kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NIGHT VENTILATION IS APPLIED
TIME 1* 2* 3* 4* 5* 6 7* 8* 9* 10* 11* 12*
Tout 27.9 27.6 27.2 27.0 26.7 26.7 27.0 27.8 28.9 30.1 31.2 32.1
BPT 25.5 26.1 26.2 26.3 26.4 28.1 25.3 25.2 25.1 25.0 25.0 25.1
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.7 33.1 33.3 33.2 32.7 31.9 31.1 30.3 29.6 29.1 28.7 28.3
BPT 24.5 23.7 23.3 23.1 22.9 23.0 23.9 23.8 24.0 24.3 24.7 25.1
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 0 %

Date: Friday 3/ 8/ 2007
NIGHT VENTILATED A/C BUILDINGS
DAILY COOLING LOAD : 191.8kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NIGHT VENTILATION IS APPLIED
TIME 1* 2* 3* 4* 5* 6 7* 8* 9* 10* 11* 12*
Tout 27.8 27.4 27.0 26.7 26.4 26.3 26.7 27.6 28.9 30.4 31.7 32.7
BPT 25.4 26.1 26.2 26.3 26.4 28.1 25.4 25.3 25.1 25.1 25.1 25.1
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 33.4 33.9 34.1 34.0 33.4 32.5 31.5 30.5 29.8 29.2 28.7 28.2
BPT 24.5 23.7 23.3 23.0 22.8 22.9 23.7 23.7 23.8 24.1 24.5 25.0
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 0 %

Date: Saturday 4/ 8/ 2007
NIGHT VENTILATED A/C BUILDINGS
DAILY COOLING LOAD : 187.3kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NIGHT VENTILATION IS APPLIED
TIME 1* 2* 3* 4* 5 6 7* 8* 9* 10* 11* 12*
Tout 27.0 26.6 26.2 25.9 25.6 25.5 25.9 26.9 28.2 29.7 31.0 32.0
BPT 24.9 25.6 25.7 25.8 25.9 27.5 24.8 24.7 24.6 24.5 24.5 24.6
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.8 33.3 33.6 33.4 32.8 31.9 30.8 29.9 29.1 28.5 27.9 27.5
BPT 23.9 23.1 22.7 22.4 22.2 22.3 23.1 23.1 23.2 23.5 24.0 24.4
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 0 %

Date: Sunday 5/ 8/ 2007
NIGHT VENTILATED A/C BUILDINGS
DAILY COOLING LOAD : 187.3kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NIGHT VENTILATION IS APPLIED
TIME 1* 2* 3* 4* 5* 6 7* 8* 9* 10* 11* 12*
Tout 27.3 26.9 26.6 26.2 26.0 25.9 26.3 27.1 28.4 29.7 31.0 31.9
BPT 24.9 25.6 25.7 25.8 25.9 27.6 24.9 24.7 24.6 24.5 24.5 24.6
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.6 33.1 33.3 33.2 32.7 31.8 30.8 29.9 29.2 28.6 28.1 27.7
BPT 24.0 23.2 22.8 22.6 22.4 22.4 23.3 23.2 23.4 23.7 24.1 24.5
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 0 %

Date: Monday 6/ 8/ 2007
NIGHT VENTILATED A/C BUILDINGS
DAILY COOLING LOAD : 157.6kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NIGHT VENTILATION IS APPLIED
TIME 1* 2* 3* 4* 5 6 7* 8* 9* 10* 11* 12*
Tout 27.3 27.0 26.7 26.5 26.3 26.2 26.5 27.2 28.2 29.3 30.2 31.0
BPT 25.5 26.1 26.2 26.3 26.4 28.0 25.2 25.1 24.9 24.8 24.8 24.9
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.5 31.9 32.1 32.0 31.6 30.9 30.1 29.4 28.8 28.4 28.0 27.6
BPT 24.3 23.4 23.1 22.9 22.8 22.9 23.8 23.8 24.0 24.3 24.7 25.1
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 0 %

Date: Tuesday 7/ 8/ 2007
NIGHT VENTILATED A/C BUILDINGS
DAILY COOLING LOAD : 147.0kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NIGHT VENTILATION IS APPLIED
TIME 1* 2* 3* 4* 5* 6 7* 8* 9* 10* 11* 12*
Tout 27.8 27.7 27.5 27.4 27.2 27.2 27.4 27.8 28.3 28.9 29.5 29.9
BPT 25.6 26.2 26.2 26.3 26.3 27.9 25.1 25.0 24.8 24.7 24.6 24.7
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 30.2 30.4 30.5 30.5 30.2 29.8 29.4 29.0 28.7 28.4 28.2 28.0
BPT 24.1 23.3 23.1 22.9 22.9 23.1 24.1 24.1 24.3 24.6 24.9 25.3
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 0 %

Date: Wednesday 8/ 8/ 2007
NIGHT VENTILATED A/C BUILDINGS
DAILY COOLING LOAD : 130.0kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NIGHT VENTILATION IS APPLIED
TIME 1* 2* 3 4 5 6 7* 8* 9* 10* 11* 12*
Tout 26.7 26.4 26.2 25.9 25.8 25.7 26.0 26.6 27.5 28.5 29.4 30.2
BPT 25.6 26.2 26.3 26.3 26.4 28.0 25.3 25.2 25.0 24.9 24.9 25.0
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 30.7 31.0 31.2 31.1 30.7 30.1 29.3 28.7 28.1 27.7 27.4 27.0
BPT 24.4 23.6 23.3 23.1 23.0 23.1 24.0 24.0 24.1 24.4 24.8 25.2
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 0 %

Date: Thursday 9/ 8/ 2007
NIGHT VENTILATED A/C BUILDINGS
DAILY COOLING LOAD : 130.0kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NIGHT VENTILATION IS APPLIED
TIME 1* 2 3 4 5 6 7 8* 9* 10* 11* 12*
Tout 25.8 25.4 25.0 24.7 24.4 24.3 24.7 25.6 26.9 28.4 29.7 30.7
BPT 25.5 26.2 26.3 26.4 26.5 28.1 25.4 25.3 25.1 25.1 25.1 25.2
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.4 31.9 32.1 32.0 31.4 30.5 29.5 28.5 27.8 27.2 26.7 26.2
BPT 24.5 23.7 23.3 23.0 22.9 22.9 23.8 23.7 23.9 24.2 24.6 25.1
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 1 %

Date: Friday 10/ 8/ 2007
NIGHT VENTILATED A/C BUILDINGS
DAILY COOLING LOAD : 159.2kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NIGHT VENTILATION IS APPLIED
TIME 1* 2* 3 4 5 6 7* 8* 9* 10* 11* 12*
Tout 26.7 26.3 26.0 25.6 25.4 25.3 25.7 26.5 27.8 29.1 30.4 31.3
BPT 25.4 26.1 26.2 26.3 26.4 28.0 25.2 25.0 24.8 24.8 24.8 24.9
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.0 32.5 32.7 32.6 32.1 31.2 30.2 29.3 28.6 28.0 27.5 27.1
BPT 24.2 23.3 22.9 22.6 22.5 22.6 23.5 23.5 23.7 24.0 24.4 24.9
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 0 %

Date: Saturday 11/ 8/ 2007
NIGHT VENTILATED A/C BUILDINGS
DAILY COOLING LOAD : 193.9kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NIGHT VENTILATION IS APPLIED
TIME 1* 2* 3* 4* 5* 6 7* 8* 9* 10* 11* 12*
Tout 27.5 27.2 26.9 26.6 26.3 26.3 26.6 27.4 28.6 29.8 30.9 31.8
BPT 24.9 25.6 25.7 25.8 25.9 27.5 24.8 24.6 24.4 24.4 24.3 24.4
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.5 32.9 33.1 33.0 32.5 31.7 30.8 30.0 29.3 28.8 28.3 27.9
BPT 23.8 23.0 22.6 22.4 22.3 22.4 23.2 23.2 23.3 23.6 24.1 24.5
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 0 %

Date: Sunday 12/ 8/ 2007
NIGHT VENTILATED A/C BUILDINGS
DAILY COOLING LOAD : 163.6kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NIGHT VENTILATION IS APPLIED
TIME 1* 2* 3* 4* 5 6 7* 8* 9* 10* 11* 12*
Tout 26.7 26.4 26.0 25.8 25.5 25.5 25.8 26.6 27.7 28.9 30.0 30.9
BPT 25.0 25.6 25.7 25.8 25.9 27.5 24.8 24.6 24.4 24.3 24.3 24.4
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.5 31.9 32.1 32.0 31.5 30.7 29.9 29.1 28.4 27.9 27.5 27.1
BPT 23.8 22.9 22.5 22.3 22.2 22.3 23.2 23.2 23.3 23.7 24.1 24.5
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 0 %

Date: Monday 13/ 8/ 2007
NIGHT VENTILATED A/C BUILDINGS
DAILY COOLING LOAD : 132.6kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NIGHT VENTILATION IS APPLIED
TIME 1* 2* 3 4 5 6 7* 8* 9* 10* 11* 12*
Tout 26.5 26.2 25.9 25.6 25.4 25.4 25.7 26.4 27.4 28.6 29.6 30.4
BPT 25.6 26.2 26.3 26.4 26.4 28.0 25.4 25.2 25.0 24.9 24.9 25.0
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.0 31.4 31.6 31.5 31.0 30.3 29.5 28.7 28.1 27.6 27.2 26.8
BPT 24.4 23.6 23.2 23.0 22.9 23.1 23.9 23.9 24.0 24.3 24.7 25.2
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 1 %

Date: Tuesday 14/ 8/ 2007
NIGHT VENTILATED A/C BUILDINGS
DAILY COOLING LOAD : 131.8kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NIGHT VENTILATION IS APPLIED
TIME 1* 2 3 4 5 6 7 8* 9* 10* 11* 12*
Tout 26.1 25.7 25.4 25.0 24.8 24.7 25.1 25.9 27.2 28.5 29.8 30.7
BPT 25.6 26.2 26.3 26.4 26.5 28.1 25.5 25.3 25.2 25.1 25.1 25.2
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.4 31.9 32.1 32.0 31.5 30.6 29.6 28.7 28.0 27.4 26.9 26.5
BPT 24.6 23.8 23.4 23.1 23.0 23.1 23.9 23.9 24.0 24.3 24.7 25.1
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 1 %

Date: Wednesday 15/ 8/ 2007
NIGHT VENTILATED A/C BUILDINGS
DAILY COOLING LOAD : 151.1kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF NIGHT VENTILATION IS APPLIED
TIME 1* 2* 3 4 5 6 7* 8* 9* 10* 11* 12*
Tout 26.7 26.3 26.0 25.6 25.4 25.3 25.7 26.5 27.8 29.1 30.4 31.3
BPT 25.5 26.2 26.3 26.4 26.5 28.1 25.4 25.3 25.1 25.0 25.0 25.1
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.0 32.5 32.7 32.6 32.1 31.2 30.2 29.3 28.6 28.0 27.5 27.1
BPT 24.5 23.7 23.3 23.0 22.9 23.0 23.8 23.8 23.9 24.2 24.6 25.1
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 0 %

Date: Wednesday 1/ 8/ 2007
A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 190.1kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF BURIED PIPES ARE USED
TIME 1* 2* 3* 4* 5* 6 7* 8* 9* 10* 11* 12*
Tout 29.5 29.3 29.0 28.8 28.6 28.6 28.9 29.4 30.3 31.2 32.1 32.7
BPT 26.5 27.1 27.1 27.2 27.3 29.0 26.2 26.1 25.9 25.8 25.8 25.9
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 33.2 33.5 33.7 33.6 33.2 32.6 32.0 31.3 30.8 30.5 30.1 29.8
BPT 25.3 24.5 24.2 24.1 23.9 24.1 24.9 24.9 25.1 25.4 25.7 26.1
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 14 %

Date: Thursday 2/ 8/ 2007
A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 155.1kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF BURIED PIPES ARE USED
TIME 1* 2* 3* 4 5 6 7* 8* 9* 10* 11* 12*
Tout 27.9 27.6 27.2 27.0 26.7 26.7 27.0 27.8 28.9 30.1 31.2 32.1
BPT 26.3 26.9 27.0 27.1 27.2 28.9 26.1 26.0 25.9 25.8 25.8 25.9
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.7 33.1 33.3 33.2 32.7 31.9 31.1 30.3 29.6 29.1 28.7 28.3
BPT 25.3 24.5 24.1 23.9 23.7 23.8 24.7 24.7 24.8 25.1 25.5 25.9
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 14 %

Date: Friday 3/ 8/ 2007
A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 164.4kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF BURIED PIPES ARE USED
TIME 1* 2* 3* 4 5 6 7* 8* 9* 10* 11* 12*
Tout 27.8 27.4 27.0 26.7 26.4 26.3 26.7 27.6 28.9 30.4 31.7 32.7
BPT 26.3 26.9 27.0 27.2 27.3 28.9 26.2 26.1 26.0 25.9 25.9 26.0
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 33.4 33.9 34.1 34.0 33.4 32.5 31.5 30.5 29.8 29.2 28.7 28.2
BPT 25.3 24.5 24.1 23.9 23.7 23.7 24.6 24.5 24.7 25.0 25.4 25.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 14 %

Date: Saturday 4/ 8/ 2007
A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 163.7kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF BURIED PIPES ARE USED
TIME 1* 2* 3 4 5 6 7* 8* 9* 10* 11* 12*
Tout 27.0 26.6 26.2 25.9 25.6 25.5 25.9 26.9 28.2 29.7 31.0 32.0
BPT 25.6 26.3 26.4 26.6 26.7 28.3 25.6 25.5 25.3 25.3 25.3 25.3
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.8 33.3 33.6 33.4 32.8 31.9 30.8 29.9 29.1 28.5 27.9 27.5
BPT 24.7 23.8 23.4 23.2 23.0 23.0 23.9 23.9 24.0 24.3 24.7 25.2
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 13 %

Date: Sunday 5/ 8/ 2007
A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 161.5kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF BURIED PIPES ARE USED
TIME 1* 2* 3* 4 5 6 7* 8* 9* 10* 11* 12*
Tout 27.3 26.9 26.6 26.2 26.0 25.9 26.3 27.1 28.4 29.7 31.0 31.9
BPT 25.7 26.4 26.5 26.6 26.7 28.3 25.6 25.5 25.4 25.3 25.3 25.4
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.6 33.1 33.3 33.2 32.7 31.8 30.8 29.9 29.2 28.6 28.1 27.7
BPT 24.8 24.0 23.6 23.3 23.2 23.2 24.1 24.0 24.2 24.5 24.9 25.3
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 13 %

Date: Monday 6/ 8/ 2007
A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 134.6kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF BURIED PIPES ARE USED
TIME 1* 2* 3 4 5 6 7* 8* 9* 10* 11* 12*
Tout 27.3 27.0 26.7 26.5 26.3 26.2 26.5 27.2 28.2 29.3 30.2 31.0
BPT 26.2 26.8 26.9 27.0 27.1 28.7 25.9 25.8 25.6 25.5 25.5 25.6
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.5 31.9 32.1 32.0 31.6 30.9 30.1 29.4 28.8 28.4 28.0 27.6
BPT 25.0 24.1 23.8 23.6 23.5 23.6 24.5 24.5 24.7 25.0 25.4 25.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 14 %

Date: Tuesday 7/ 8/ 2007
A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 124.2kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF BURIED PIPES ARE USED
TIME 1* 2* 3* 4* 5* 6 7* 8* 9* 10* 11* 12*
Tout 27.8 27.7 27.5 27.4 27.2 27.2 27.4 27.8 28.3 28.9 29.5 29.9
BPT 26.3 26.8 26.9 26.9 27.0 28.6 25.8 25.6 25.4 25.3 25.3 25.4
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 30.2 30.4 30.5 30.5 30.2 29.8 29.4 29.0 28.7 28.4 28.2 28.0
BPT 24.8 24.0 23.7 23.6 23.6 23.8 24.7 24.7 24.9 25.2 25.6 25.9
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 15 %

Date: Wednesday 8/ 8/ 2007
A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 111.8kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF BURIED PIPES ARE USED
TIME 1* 2 3 4 5 6 7* 8* 9* 10* 11* 12*
Tout 26.7 26.4 26.2 25.9 25.8 25.7 26.0 26.6 27.5 28.5 29.4 30.2
BPT 26.2 26.8 26.9 27.0 27.0 28.6 25.9 25.8 25.6 25.5 25.5 25.6
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 30.7 31.0 31.2 31.1 30.7 30.1 29.3 28.7 28.1 27.7 27.4 27.0
BPT 25.0 24.2 23.9 23.7 23.6 23.7 24.6 24.6 24.7 25.0 25.4 25.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 14 %

Date: Thursday 9/ 8/ 2007
A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 114.6kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6 7 8 9* 10* 11* 12*
Tout 25.8 25.4 25.0 24.7 24.4 24.3 24.7 25.6 26.9 28.4 29.7 30.7
BPT 26.1 26.8 26.9 27.0 27.1 28.7 26.0 25.9 25.7 25.7 25.7 25.8
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.4 31.9 32.1 32.0 31.4 30.5 29.5 28.5 27.8 27.2 26.7 26.2
BPT 25.1 24.3 23.9 23.6 23.5 23.5 24.4 24.3 24.5 24.8 25.2 25.6
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 13 %

Date: Friday 10/ 8/ 2007
A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 139.3kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF BURIED PIPES ARE USED
TIME 1* 2 3 4 5 6 7 8* 9* 10* 11* 12*
Tout 26.7 26.3 26.0 25.6 25.4 25.3 25.7 26.5 27.8 29.1 30.4 31.3
BPT 26.1 26.7 26.8 27.0 27.1 28.7 25.9 25.7 25.5 25.5 25.5 25.5
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.0 32.5 32.7 32.6 32.1 31.2 30.2 29.3 28.6 28.0 27.5 27.1
BPT 24.9 24.0 23.6 23.3 23.2 23.3 24.2 24.2 24.4 24.7 25.1 25.6
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 13 %

Date: Saturday 11/ 8/ 2007
A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 167.1kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF BURIED PIPES ARE USED
TIME 1* 2* 3* 4* 5 6 7* 8* 9* 10* 11* 12*
Tout 27.5 27.2 26.9 26.6 26.3 26.3 26.6 27.4 28.6 29.8 30.9 31.8
BPT 25.7 26.3 26.4 26.6 26.6 28.3 25.6 25.4 25.2 25.1 25.1 25.2
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.5 32.9 33.1 33.0 32.5 31.7 30.8 30.0 29.3 28.8 28.3 27.9
BPT 24.6 23.8 23.4 23.1 23.0 23.1 24.0 24.0 24.1 24.4 24.8 25.3
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 13 %

Date: Sunday 12/ 8/ 2007
A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 143.0kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF BURIED PIPES ARE USED
TIME 1* 2* 3 4 5 6 7* 8* 9* 10* 11* 12*
Tout 26.7 26.4 26.0 25.8 25.5 25.5 25.8 26.6 27.7 28.9 30.0 30.9
BPT 25.6 26.2 26.3 26.4 26.5 28.1 25.4 25.2 25.0 25.0 25.0 25.0
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.5 31.9 32.1 32.0 31.5 30.7 29.9 29.1 28.4 27.9 27.5 27.1
BPT 24.4 23.6 23.2 22.9 22.9 23.0 23.8 23.8 24.0 24.3 24.7 25.2
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 13 %

Date: Monday 13/ 8/ 2007
A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 115.2kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF BURIED PIPES ARE USED
TIME 1* 2 3 4 5 6 7 8* 9* 10* 11* 12*
Tout 26.5 26.2 25.9 25.6 25.4 25.4 25.7 26.4 27.4 28.6 29.6 30.4
BPT 26.2 26.8 26.9 27.0 27.1 28.7 26.0 25.8 25.6 25.6 25.6 25.6
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.0 31.4 31.6 31.5 31.0 30.3 29.5 28.7 28.1 27.6 27.2 26.8
BPT 25.0 24.2 23.9 23.6 23.6 23.7 24.5 24.5 24.7 25.0 25.4 25.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 14 %

Date: Tuesday 14/ 8/ 2007
A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 115.1kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6 7 8* 9* 10* 11* 12*
Tout 26.1 25.7 25.4 25.0 24.8 24.7 25.1 25.9 27.2 28.5 29.8 30.7
BPT 26.2 26.8 26.9 27.0 27.1 28.7 26.1 25.9 25.8 25.7 25.7 25.8
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.4 31.9 32.1 32.0 31.5 30.6 29.6 28.7 28.0 27.4 26.9 26.5
BPT 25.2 24.4 24.0 23.7 23.6 23.7 24.5 24.5 24.6 24.9 25.3 25.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 13 %

Date: Wednesday 15/ 8/ 2007
A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 131.7kWh/Day
CALCULATED BALANCE TEMPERATURES (BPT) IF BURIED PIPES ARE USED
TIME 1* 2 3 4 5 6 7 8* 9* 10* 11* 12*
Tout 26.7 26.3 26.0 25.6 25.4 25.3 25.7 26.5 27.8 29.1 30.4 31.3
BPT 26.2 26.8 26.9 27.1 27.2 28.8 26.1 25.9 25.8 25.7 25.7 25.8
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.0 32.5 32.7 32.6 32.1 31.2 30.2 29.3 28.6 28.0 27.5 27.1
BPT 25.2 24.4 24.0 23.7 23.6 23.7 24.5 24.5 24.6 24.9 25.3 25.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 13 %

Date: Wednesday 1/ 8/ 2007
A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 190.1kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1* 2* 3* 4* 5* 6 7* 8* 9* 10* 11* 12*
Tout 29.5 29.3 29.0 28.8 28.6 28.6 28.9 29.4 30.3 31.2 32.1 32.7
BPT 26.5 27.1 27.1 27.2 27.3 29.0 26.2 26.1 25.9 25.8 25.8 25.9
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 33.2 33.5 33.7 33.6 33.2 32.6 32.0 31.3 30.8 30.5 30.1 29.8
BPT 25.3 24.5 24.2 24.1 23.9 24.1 24.9 24.9 25.1 25.4 25.7 26.1
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 14 %

Date: Thursday 2/ 8/ 2007
A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 155.1kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1* 2* 3* 4 5 6 7* 8* 9* 10* 11* 12*
Tout 27.9 27.6 27.2 27.0 26.7 26.7 27.0 27.8 28.9 30.1 31.2 32.1
BPT 26.3 26.9 27.0 27.1 27.2 28.9 26.1 26.0 25.9 25.8 25.8 25.9
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.7 33.1 33.3 33.2 32.7 31.9 31.1 30.3 29.6 29.1 28.7 28.3
BPT 25.3 24.5 24.1 23.9 23.7 23.8 24.7 24.7 24.8 25.1 25.5 25.9
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 14 %

Date: Friday 3/ 8/ 2007
A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 164.4kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1* 2* 3* 4 5 6 7* 8* 9* 10* 11* 12*
Tout 27.8 27.4 27.0 26.7 26.4 26.3 26.7 27.6 28.9 30.4 31.7 32.7
BPT 26.3 26.9 27.0 27.2 27.3 28.9 26.2 26.1 26.0 25.9 25.9 26.0
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 33.4 33.9 34.1 34.0 33.4 32.5 31.5 30.5 29.8 29.2 28.7 28.2
BPT 25.3 24.5 24.1 23.9 23.7 23.7 24.6 24.5 24.7 25.0 25.4 25.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 14 %

Date: Saturday 4/ 8/ 2007
A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 162.4kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1* 2* 3 4 5 6 7* 8* 9* 10* 11* 12*
Tout 27.0 26.6 26.2 25.9 25.6 25.5 25.9 26.9 28.2 29.7 31.0 32.0
BPT 25.7 26.4 26.5 26.6 26.7 28.3 25.6 25.5 25.4 25.3 25.3 25.4
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.8 33.3 33.6 33.4 32.8 31.9 30.8 29.9 29.1 28.5 27.9 27.5
BPT 24.7 23.9 23.5 23.2 23.0 23.1 23.9 23.9 24.0 24.3 24.8 25.2
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 13 %

Date: Sunday 5/ 8/ 2007
A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 161.5kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1* 2* 3* 4 5 6 7* 8* 9* 10* 11* 12*
Tout 27.3 26.9 26.6 26.2 26.0 25.9 26.3 27.1 28.4 29.7 31.0 31.9
BPT 25.7 26.4 26.5 26.6 26.7 28.3 25.6 25.5 25.4 25.3 25.3 25.4
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.6 33.1 33.3 33.2 32.7 31.8 30.8 29.9 29.2 28.6 28.1 27.7
BPT 24.8 24.0 23.6 23.3 23.2 23.2 24.1 24.0 24.2 24.5 24.9 25.3
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 13 %

Date: Monday 6/ 8/ 2007
A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 134.6kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1* 2* 3 4 5 6 7* 8* 9* 10* 11* 12*
Tout 27.3 27.0 26.7 26.5 26.3 26.2 26.5 27.2 28.2 29.3 30.2 31.0
BPT 26.2 26.8 26.9 27.0 27.1 28.7 25.9 25.8 25.6 25.5 25.5 25.6
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.5 31.9 32.1 32.0 31.6 30.9 30.1 29.4 28.8 28.4 28.0 27.6
BPT 25.0 24.1 23.8 23.6 23.5 23.6 24.5 24.5 24.7 25.0 25.4 25.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 14 %

Date: Tuesday 7/ 8/ 2007
A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 124.2kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1* 2* 3* 4* 5* 6 7* 8* 9* 10* 11* 12*
Tout 27.8 27.7 27.5 27.4 27.2 27.2 27.4 27.8 28.3 28.9 29.5 29.9
BPT 26.3 26.8 26.9 26.9 27.0 28.6 25.8 25.6 25.4 25.3 25.3 25.4
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 30.2 30.4 30.5 30.5 30.2 29.8 29.4 29.0 28.7 28.4 28.2 28.0
BPT 24.8 24.0 23.7 23.6 23.6 23.8 24.7 24.7 24.9 25.2 25.6 25.9
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 15 %

Date: Wednesday 8/ 8/ 2007
A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 110.8kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1* 2 3 4 5 6 7* 8* 9* 10* 11* 12*
Tout 26.7 26.4 26.2 25.9 25.8 25.7 26.0 26.6 27.5 28.5 29.4 30.2
BPT 26.3 26.8 26.9 27.0 27.1 28.7 26.0 25.8 25.6 25.6 25.6 25.6
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 30.7 31.0 31.2 31.1 30.7 30.1 29.3 28.7 28.1 27.7 27.4 27.0
BPT 25.0 24.2 23.9 23.7 23.6 23.8 24.6 24.6 24.8 25.1 25.5 25.9
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 15 %

Date: Thursday 9/ 8/ 2007
A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 112.7kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6 7 8 9* 10* 11* 12*
Tout 25.8 25.4 25.0 24.7 24.4 24.3 24.7 25.6 26.9 28.4 29.7 30.7
BPT 26.2 26.8 26.9 27.1 27.2 28.7 26.1 26.0 25.8 25.8 25.8 25.8
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.4 31.9 32.1 32.0 31.4 30.5 29.5 28.5 27.8 27.2 26.7 26.2
BPT 25.2 24.4 24.0 23.7 23.5 23.6 24.4 24.4 24.6 24.8 25.3 25.7
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 14 %

Date: Friday 10/ 8/ 2007
A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 138.0kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1* 2 3 4 5 6 7 8* 9* 10* 11* 12*
Tout 26.7 26.3 26.0 25.6 25.4 25.3 25.7 26.5 27.8 29.1 30.4 31.3
BPT 26.1 26.8 26.9 27.0 27.1 28.7 25.9 25.8 25.6 25.5 25.5 25.6
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.0 32.5 32.7 32.6 32.1 31.2 30.2 29.3 28.6 28.0 27.5 27.1
BPT 24.9 24.0 23.6 23.4 23.2 23.3 24.3 24.2 24.4 24.7 25.2 25.7
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 14 %

Date: Saturday 11/ 8/ 2007
A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 167.1kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1* 2* 3* 4* 5 6 7* 8* 9* 10* 11* 12*
Tout 27.5 27.2 26.9 26.6 26.3 26.3 26.6 27.4 28.6 29.8 30.9 31.8
BPT 25.7 26.3 26.4 26.6 26.6 28.3 25.6 25.4 25.2 25.1 25.1 25.2
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.5 32.9 33.1 33.0 32.5 31.7 30.8 30.0 29.3 28.8 28.3 27.9
BPT 24.6 23.8 23.4 23.1 23.0 23.1 24.0 24.0 24.1 24.4 24.8 25.3
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 13 %

Date: Sunday 12/ 8/ 2007
A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 141.7kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1* 2* 3 4 5 6 7* 8* 9* 10* 11* 12*
Tout 26.7 26.4 26.0 25.8 25.5 25.5 25.8 26.6 27.7 28.9 30.0 30.9
BPT 25.7 26.3 26.4 26.5 26.6 28.2 25.5 25.3 25.1 25.0 25.0 25.1
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.5 31.9 32.1 32.0 31.5 30.7 29.9 29.1 28.4 27.9 27.5 27.1
BPT 24.5 23.6 23.2 23.0 22.9 23.0 23.9 23.9 24.0 24.4 24.8 25.2
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 14 %

Date: Monday 13/ 8/ 2007
A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 113.9kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1* 2 3 4 5 6 7 8* 9* 10* 11* 12*
Tout 26.5 26.2 25.9 25.6 25.4 25.4 25.7 26.4 27.4 28.6 29.6 30.4
BPT 26.2 26.8 26.9 27.0 27.1 28.7 26.0 25.9 25.7 25.6 25.6 25.7
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.0 31.4 31.6 31.5 31.0 30.3 29.5 28.7 28.1 27.6 27.2 26.8
BPT 25.1 24.3 23.9 23.7 23.6 23.7 24.6 24.5 24.7 25.0 25.4 25.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 15 %

Date: Tuesday 14/ 8/ 2007
A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 113.5kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6 7 8 9* 10* 11* 12*
Tout 26.1 25.7 25.4 25.0 24.8 24.7 25.1 25.9 27.2 28.5 29.8 30.7
BPT 26.3 26.9 27.0 27.1 27.2 28.8 26.2 26.0 25.8 25.8 25.8 25.9
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 31.4 31.9 32.1 32.0 31.5 30.6 29.6 28.7 28.0 27.4 26.9 26.5
BPT 25.3 24.5 24.1 23.8 23.7 23.8 24.6 24.5 24.7 25.0 25.4 25.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 15 %

Date: Wednesday 15/ 8/ 2007
A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 130.4kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1* 2 3 4 5 6 7 8* 9* 10* 11* 12*
Tout 26.7 26.3 26.0 25.6 25.4 25.3 25.7 26.5 27.8 29.1 30.4 31.3
BPT 26.3 26.9 27.0 27.1 27.2 28.8 26.2 26.0 25.8 25.8 25.8 25.8
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 32.0 32.5 32.7 32.6 32.1 31.2 30.2 29.3 28.6 28.0 27.5 27.1
BPT 25.2 24.4 24.0 23.7 23.6 23.7 24.5 24.5 24.6 25.0 25.4 25.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 14 %

Date: Wednesday 1/ 8/ 2007
NIGHT VENTILATED NON A/C BUILDINGS
DAILY COOLING LOAD : 267.7kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF NIGHT VENTILATION IS APPLIED
TIME 1* 2* 3* 4* 5* 6* 7* 8* 9* 10* 11* 12*
Tout 29.5 29.3 29.0 28.8 28.6 28.6 28.9 29.4 30.3 31.2 32.1 32.7
BPT 28.2 27.7 27.6 27.5 27.5 25.8 28.5 28.6 28.8 28.8 28.9 28.8
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 33.2 33.5 33.7 33.6 33.2 32.6 32.0 31.3 30.8 30.5 30.1 29.8
BPT 29.4 30.1 30.4 30.6 30.7 30.6 29.7 29.7 29.6 29.3 28.9 28.6
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 0 %

Date: Thursday 2/ 8/ 2007
NIGHT VENTILATED NON A/C BUILDINGS
DAILY COOLING LOAD : 172.2kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF NIGHT VENTILATION IS APPLIED
TIME 1 2 3 4 5 6* 7 8 9* 10* 11* 12*
Tout 27.9 27.6 27.2 27.0 26.7 26.7 27.0 27.8 28.9 30.1 31.2 32.1
BPT 28.3 27.7 27.7 27.5 27.5 25.9 28.5 28.6 28.7 28.8 28.8 28.7
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21 22 23 24
Tout 32.7 33.1 33.3 33.2 32.7 31.9 31.1 30.3 29.6 29.1 28.7 28.3
BPT 29.3 30.1 30.4 30.7 30.8 30.7 29.9 29.9 29.8 29.5 29.1 28.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 5 %

Date: Friday 3/ 8/ 2007
NIGHT VENTILATED NON A/C BUILDINGS
DAILY COOLING LOAD : 183.6kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF NIGHT VENTILATION IS APPLIED
TIME 1 2 3 4 5 6* 7 8 9* 10* 11* 12*
Tout 27.8 27.4 27.0 26.7 26.4 26.3 26.7 27.6 28.9 30.4 31.7 32.7
BPT 28.4 27.8 27.7 27.5 27.4 25.8 28.5 28.6 28.7 28.8 28.8 28.7
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21 22 23 24
Tout 33.4 33.9 34.1 34.0 33.4 32.5 31.5 30.5 29.8 29.2 28.7 28.2
BPT 29.3 30.1 30.5 30.7 30.9 30.9 30.0 30.1 30.0 29.7 29.3 28.9
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 4 %

Date: Saturday 4/ 8/ 2007
NIGHT VENTILATED NON A/C BUILDINGS
DAILY COOLING LOAD : 165.6kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF NIGHT VENTILATION IS APPLIED
TIME 1 2 3 4 5 6 7 8 9 10* 11* 12*
Tout 27.0 26.6 26.2 25.9 25.6 25.5 25.9 26.9 28.2 29.7 31.0 32.0
BPT 29.0 28.4 28.3 28.1 28.0 26.5 29.1 29.2 29.4 29.4 29.4 29.3
TIME 13* 14* 15* 16* 17* 18* 19* 20 21 22 23 24
Tout 32.8 33.3 33.6 33.4 32.8 31.9 30.8 29.9 29.1 28.5 27.9 27.5
BPT 30.0 30.8 31.2 31.4 31.6 31.5 30.7 30.7 30.6 30.3 29.9 29.5
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 12 %

Date: Sunday 5/ 8/ 2007
NIGHT VENTILATED NON A/C BUILDINGS
DAILY COOLING LOAD : 162.2kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF NIGHT VENTILATION IS APPLIED
TIME 1 2 3 4 5 6 7 8 9 10* 11* 12*
Tout 27.3 26.9 26.6 26.2 26.0 25.9 26.3 27.1 28.4 29.7 31.0 31.9
BPT 28.9 28.3 28.2 28.0 27.9 26.4 29.0 29.1 29.2 29.3 29.3 29.2
TIME 13* 14* 15* 16* 17* 18* 19* 20 21 22 23 24
Tout 32.6 33.1 33.3 33.2 32.7 31.8 30.8 29.9 29.2 28.6 28.1 27.7
BPT 29.8 30.6 30.9 31.2 31.3 31.3 30.5 30.5 30.4 30.1 29.7 29.3
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 13 %

Date: Monday 6/ 8/ 2007
NIGHT VENTILATED NON A/C BUILDINGS
DAILY COOLING LOAD : 139.3kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF NIGHT VENTILATION IS APPLIED
TIME 1 2 3 4 5 6* 7 8 9 10* 11* 12*
Tout 27.3 27.0 26.7 26.5 26.3 26.2 26.5 27.2 28.2 29.3 30.2 31.0
BPT 28.4 27.7 27.7 27.6 27.5 26.0 28.6 28.7 28.9 29.0 29.0 28.9
TIME 13* 14* 15* 16* 17* 18* 19* 20 21 22 23 24
Tout 31.5 31.9 32.1 32.0 31.6 30.9 30.1 29.4 28.8 28.4 28.0 27.6
BPT 29.5 30.3 30.7 30.8 31.0 30.8 30.0 30.0 29.8 29.5 29.1 28.7
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 11 %

Date: Tuesday 7/ 8/ 2007
NIGHT VENTILATED NON A/C BUILDINGS
DAILY COOLING LOAD : 45.0kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF NIGHT VENTILATION IS APPLIED
TIME 1 2* 3 4 5 6* 7 8 9 10 11* 12*
Tout 27.8 27.7 27.5 27.4 27.2 27.2 27.4 27.8 28.3 28.9 29.5 29.9
BPT 28.2 27.7 27.7 27.6 27.6 26.0 28.7 28.9 29.1 29.1 29.2 29.1
TIME 13* 14* 15 16 17 18 19 20 21 22 23 24
Tout 30.2 30.4 30.5 30.5 30.2 29.8 29.4 29.0 28.7 28.4 28.2 28.0
BPT 29.7 30.4 30.7 30.8 30.8 30.6 29.7 29.7 29.5 29.2 28.9 28.5
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 69 %

Date: Wednesday 8/ 8/ 2007
NIGHT VENTILATED NON A/C BUILDINGS
DAILY COOLING LOAD : 75.1kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF NIGHT VENTILATION IS APPLIED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 26.7 26.4 26.2 25.9 25.8 25.7 26.0 26.6 27.5 28.5 29.4 30.2
BPT 28.3 27.8 27.7 27.6 27.5 26.0 28.6 28.8 28.9 29.0 29.0 28.9
TIME 13* 14* 15* 16* 17 18 19 20 21 22 23 24
Tout 30.7 31.0 31.2 31.1 30.7 30.1 29.3 28.7 28.1 27.7 27.4 27.0
BPT 29.5 30.3 30.6 30.8 30.9 30.7 29.9 29.9 29.8 29.5 29.1 28.7
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 42 %

Date: Thursday 9/ 8/ 2007
NIGHT VENTILATED NON A/C BUILDINGS
DAILY COOLING LOAD : 96.4kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF NIGHT VENTILATION IS APPLIED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 25.8 25.4 25.0 24.7 24.4 24.3 24.7 25.6 26.9 28.4 29.7 30.7
BPT 28.5 27.9 27.8 27.7 27.6 26.1 28.6 28.7 28.9 28.9 28.9 28.9
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 31.4 31.9 32.1 32.0 31.4 30.5 29.5 28.5 27.8 27.2 26.7 26.2
BPT 29.5 30.3 30.7 30.9 31.1 31.0 30.2 30.2 30.1 29.8 29.4 29.0
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 26 %

Date: Friday 10/ 8/ 2007
NIGHT VENTILATED NON A/C BUILDINGS
DAILY COOLING LOAD : 109.7kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF NIGHT VENTILATION IS APPLIED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 26.7 26.3 26.0 25.6 25.4 25.3 25.7 26.5 27.8 29.1 30.4 31.3
BPT 28.6 27.9 27.8 27.7 27.6 26.1 28.7 28.9 29.1 29.2 29.2 29.1
TIME 13* 14* 15* 16* 17* 18* 19 20 21 22 23 24
Tout 32.0 32.5 32.7 32.6 32.1 31.2 30.2 29.3 28.6 28.0 27.5 27.1
BPT 29.7 30.6 31.0 31.2 31.3 31.2 30.4 30.4 30.2 29.9 29.5 29.0
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 31 %

Date: Saturday 11/ 8/ 2007
NIGHT VENTILATED NON A/C BUILDINGS
DAILY COOLING LOAD : 164.3kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF NIGHT VENTILATION IS APPLIED
TIME 1 2 3 4 5 6 7 8 9 10* 11* 12*
Tout 27.5 27.2 26.9 26.6 26.3 26.3 26.6 27.4 28.6 29.8 30.9 31.8
BPT 28.9 28.3 28.2 28.1 28.0 26.4 29.0 29.2 29.4 29.4 29.4 29.4
TIME 13* 14* 15* 16* 17* 18* 19* 20 21 22 23 24
Tout 32.5 32.9 33.1 33.0 32.5 31.7 30.8 30.0 29.3 28.8 28.3 27.9
BPT 30.0 30.8 31.1 31.4 31.5 31.4 30.5 30.6 30.4 30.1 29.7 29.3
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 15 %

Date: Sunday 12/ 8/ 2007
NIGHT VENTILATED NON A/C BUILDINGS
DAILY COOLING LOAD : 92.0kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF NIGHT VENTILATION IS APPLIED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 26.7 26.4 26.0 25.8 25.5 25.5 25.8 26.6 27.7 28.9 30.0 30.9
BPT 29.0 28.4 28.3 28.2 28.1 26.6 29.2 29.4 29.5 29.6 29.6 29.5
TIME 13* 14* 15* 16* 17 18 19 20 21 22 23 24
Tout 31.5 31.9 32.1 32.0 31.5 30.7 29.9 29.1 28.4 27.9 27.5 27.1
BPT 30.1 30.9 31.3 31.5 31.6 31.5 30.7 30.7 30.5 30.2 29.8 29.4
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 44 %

Date: Monday 13/ 8/ 2007
NIGHT VENTILATED NON A/C BUILDINGS
DAILY COOLING LOAD : 93.8kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF NIGHT VENTILATION IS APPLIED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 26.5 26.2 25.9 25.6 25.4 25.4 25.7 26.4 27.4 28.6 29.6 30.4
BPT 28.4 27.8 27.7 27.6 27.6 26.0 28.6 28.8 28.9 29.0 29.0 28.9
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 31.0 31.4 31.6 31.5 31.0 30.3 29.5 28.7 28.1 27.6 27.2 26.8
BPT 29.5 30.3 30.6 30.8 30.9 30.8 30.0 30.0 29.9 29.6 29.2 28.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 30 %

Date: Tuesday 14/ 8/ 2007
NIGHT VENTILATED NON A/C BUILDINGS
DAILY COOLING LOAD : 95.7kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF NIGHT VENTILATION IS APPLIED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 26.1 25.7 25.4 25.0 24.8 24.7 25.1 25.9 27.2 28.5 29.8 30.7
BPT 28.4 27.9 27.8 27.6 27.5 26.0 28.5 28.7 28.8 28.9 28.9 28.8
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 31.4 31.9 32.1 32.0 31.5 30.6 29.6 28.7 28.0 27.4 26.9 26.5
BPT 29.4 30.2 30.5 30.8 30.9 30.8 30.1 30.1 30.0 29.7 29.3 28.9
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 28 %

Date: Wednesday 15/ 8/ 2007
NIGHT VENTILATED NON A/C BUILDINGS
DAILY COOLING LOAD : 140.3kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF NIGHT VENTILATION IS APPLIED
TIME 1 2 3 4 5 6 7 8 9 10* 11* 12*
Tout 26.7 26.3 26.0 25.6 25.4 25.3 25.7 26.5 27.8 29.1 30.4 31.3
BPT 28.4 27.8 27.7 27.6 27.5 26.0 28.5 28.7 28.9 28.9 28.9 28.8
TIME 13* 14* 15* 16* 17* 18* 19* 20 21 22 23 24
Tout 32.0 32.5 32.7 32.6 32.1 31.2 30.2 29.3 28.6 28.0 27.5 27.1
BPT 29.4 30.2 30.6 30.9 30.9 30.9 30.1 30.1 30.0 29.7 29.3 28.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF NIGHT VENTIL IS APPLIED : 8 %

Date: Wednesday 1/ 8/ 2007
NON A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 210.1kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF BURIED PIPES ARE USED
TIME 1* 2* 3* 4* 5* 6* 7 8 9* 10* 11* 12*
Tout 29.5 29.3 29.0 28.8 28.6 28.6 28.9 29.4 30.3 31.2 32.1 32.7
BPT 29.1 28.5 28.5 28.4 28.3 26.6 29.4 29.5 29.6 29.7 29.7 29.6
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 33.2 33.5 33.7 33.6 33.2 32.6 32.0 31.3 30.8 30.5 30.1 29.8
BPT 30.2 31.0 31.2 31.4 31.5 31.4 30.6 30.6 30.4 30.2 29.8 29.4
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 5 %

Date: Thursday 2/ 8/ 2007
NON A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 133.6kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6* 7 8 9 10* 11* 12*
Tout 27.9 27.6 27.2 27.0 26.7 26.7 27.0 27.8 28.9 30.1 31.2 32.1
BPT 29.1 28.5 28.4 28.3 28.2 26.6 29.3 29.4 29.5 29.6 29.6 29.5
TIME 13* 14* 15* 16* 17* 18* 19* 20 21 22 23 24
Tout 32.7 33.1 33.3 33.2 32.7 31.9 31.1 30.3 29.6 29.1 28.7 28.3
BPT 30.1 30.9 31.2 31.4 31.6 31.5 30.7 30.7 30.6 30.3 29.9 29.5
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 26 %

Date: Friday 3/ 8/ 2007
NON A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 143.3kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6 7 8 9 10* 11* 12*
Tout 27.8 27.4 27.0 26.7 26.4 26.3 26.7 27.6 28.9 30.4 31.7 32.7
BPT 29.2 28.6 28.5 28.4 28.3 26.7 29.3 29.4 29.5 29.6 29.6 29.5
TIME 13* 14* 15* 16* 17* 18* 19* 20 21 22 23 24
Tout 33.4 33.9 34.1 34.0 33.4 32.5 31.5 30.5 29.8 29.2 28.7 28.2
BPT 30.1 30.9 31.3 31.5 31.7 31.7 30.9 30.9 30.8 30.5 30.1 29.7
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 25 %

Date: Saturday 4/ 8/ 2007
NON A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 110.4kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 27.0 26.6 26.2 25.9 25.6 25.5 25.9 26.9 28.2 29.7 31.0 32.0
BPT 29.7 29.1 29.0 28.8 28.7 27.2 29.8 29.9 30.0 30.1 30.1 30.0
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 32.8 33.3 33.6 33.4 32.8 31.9 30.8 29.9 29.1 28.5 27.9 27.5
BPT 30.6 31.5 31.8 32.1 32.3 32.2 31.4 31.4 31.3 31.0 30.6 30.2
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 41 %

Date: Sunday 5/ 8/ 2007
NON A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 106.6kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 27.3 26.9 26.6 26.2 26.0 25.9 26.3 27.1 28.4 29.7 31.0 31.9
BPT 29.6 29.0 28.9 28.8 28.7 27.1 29.7 29.8 30.0 30.0 30.0 29.9
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 32.6 33.1 33.3 33.2 32.7 31.8 30.8 29.9 29.2 28.6 28.1 27.7
BPT 30.5 31.3 31.7 31.9 32.1 32.0 31.2 31.3 31.1 30.9 30.5 30.1
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 43 %

Date: Monday 6/ 8/ 2007
NON A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 75.6kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 27.3 27.0 26.7 26.5 26.3 26.2 26.5 27.2 28.2 29.3 30.2 31.0
BPT 29.0 28.4 28.4 28.3 28.2 26.7 29.3 29.4 29.6 29.7 29.7 29.6
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 31.5 31.9 32.1 32.0 31.6 30.9 30.1 29.4 28.8 28.4 28.0 27.6
BPT 30.2 31.0 31.3 31.5 31.6 31.5 30.7 30.7 30.5 30.2 29.8 29.4
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 52 %

Date: Tuesday 7/ 8/ 2007
NON A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 8.4kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6* 7 8 9 10 11 12*
Tout 27.8 27.7 27.5 27.4 27.2 27.2 27.4 27.8 28.3 28.9 29.5 29.9
BPT 28.8 28.3 28.3 28.2 28.2 26.6 29.3 29.5 29.7 29.8 29.8 29.7
TIME 13 14 15 16 17 18 19 20 21 22 23 24
Tout 30.2 30.4 30.5 30.5 30.2 29.8 29.4 29.0 28.7 28.4 28.2 28.0
BPT 30.3 31.0 31.3 31.4 31.4 31.3 30.4 30.3 30.2 29.9 29.5 29.2
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 94 %

Date: Wednesday 8/ 8/ 2007
NON A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 45.5kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11 12*
Tout 26.7 26.4 26.2 25.9 25.8 25.7 26.0 26.6 27.5 28.5 29.4 30.2
BPT 28.9 28.3 28.3 28.2 28.1 26.6 29.2 29.3 29.5 29.6 29.6 29.5
TIME 13* 14* 15* 16 17 18 19 20 21 22 23 24
Tout 30.7 31.0 31.2 31.1 30.7 30.1 29.3 28.7 28.1 27.7 27.4 27.0
BPT 30.1 30.8 31.2 31.3 31.4 31.3 30.5 30.5 30.3 30.0 29.7 29.3
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 65 %

Date: Thursday 9/ 8/ 2007
NON A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 72.4kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 25.8 25.4 25.0 24.7 24.4 24.3 24.7 25.6 26.9 28.4 29.7 30.7
BPT 29.1 28.4 28.3 28.2 28.1 26.6 29.1 29.3 29.4 29.5 29.5 29.4
TIME 13* 14* 15* 16* 17 18 19 20 21 22 23 24
Tout 31.4 31.9 32.1 32.0 31.4 30.5 29.5 28.5 27.8 27.2 26.7 26.2
BPT 30.0 30.8 31.2 31.4 31.6 31.5 30.7 30.7 30.6 30.3 29.9 29.5
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 45 %

Date: Friday 10/ 8/ 2007
NON A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 99.1kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 26.7 26.3 26.0 25.6 25.4 25.3 25.7 26.5 27.8 29.1 30.4 31.3
BPT 29.2 28.6 28.5 28.3 28.2 26.7 29.4 29.5 29.7 29.8 29.8 29.7
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 32.0 32.5 32.7 32.6 32.1 31.2 30.2 29.3 28.6 28.0 27.5 27.1
BPT 30.3 31.2 31.6 31.8 32.0 31.9 31.0 31.0 30.8 30.5 30.1 29.6
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 38 %

Date: Saturday 11/ 8/ 2007
NON A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 108.0kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 27.5 27.2 26.9 26.6 26.3 26.3 26.6 27.4 28.6 29.8 30.9 31.8
BPT 29.6 29.0 28.9 28.8 28.7 27.2 29.8 30.0 30.1 30.2 30.2 30.1
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 32.5 32.9 33.1 33.0 32.5 31.7 30.8 30.0 29.3 28.8 28.3 27.9
BPT 30.7 31.5 31.9 32.1 32.2 32.1 31.3 31.3 31.2 30.9 30.5 30.0
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 44 %

Date: Sunday 12/ 8/ 2007
NON A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 56.5kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11 12*
Tout 26.7 26.4 26.0 25.8 25.5 25.5 25.8 26.6 27.7 28.9 30.0 30.9
BPT 29.6 29.0 28.9 28.8 28.7 27.2 29.8 30.0 30.1 30.2 30.2 30.1
TIME 13* 14* 15* 16 17 18 19 20 21 22 23 24
Tout 31.5 31.9 32.1 32.0 31.5 30.7 29.9 29.1 28.4 27.9 27.5 27.1
BPT 30.7 31.5 31.9 32.1 32.2 32.1 31.3 31.3 31.1 30.8 30.4 30.0
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 65 %

Date: Monday 13/ 8/ 2007
NON A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 69.9kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 26.5 26.2 25.9 25.6 25.4 25.4 25.7 26.4 27.4 28.6 29.6 30.4
BPT 29.0 28.4 28.3 28.2 28.1 26.6 29.1 29.3 29.5 29.6 29.6 29.5
TIME 13* 14* 15* 16* 17 18 19 20 21 22 23 24
Tout 31.0 31.4 31.6 31.5 31.0 30.3 29.5 28.7 28.1 27.6 27.2 26.8
BPT 30.1 30.8 31.2 31.4 31.5 31.4 30.6 30.6 30.4 30.1 29.8 29.3
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 47 %

Date: Tuesday 14/ 8/ 2007
NON A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 86.4kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 26.1 25.7 25.4 25.0 24.8 24.7 25.1 25.9 27.2 28.5 29.8 30.7
BPT 29.0 28.4 28.3 28.2 28.1 26.6 29.0 29.2 29.4 29.4 29.4 29.4
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 31.4 31.9 32.1 32.0 31.5 30.6 29.6 28.7 28.0 27.4 26.9 26.5
BPT 29.9 30.7 31.1 31.3 31.4 31.4 30.6 30.6 30.5 30.2 29.8 29.4
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 35 %

Date: Wednesday 15/ 8/ 2007
NON A/C BUILDINGS USING BURIED PIPES
DAILY COOLING LOAD : 93.6kWh/Day
CALCULATED BALANCE TEMPERATURES, (BPT), IF BURIED PIPES ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 26.7 26.3 26.0 25.6 25.4 25.3 25.7 26.5 27.8 29.1 30.4 31.3
BPT 29.1 28.5 28.4 28.2 28.1 26.6 29.1 29.3 29.5 29.5 29.6 29.5
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 32.0 32.5 32.7 32.6 32.1 31.2 30.2 29.3 28.6 28.0 27.5 27.1
BPT 30.0 30.8 31.2 31.5 31.6 31.5 30.7 30.7 30.6 30.3 29.9 29.5
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
PERCENTAGE OF ENERGY CONSERVATION IF BURIED PIPES ARE USED : 38 %

Date: Wednesday 1/ 8/ 2007
NON A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 210.1kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1* 2* 3* 4* 5* 6* 7 8 9* 10* 11* 12*
Tout 29.5 29.3 29.0 28.8 28.6 28.6 28.9 29.4 30.3 31.2 32.1 32.7
BPT 29.1 28.6 28.5 28.4 28.4 26.7 29.4 29.5 29.7 29.7 29.8 29.7
TIME 13* 14* 15* 16* 17* 18* 19* 20* 21* 22* 23* 24*
Tout 33.2 33.5 33.7 33.6 33.2 32.6 32.0 31.3 30.8 30.5 30.1 29.8
BPT 30.3 31.0 31.3 31.4 31.6 31.5 30.6 30.6 30.5 30.2 29.8 29.5
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 5 %

Date: Thursday 2/ 8/ 2007
NON A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 133.6kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6* 7 8 9 10* 11* 12*
Tout 27.9 27.6 27.2 27.0 26.7 26.7 27.0 27.8 28.9 30.1 31.2 32.1
BPT 29.2 28.6 28.5 28.4 28.3 26.7 29.3 29.4 29.6 29.6 29.6 29.6
TIME 13* 14* 15* 16* 17* 18* 19* 20 21 22 23 24
Tout 32.7 33.1 33.3 33.2 32.7 31.9 31.1 30.3 29.6 29.1 28.7 28.3
BPT 30.2 30.9 31.3 31.5 31.6 31.6 30.7 30.7 30.6 30.3 30.0 29.6
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 26 %

Date: Friday 3/ 8/ 2007
NON A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 143.3kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6 7 8 9 10* 11* 12*
Tout 27.8 27.4 27.0 26.7 26.4 26.3 26.7 27.6 28.9 30.4 31.7 32.7
BPT 29.3 28.6 28.5 28.4 28.3 26.7 29.3 29.4 29.6 29.6 29.6 29.6
TIME 13* 14* 15* 16* 17* 18* 19* 20 21 22 23 24
Tout 33.4 33.9 34.1 34.0 33.4 32.5 31.5 30.5 29.8 29.2 28.7 28.2
BPT 30.2 31.0 31.3 31.6 31.8 31.7 30.9 30.9 30.8 30.5 30.1 29.7
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 25 %

Date: Saturday 4/ 8/ 2007
NON A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 109.2kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 27.0 26.6 26.2 25.9 25.6 25.5 25.9 26.9 28.2 29.7 31.0 32.0
BPT 29.8 29.2 29.1 29.0 28.8 27.3 29.9 30.0 30.2 30.2 30.2 30.1
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 32.8 33.3 33.6 33.4 32.8 31.9 30.8 29.9 29.1 28.5 27.9 27.5
BPT 30.8 31.6 32.0 32.2 32.4 32.3 31.5 31.6 31.4 31.1 30.7 30.3
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 42 %

Date: Sunday 5/ 8/ 2007
NON A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 106.6kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 27.3 26.9 26.6 26.2 26.0 25.9 26.3 27.1 28.4 29.7 31.0 31.9
BPT 29.7 29.1 29.0 28.8 28.7 27.2 29.8 29.9 30.0 30.1 30.1 30.0
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 32.6 33.1 33.3 33.2 32.7 31.8 30.8 29.9 29.2 28.6 28.1 27.7
BPT 30.6 31.4 31.7 32.0 32.1 32.1 31.3 31.3 31.2 30.9 30.5 30.1
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 43 %

Date: Monday 6/ 8/ 2007
NON A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 75.6kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 27.3 27.0 26.7 26.5 26.3 26.2 26.5 27.2 28.2 29.3 30.2 31.0
BPT 29.1 28.5 28.4 28.3 28.3 26.7 29.3 29.5 29.7 29.7 29.7 29.7
TIME 13* 14* 15* 16* 17 18 19 20 21 22 23 24
Tout 31.5 31.9 32.1 32.0 31.6 30.9 30.1 29.4 28.8 28.4 28.0 27.6
BPT 30.3 31.1 31.4 31.6 31.7 31.6 30.7 30.7 30.6 30.3 29.9 29.5
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 52 %

Date: Tuesday 7/ 8/ 2007
NON A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 8.4kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6* 7 8 9 10 11 12*
Tout 27.8 27.7 27.5 27.4 27.2 27.2 27.4 27.8 28.3 28.9 29.5 29.9
BPT 28.9 28.3 28.3 28.3 28.2 26.7 29.4 29.5 29.7 29.8 29.8 29.8
TIME 13 14 15 16 17 18 19 20 21 22 23 24
Tout 30.2 30.4 30.5 30.5 30.2 29.8 29.4 29.0 28.7 28.4 28.2 28.0
BPT 30.4 31.1 31.4 31.5 31.5 31.3 30.4 30.4 30.2 29.9 29.6 29.2
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 94 %

Date: Wednesday 8/ 8/ 2007
NON A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 31.1kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11 12*
Tout 26.7 26.4 26.2 25.9 25.8 25.7 26.0 26.6 27.5 28.5 29.4 30.2
BPT 29.0 28.4 28.4 28.3 28.2 26.7 29.3 29.4 29.6 29.7 29.7 29.6
TIME 13* 14* 15 16 17 18 19 20 21 22 23 24
Tout 30.7 31.0 31.2 31.1 30.7 30.1 29.3 28.7 28.1 27.7 27.4 27.0
BPT 30.2 31.0 31.3 31.4 31.5 31.4 30.6 30.6 30.4 30.1 29.8 29.4
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 76 %

Date: Thursday 9/ 8/ 2007
NON A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 70.6kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 25.8 25.4 25.0 24.7 24.4 24.3 24.7 25.6 26.9 28.4 29.7 30.7
BPT 29.2 28.6 28.5 28.4 28.3 26.8 29.3 29.4 29.6 29.6 29.6 29.6
TIME 13* 14* 15* 16* 17 18 19 20 21 22 23 24
Tout 31.4 31.9 32.1 32.0 31.4 30.5 29.5 28.5 27.8 27.2 26.7 26.2
BPT 30.2 31.0 31.4 31.6 31.8 31.7 30.9 30.9 30.8 30.5 30.1 29.7
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 46 %

Date: Friday 10/ 8/ 2007
NON A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 97.8kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 26.7 26.3 26.0 25.6 25.4 25.3 25.7 26.5 27.8 29.1 30.4 31.3
BPT 29.3 28.7 28.6 28.5 28.4 26.8 29.5 29.7 29.8 29.9 29.9 29.8
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 32.0 32.5 32.7 32.6 32.1 31.2 30.2 29.3 28.6 28.0 27.5 27.1
BPT 30.5 31.3 31.7 32.0 32.1 32.0 31.1 31.1 31.0 30.7 30.2 29.8
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 39 %

Date: Saturday 11/ 8/ 2007
NON A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 108.0kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 27.5 27.2 26.9 26.6 26.3 26.3 26.6 27.4 28.6 29.8 30.9 31.8
BPT 29.7 29.1 29.0 28.9 28.8 27.2 29.8 30.0 30.2 30.2 30.2 30.2
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 32.5 32.9 33.1 33.0 32.5 31.7 30.8 30.0 29.3 28.8 28.3 27.9
BPT 30.8 31.6 31.9 32.2 32.3 32.2 31.3 31.4 31.2 30.9 30.5 30.1
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 44 %

Date: Sunday 12/ 8/ 2007
NON A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 55.8kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11 12*
Tout 26.7 26.4 26.0 25.8 25.5 25.5 25.8 26.6 27.7 28.9 30.0 30.9
BPT 29.7 29.1 29.0 28.9 28.8 27.3 29.9 30.1 30.2 30.3 30.3 30.2
TIME 13* 14* 15* 16 17 18 19 20 21 22 23 24
Tout 31.5 31.9 32.1 32.0 31.5 30.7 29.9 29.1 28.4 27.9 27.5 27.1
BPT 30.8 31.7 32.0 32.3 32.3 32.2 31.4 31.4 31.2 30.9 30.5 30.1
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 66 %

Date: Monday 13/ 8/ 2007
NON A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 61.5kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11 12*
Tout 26.5 26.2 25.9 25.6 25.4 25.4 25.7 26.4 27.4 28.6 29.6 30.4
BPT 29.1 28.5 28.4 28.3 28.2 26.7 29.3 29.5 29.6 29.7 29.7 29.6
TIME 13* 14* 15* 16* 17 18 19 20 21 22 23 24
Tout 31.0 31.4 31.6 31.5 31.0 30.3 29.5 28.7 28.1 27.6 27.2 26.8
BPT 30.2 31.0 31.3 31.5 31.6 31.5 30.7 30.7 30.6 30.3 29.9 29.5
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 54 %

Date: Tuesday 14/ 8/ 2007
NON A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 70.0kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 26.1 25.7 25.4 25.0 24.8 24.7 25.1 25.9 27.2 28.5 29.8 30.7
BPT 29.1 28.6 28.5 28.3 28.2 26.7 29.2 29.4 29.5 29.6 29.6 29.5
TIME 13* 14* 15* 16* 17 18 19 20 21 22 23 24
Tout 31.4 31.9 32.1 32.0 31.5 30.6 29.6 28.7 28.0 27.4 26.9 26.5
BPT 30.1 30.9 31.2 31.5 31.6 31.5 30.8 30.8 30.7 30.4 30.0 29.6
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 47 %

Date: Wednesday 15/ 8/ 2007
NON A/C BUILDINGS USING NIGHT VENTILATION AND BURIED PIPES
DAILY COOLING LOAD : 92.2kWh/Day
BALANCE TEMPERATURES, IF BURIED PIPES AND NIGHT VENTILATION ARE USED
TIME 1 2 3 4 5 6 7 8 9 10 11* 12*
Tout 26.7 26.3 26.0 25.6 25.4 25.3 25.7 26.5 27.8 29.1 30.4 31.3
BPT 29.2 28.6 28.5 28.4 28.3 26.7 29.3 29.5 29.6 29.7 29.7 29.6
TIME 13* 14* 15* 16* 17* 18 19 20 21 22 23 24
Tout 32.0 32.5 32.7 32.6 32.1 31.2 30.2 29.3 28.6 28.0 27.5 27.1
BPT 30.2 31.0 31.4 31.6 31.7 31.6 30.9 30.9 30.7 30.4 30.0 29.6
* : Overheating Period
BPT : Balance Point Temperature
Tout : Outdoor Temperature
ENERGY CONSERVATION IF NIGHT VENTIL AND BURIED PIPES ARE USED : 39 %
