An Evaluation of Residence Satisfaction on Window Design of Mass Housing in Hot-Humid Climates: The Case of Famagusta, North Cyprus

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Submitted to the Institute of Graduate Studies and Research in partial fulfillment of the requirements for the Degree of

> Master of Science in Architecture

Eastern Mediterranean University September, 2014 Gazimağusa, North Cyprus Approval of the Institute of Graduate Studies and Research

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We certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality as a thesis for the degree of Master of Science in Architecture.

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ABSTRACT

Windows are one of the building components, which are not only essential in terms of connecting inside and outside of the building but also for providing daylighting and natural ventilation to interior spaces. In hot-humid climates, windows' role become more prominent - especially in residences where users spend a considerable amount of time - for supplying proper daylight admittance through the control of sun and ventilation for the elimination of humidity.

Considering the increasing amount of mass housing in cities where demand for shelter is continuously up rising, there is more similar type residential buildings appearing, designed with little or no consideration of local climatic issues. This has resulted in the increase of dissatisfied users where there are major complaints relating to improperly lit interior spaces, lack of suitable shading devices to control unwanted sun during lengthy summer seasons, and necessary openings to provide natural ventilation.

The aim of this thesis is to understand the problems associated with window design and the level of satisfaction of users in relation to daylighting and ventilation issues in selected residential buildings in Famagusta, North Cyprus through observations and questionnaires with the users. For this purpose, selected criteria such as type of shading device, orientation, size, placement and ratio of windows area to floor area, glazing and opening types have been investigated to understand whether windows have been appropriately used in these apartment type buildings in hot-humid climate. The observations and questionnaires prove that in the design of windows, use of appropriate shading devices, windows size, types of windows, placement as well as building orientation can be effective on the performance of windows and affect user satisfaction.

Keywords: Window design, Daylighting, Ventilation, Residential Building, Hot-humid climate, Residence satisfaction Pencere, iç mekanı aydınlatmak ve doğal havalandırmayı sağlamak yanında binanın içi ve dışı arasında görsel bir iletişim kurmayı sağlayan önemli bir yapı elemanıdır. Özellikle sıcak-nemli iklimlerde nemin ortadan kaldırılması amacı ile güneş ve havalandırma kontrolünü sağlamakta önemli görevler üstlendiğini söyleyebiliriz. Özellikle toplu konut örneklerinde doğru pencere tasarımı ve uygulamasının, binalarda enerji tasarrufu sağlamak ve kullanıcıyı memnun etmek açısından önemli olduğunu yapılan araştırmalardan da anlamaktayız.

Özellikle kentlerde karşılaşılan ve birbirleri ile cok benzeşen toplu konut örneklerinin pencere tasarımlarına bakıldığında yerel iklim verilerinin az veya hiç dikkate alınmadığı gözlenmektedir. Yanlış doğal havalandırma, uygunsuz genişlikte açıklıklar ve istenmeyen güneşi kontrol etmeyi amaçlayan uygun gölgeleme araçlarının eksikliği, kullanıcı memnuniyetsizliğini oluşturan nedenlerden sayılabilir.

Tezin amacı, sıcak-nemli iklime sahip Gazimağusa kentinde toplu konut örneklemleri aracılığı ile günışığı ve havalandırma kriterlerinin pencere tasarımında ne kadar etkili olduğunu anlamaktır. Bu amaçla, pencere boyutları ve tipleri yanında yerleşimi, pencere/taban oranı, gölgeleme araçları gibi alt kriterler belirlenerek, kullanılan pencerelerin sıcak-nemli iklim gereklerine göre tasarlanıp tasarlanmadığı gözlemler ve kullanıcı memnuniyeti üzerinden tartışılmaktadır. Bu kapsamda yapılan gözlem ve anketlerin sonucunda pencere tasarımının ve ona uygun gölgeleme elemanlarının kullanılmasının, pencere boyutları ve tipi yanında hangi yönde konumlandığının kullanıcı memnuyiteni etkilediği ortaya çıkmıştır.

v

Anahtar Kelimeler: Pencere tasarımı, Günışığı, Havalandırma, Konut, Sıcak-nemli

iklim, Kullanıcı memnuniyeti

DEDICATION

To MY BELOVED FAMILY,

who supported me in every aspect of my life.

My father and my mother (MOSTAFA and MARYAM),

my sister (SANAZ),

my brother (ASHKAN),

and my brother-in-low (MAJID).

I dedicated this study to dearest persons in my life.

ACKNOWLEDGMENT

First of all, I have to thank God for giving me the gift and patience for studying abroad. My experience at the Eastern Mediterranean has been an unforgettable one.

I am very grateful to my supervisor Asst. Prof. Dr. Pınar Uluçay who has supported me during this challenging process. Her guidance and contributions have been of great benefit to this study.

The other person of great importance is Asst. Prof. Dr. Polat Hançer who has helped and guided me along this journey. I really appreciate his guidance which proved to be very useful during the writing of this thesis.

Special appreciation is also extended to my dear jury members Assoc. Prof. Dr. Mukkades Faslı and Asst. Prof. Dr. Nazife Ozay who have greatly contributed to the development of the thesis.

I would like to mention my great happiness due to support and help I have received from my sister Sanaz Abdali HajiAbadi, my friends, and many of the instructors of Eastern Mediterranean University, designers, and users of the residences who contributed immensely to the delivery of this thesis.

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Chapter 1

INTRODUCTION

Windows have been used for centuries for the purpose of constructing a visual link between the interior and exterior space; providing daylight and sun to the users and control the indoor temperature for providing comfortable environments. Considering the amount of importance given to saving energy in buildings today in relation to rising energy costs, windows as building components contributing to heat loss and gain in buildings gained more significance. Keeping in mind that windows are responsible for 10 - 20% of heat loss in buildings in winter and 25 - 35% of heat gain in summer, it is very important to design them accordingly so that they contribute to the thermal comfort of indoor environments; help save energy in buildings and therefore contribute to the residence satisfaction.

It has been observed that due to the rising population and need for more housing in North Cyprus, there is a tendency to design and repeatedly construct similar mass housing units that do not take the local climate into consideration. In order to look into this problem in more detail, this study focuses on case studies where daylighting and ventilation issues in window design are investigated as important criteria affecting the satisfaction of residences in terms of indoor environment quality. Although windows have another important role such as providing visual contact between the inside and outside environment, this issue will not be investigated in this study. Accordingly, the thesis is constructed on four chapters where the introduction part includes a general discussion of the topic, the research problem, limitations and methodology of the study.

In need to understand the topic more clearly chapter two includes a literature review on functional features of windows such as daylighting (e.g. shading devices, orientation, windows size, ratio of windows area to floor area, and placement of windows), and ventilation (e.g. ventilation types, control air leakage, and windows opening type) which can be effective on the quality of indoor environment and satisfaction of residences through windows design. Moving on from this information, chapter three investigates the selected cases based on the criteria presented in chapter two and discusses the findings of the analysis. This is realized through observations and questionnaires carried out in selected mass housing from the city of Famagusta which possesses hot-humid climate that presents many challenges for the design of buildings. Finally, the fourth chapter presents the conclusions and recommendations relating to this study.

1.1 Problem Definition

The window is known to have two essential functions in buildings located in hot-humid climates which also affect the thermal comfort of users: (1) ventilation for the elimination of humidity, and (2) appropriate daylight admittance through the control of sun. This becomes a highly important issue especially in typical mass housing units built without the consideration of appropriate daylight admittance, lack of overhangs to control unwanted sun and lack of enough ventilation. This takes place partially due to the economic reasons where construction companies target for maximum amount of flats and partially due to lack of relevant standards in Northern Cyprus. Within this framework, this research makes use of focused questionnaire and observations as methods of analysis for understanding the general problems underlying window design in hot humid zones with specific emphasis on apartment type housing which are becoming extensively popular amongst construction companies in Northern Cyprus.

1.2 Aims and Objectives

In line with the specified research question, the thesis aims to carry out a study on selected housing examples in the coastal city of North Cyprus, Famagusta, where existing problems deriving from window design are analyzed based on some predetermined criteria in need to come up with an optimization of window design for standard apartment type housing in hot humid climates. These criteria have been selected carefully after a review of significant resources on the subject matter. Considering that the main function of windows does not solely involve providing visual contact but supplying enough daylight to an occupied space, eliminating any undesirable side effects; and providing ventilation for the elimination of humidity, the selected examples are evaluated through these major criteria so that further recommendations can be laid out. However, it is also known that window design should involve careful balance of heat gain and loss, glare control, and variations in daylight availability. Additionally, window size and spacing, glass selection and some other important issues should carefully be considered in the evaluation of window design in order to understand whether appropriate conditions have been met for achieving optimum performance in the given conditions. The findings will help create a guideline for optimum window design in standard mass housing units in hot humid climates.

1.3 Research Questions

In order to understand whether windows in these housing units are appropriately designed, the research questions:

1. Are users satisfied with current window design (size, type, location, etc.) in their units?

• What are the major criteria for assessing window design in standard apartment type housing in hot-humid climates?

• What is the optimum window design that should be applied to standard shaped rooms that residents spend most of their time (living room including kitchen/ and bedroom)?

1.4 Methodology

This study makes use of mainly qualitative type of methodology to realize the research which includes an in-depth literature review to understand the topic and develop criteria for the assessment of collected data; focused questionnaires with the users of the case study, as well as observations to understand the cases, and help towards the analysis of data collected. After a review of all the construction companies delivering mass housing in Famagusta, Uzun, Dovec and Noyanlar have been selected due to being well known and delivering the highest number of mass housing in the construction market. The user typology has also been influential in the selection of these examples. From each of the construction companies stated, two apartment blocks have been selected for further analysis. These examples are mainly located in Karakol, Tuzla and Sakarya areas of the city (Famagusta), North Cyprus.

Initially, books, articles and internet resources have been researched to comprehend what the characteristics of window and its primary functions are. In the case study chapter, observations, focused questionnaires are utilized to understand the residence satisfaction relating to window design, which are presented through inventories charts and tables.

1.5 Limitations

In this study, the residences' satisfaction are investigated in randomly selected apartment buildings from Uzun, Noyanlar and Dovec construction companies where second and third floor flats with single and double glazed windows are taken as the focus of this study. Although window has several roles in the building such as providing visual contact, ventilation and daylighting, only daylighting and ventilation issues will be investigated in this thesis. Although, 36 flats have been analyzed in detail, users from other flats in these buildings have also been questioned.

Chapter 2

UNDERSTANDING THE SIGNIFICANCE OF WINDOWS IN THE DESIGN OF HOUSING IN HOT-HUMID CLIMATE

A building has several components and one of them is the window. At first, the importance of this building material has not been considered very much, but as the construction technology developed, and the building skin has become more advanced in terms of the provision of thermal comfort, window performance has also gained significance. Considering that window as a building element affect heat loss and gain in buildings to a great extent, and therefore the usage of energy in buildings, their appropriate design is important as it affects the user satisfaction.

Many aspects should be considered in the design of windows for providing comfortable indoor environment. One of these factors is the appropriate orientation of the building to respond to the local climate so that windows can let in appropriate daylight and ventilation and block the unwanted sun whenever is possible. This issue has to be underlined especially in hot-humid climates where the eradication of humidity from the indoor environment becomes a significant problem to be considered.

Daylight has essential function in terms of providing heat and saving energy in the building especially during winter seasons. However, overheating can occur in summer and this problem can be solved with the use of shading devices, and greenery. The other issues to be considered are window area, ratio of window area to floor area, placement, and glazing in window design for providing suitable daylight to indoor environment.

The second important criterion is natural ventilation which makes it possible to let fresh air into the indoor spaces through natural and cross ventilation. This is a very important issue as it can led to sick building syndrome in buildings and affect human health. Therefore, it has great influence on user satisfaction.

The chapter follows with sub sections such as the functional features of windows which investigate ventilation and daylighting issues in more depth.

2.1 The Functional Features of Windows

Windows are inseparable components of façades and have various important functions such as providing view and daylight to the building and protecting the users from extremes of environmental conditions. Depending on the circumstances, windows should be designed to avoid daylight, airflow and water vapor through the addition of some other components such as insulation layers. In other words, windows are openings on building façade that allow the entry of light, air and sound, and that is exactly why they should be properly sealed and insulated. Windows are also described as glazing embedded in frames (Linera & Gonzalez, 2011). Furthermore, windows have an important role in providing air quality, well-being, and fulfillment. Many aspects should be considered in the design of windows. Some of the essential factors for window performance are listed as sunlight penetration, control of air flow and ventilation (Bülow-Hübe, 2001). The other important aspects are overheating and glare in hot days which can be solved by controlling the solar gain and daylight. The amount of solar gain and daylight can be adjusted through the use of windows with shading devices that can help control undesirable sunlight in hot days.

2.1.1 Sunlight Penetration and Daylighting

Windows in buildings have an important role in terms of controlling solar heat gains. In cold climates, windows should allow enough sunlight through to heat the interior spaces and in hot climates where sunny days override cold days the amount of sunlight entering the building should be controlled; and ventilation should be provided to help cooling. Therefore, windows should be able to control solar heating, provide natural ventilation as well as helping to prevent noise, and maintain building security. This in some cases may require the installation of complex windows with characteristics like, glazing, external shading, internal or mid-pane blinds, and operable windows (Beggs, 2002).

When windows are allowing daylighting enter into interior spaces, they should also provide visual contact with the exterior spaces without causing change in the quality of the color of light. Furthermore, the privacy should be considered in the design of the windows. Visual access and visual exposure are two issues that must be differentiated in the design of windows. If both of these issues are considered in the design of the windows, then desirable solutions can be achieved. The other important thing is to consider the geographical location and appropriate orientation of the building. Moreover, it is important to consider the climate to gain heat from the sun in cold days and avoid overheating in summer. However, UV rays as part of the solar radiation should be controlled due to the fading of color of textiles and so on. In order to control the high emissivity of glass for long-wave radiation, low-emissivity coatings should be added to the windows. These kinds of coatings help reflect sunlight and are highly recommended for hot climates where the outdoor temperature is high. In such cases, windows with low-emissivity (LE) coating will not allow heat enter inside and when sun is low windows will not allow the heat leave the building. Furthermore, LE coatings can control the UV rays and long-wave infrared heat without preventing visible light from passing (Linera & Gonzalez, 2011).

One of the most important characteristic of the window is to provide daylighting and visual contact without changes in the quality of the light color. Furthermore, the privacy should be considered in the design of windows. In line with this, visual access and visual exposure are two concepts that must be differentiated. If both concepts consider in the design of the window is desirable. The other important thing is to consider the geographical, and location of the building. Moreover, it is important to consider the climate to gain the heat from the sun in cold days and avoid it in summer. On the other hand, UV rays part of the solar radiation should be control due to the problems that make for the color, textile and so on. To control the high emissivity of glass for long-wave radiation, low-emissivity coatings should be added to the windows. These kinds of coatings return heat back to its source where the outdoor temperature is high they do not let heat go inside and when is low they do not let the heat leave the building. Furthermore, LE coatings can control the UV rays and long-wave infrared heat without preventing visible light from passing (Linera & Gonzalez, 2011).

Although the legal provisions for providing daylight to indoor environment changes according to the building codes of countries, these buildings standards nonetheless help, enhance well-being and satisfaction of the users (Millet, 1998). According to BBR¹ (1999) depending on the direct access of the daylight, most of the rooms and places used by residents in the home should be located in those areas. Moreover, apartment buildings should have access to direct sunlight so size of the windows should be chosen accordingly to absorb enough light. The minimum size of the glass area should be approximately 10% of the floor area. If building parts or other buildings block the daylight more than 20% of the view angle, the glass area should be increased in cold regions like Sweden (Bülow-Hübe, 2001)

In hot humid regions, windows should protect indoor environment from cold weather in winter and overheating in summer. For instance, windows should provide proper daylight in winter for heating the indoor environment and in summer they should not cause overheating. It is very important to protect windows from direct sunlight heating. In order to reduce daylight gain in hot days, it is essential to understand the path of the sun. Therefore, windows in those directions should be minimized or designed accordingly to control heat gain in summer time. In southern facade, openings should be greater than 10 - 12% of floor area for direct gain. Openings in north side should not exceed 5% of the total wall area which is an acceptable standard for natural ventilation at night (Lapithis, 2005).

In Florida for example, sunrise is from north-east and sunset is from north-west in summer time – figure 1. Therefore, it is recommended to minimize windows in those facades, which can be accomplished by the proper orientation of building and shading of windows (McCluney & Jindra, 2000).

¹ BBR: Boverkets Byggregler. (Building regulations of the National Board of Housing, Building and Planning)

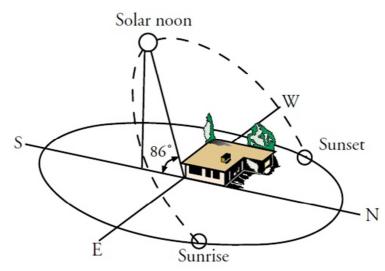


Figure 1: Summer Sun path. Source: (McCluney & Jindra, 2000)

Therefore, orientation in general is a very significant issue to be considered in the design of buildings as it is a major criterion affecting the performance of windows.

2.1.1.1 Orientation

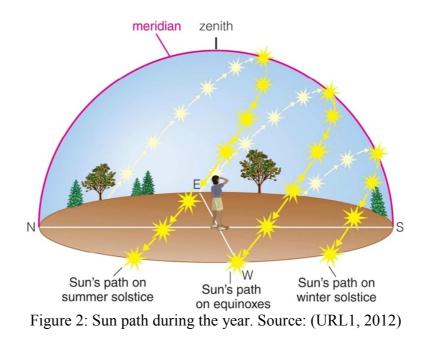
Benefits of a properly oriented building includes provision of heat in winter and blocking of sunlight in summer which help control heating and cooling loads and therefore, the overall energy consumption of the building (Albanese, 2010).

Windows on the east and west facades of the building, may cause overheating in spring and fall months due to the low angle of the sun. Consequently, reducing window area on the east and west sides of the building maximize the solar orientation of the building. Furthermore, windows performance should be enhanced with the use of energy efficient windows with proper insulation that standard windows cannot offer.

If sunrise is from the east and sunset from the west, for absorbing the sunlight more in the cold days the length of the building should be orientated towards north and south. Moreover, shape of the building should be rectangular and compact to increase heat gain in winter in the Northern hemisphere. The sunlight is absorbed more on the south side of the building and in cold days, it is absorbed with the lowest angel of the sun. If the glazing dimensions are increased in the southern facade, the south side of building absorbs more light. However, in hot days, absorbing the sunlight creates some problems and it must be reduced, because the sun is higher in the sky. In order to control and decline the heat loss, shading devices and greenery that provide shade may be used to reduce the heat gain (Albanese, 2010); (Wollos, 2013).

The orientation of the building should be away from south up to 5 degree and it has essential role on the saving of energy in the building. For example, if the angle of the building is 30 degree to the south the potential for saving energy is only 5 percent. A building with just consideration of the orientation has the potential to save the energy 10 - 20 percent in heating and 10 - 40 percent in cooling. Building with other features can decline the use of energy around 30 - 40 percent (Wollos, 2013).

In order to gain proper daylight, orientation of the building is important and it should be according to the sunrise and sunset, and amount of sunlight during day (Phillips, 2004). Furthermore, orientation of the building is different for northern or southern hemisphere, position of sun and length of daylight during the year. For example, to gain proper daylight in summer and winter difference of sun height in sky should be considered - Figure 2.



In hot humid climates, windows on southern side has significant role for daylight gain. However, it creates some difficulties for residences in hot days which can be solved by proper orientation of building, integration of shading devices and greenery.. Furthermore, to provide suitable daylight, windows on southern facades provide more of a proper choice despite of east and west windows (Lapithis, 2005).

Windows were able to control solar heat gain in the past, and now with the design of new generation windows it has become easy to control the entry of solar heat gain in hot-humid climates. In hot climates, the strategy is to face most of the windows in the north side, where there is no direct exposure to sun or locate most of the windows in the south side if shading devices such as overhangs are used to block the inconvenient sunlight in hot days. Windows in west side have essential role in the gain of afternoon sun, when temperature climbs to the peak; and east windows have the same problem in the morning time when air temperature decrease. In the past, designers used to avoid locating windows in west and east yet. These days, there is not any problem in locating efficient windows in west and east faces (Fosdick, Judy; Homes, Tierra Concrete; Energy, U.S. Department of, 2012).

Consequently, design of buildings present challenges for the architect in how to orient the building, how much glazing area to provide, the insulation and material selection and consideration of shading devices to help save energy in buildings and satisfy the residence.

2.1.1.2 Glazing Area and Placement

Glazing area is another essential factor that has influence on amount of daylight gain income. The common glazed fractions are in range of 20 - 60%. Moreover, size and placement or location of windows in the facades is an area of design that should be given careful attention to with regard to the amount of daylight provided; the distribution of daylight, and the interaction with other design requirements, for example heat loss/gain or ventilation (Millet, 1998).

When the height of the windows is high and the window is strip, it helps to get deeper daylight - figure 3. The other essential issue that may help for good daylighting and ventilation is to use minimum sill height in the windows design. Moreover, the head height should be between table and level head of a user that is between 0.3 - 1 m - figure 4. Furthermore, for suitable daylight and glare prevention separate apertures may be used on the façade of the building (ECBC Envelope for Warm & Humid Climate, 2012).

Area of the glazing to the floor area in the south facade of the building is essential, if the ratio of glazing to floor area is 8 to 10%, the building is called Sun-Tempered and the ratio of the glazing to the floor area is 15 to 20% of the floor area, a building known as passive solar (Wollos, 2013).



Figure 3: Strip windows in Villa Savoye. Source: (URL2, 2006)

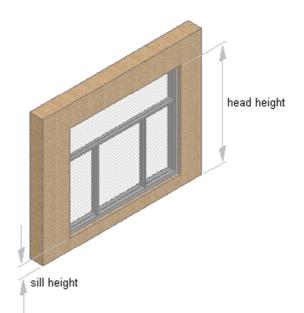


Figure 4: Sill height and head height. Source: (URL3, 2014)

There are different types of openings in buildings, and each have a different influence on the heat loss and gain in buildings. Yet, glazing type is also important.

2.1.1.3 Windows and Glazing

Nowadays, glazing systems have a significant role in controlling heat and light which have substantial impact on the thermal comfort and energy saving in residential buildings. Another issue that needs to be considered when selecting windows is the U-value². The below chart demonstrates thermal efficiency of seven different types of glazing material (Smith, 2003). Accordingly, double glazed window is one of the best materials for saving energy (Milne & Boardman, 2000) – Figure 5.

Glazing	U Value (W/m ² K)
Single glazing	5.6
Double glazing	3
Triple glazing	2.4
Double with Low E	2.4
Double with Low E and Argon	2.2
Triple with 2 Low E and 2 Argon	1
Double with Aerogel	0.5-1.0

Figure 5: Heat transfer through different type of glazing. Source: (Smith, 2003)

In every climate, large glazing should be oriented to the equator. Windows in west and east side can lead to overheating and decline solar gain easily. Proper designing of windows is important for the absorption of heat; therefore, local climate should be considered carefully (Feist, 2014). There are some standard materials used for glazing of well-insulated windows such as soda lime glass, PMMA (polymethylmethacrylate) and polycarbonates.

• **Soda-Lime Glass** (SLG) is a combination of 70% silica (silicon dioxide), 15% soda (sodium oxide), 9% lime (calcium dioxide) and some different materials with low proportion. SLG is a suitable material with some benefits as cheap,

² U (-value): Heat transfer coefficient, describes how a building element transports heat. [W/m².K]

reasonable hard, chemically stable or steady, and extremely workable. The thermal conductivity is 1 W/(m.k) and value of density 2500 kg/m³ (Linera & Gonzalez, 2011).

• **PMMA** (polymethylmethacrylate) is a type of colorless polymer used for optical applications with composite $C_5H_8O_2$ that has some advantages like being water proof and scratch resistant. Strength and poor chemical resistance are the weaknesses of the PMMA. Thermal conductivity is 0.18 w/(m.k) and density of PMMA is 1180 kg/m³ (Scott, 2001).

• **Polycarbonates** are a special type of polyester which is used as an engineering plastic. Due to the structure of Polycarbonates, this material possesses some characteristics such as high strength, transparency; moreover, it can be injection-molded, blow molded and extruded. Thermal conductivity is 0.2 w/(m.k) and density of the Polycarbonate is 1200 kg/m³ (Scott, 2001).

2.1.1.4 Sun Protection Systems

Integrating shading devices to windows is a good strategy for controlling solar radiation. In the design of shading devices, the latitude of place, azimuth of the sun and angle of the altitude are important issues to be considered. There are different categories for the shading devices; and these can be classified under two and three groupings (Energy and Resources Institute, Institut Catalá d'Energia, Asia Urbs Programme, 2004).

First one is external sunshade which can be named as fixed and movable types. Fixed one includes horizontal, and vertical louvers and egg create types. The horizontal louvres control the high altitude sun in summer and vertical ones protect the windows from the southwest and northwest solar radiation. The last one is the egg create type that is suitable for the west facade of the building. The benefit of movable one is more than stable one due to adjustments depending on the climate and circumstances. For example, it can allow the winter sun and block the solar radiation in the summer. The second one is internal sunshades which can be fixed or movable. These include; vertical blinds, roller devices, and curtains. The performance of the internal sunshades is related to reflective index, color, air tightness, and fabric (Energy and Resources Institute, Institut Catalá d'Energia, Asia Urbs Programme, 2004). The third type is the sunshade that comes in between two layers of openings, which can be fixed, movable, or automotive.

Additionally, sunshades can be classified as overhangs, louvers, light shelves, and fins as can be seen in - figure 6. Advantages of sunshades include blocking of direct gain in summer whereas disadvantages of fins are blocking of the desired light, view, and lack of durability (Robertson & Athienitis, 2007). In hot humid regions, windows on the southern facade should be designed with overhangs to control direct sun light during summer and early fall. On western façade, windows should be minimized, shading devices should be installed and appropriate trees should be located. Movable or stable shading devices may be integrated in southern facades.

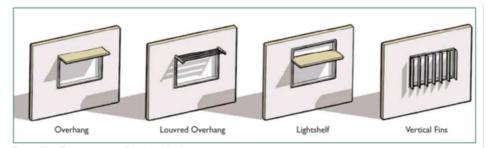


Figure 6: Four models of exterior sun shading. Source: (Robertson & Athienitis, 2007)

Another benefit of integrating sunshades to the windows is the positive effect on the energy consumption of the buildings and increasing protection of the residences from sunlight in summer. For instance, according to the research done by the (Efficient Windows Collaborative (EWC), 2013) energy saving of buildings with shading devices integrated on the east and west side of the building is two times more than buildings without any shading devices. The other benefits of sunshades are the impact they have on cooling loads of buildings in summer; and possible allowance of integration of high percentage of glazing in buildings.

The preferable type of internal sunshade for controlling summer sun is the movable one. However, the disadvantage of internal sunshade is such that it absorbs heat, and therefore transmits heat into the building, causing too much need for cooling in summer and undesired heat gain in winter. They also have advantages such as providing protection from dirt, pollution and they are easy to install. Some elements can be added to enhance the performance of shading devices like; micro-grid and prism systems (Schittich, 2001).

Improving the windows with integrating shading devices has important role on increasing the residence satisfaction, energy saving and increasing of human comfort levels. The best type of shading device is the exterior ones which have more impact on blocking of sunlight for longer periods. For instance, the popular types of the exterior sunshades are the exterior overhangs. Overhangs have effective role on the control of solar radiation and glare prevention especially on the southern facades of buildings in hot summer days without reducing the possibility of outside views. There are the other types of the exterior sunshades such as; grills, awnings, shutters, roll-down shades/shutters, and canopies. However, use of the different types of the shading devices is related to the availability, local use and design of building. In some regions, interior common sunshades such as drapes, blinds, or sunshades on windows are used extensively to control the privacy, daylight; decrease overheating; fading of fabrics and add to the quality of interior decoration. However, interior shading on its own is not enough to control the overheating due to the capacity of interior spaces absorb heat by the interior shading elements. It is therefore necessary to integrate other types of shading elements to the windows to control the entry of sunlight to the interior spaces. Yet, it is also important to control the sunshade for receiving proper light, shade and view in appropriate times. Therefore, additional technologies to shading devices can improve their performance for controlling sunlight entry in summer or allowing sunlight entry in winter.

Landscape elements such as broad-leafed trees can also help provide cool shade, and reduce the exterior temperature by least 5°C through evaporation of moisture. Generally, trees and bushes located on proper direction help towards shading and ventilation of the building. In addition, they are able to provide shading, even with low angle of east and west sun (Efficient Windows Collaborative (EWC), 2013) – Figure 7.

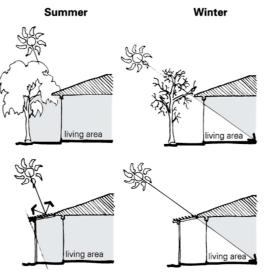


Figure 7: Role of the landscaping element in the control of sun through the windows. Source: (URL4, 2013)

In hot-humid regions, solar gain through windows is often a major component of the overall heat gains of a building. Also, solar radiation on the opaque parts of the building envelope raises the surface temperature of the envelope and contributes to the heating of the interior environment. A number of investigations highlight the importance of providing effective shading as part of the overall strategy for preventing overheating in hot-humid climates. Of these, some also present results which suggest that shading opaque areas, such as walls and roofs, is probably of no less importance than shading glass areas. Effective shading can be provided by various means, including dedicated shading devices, nearby structures, vegetation and special glasses. Generally, external shading devices are considered the most effective, since they intercept solar radiation before it passes through the building envelope into the interior space. An appropriately orientated high-pitched roof which affords self shading and allows only one side of it to receive direct solar radiation at a time is another possible shading technique. A key matter which should be considered in shading design is its tendency to conflict with daylighting. Reduced daylight penetration due to shading design can increase the need for artificial lighting, which

then offsets the energy savings from reduced heat gains. Such a conflict can be lessened, for example, by using inner surfaces of high reflectance values, such as wall surfaces with light colors, or using light shelves to reflect daylight into the deeper part of the interior. Movable shading devices, like louvres, which allow the inhabitants to adjust their local lighting and thermal environment, are additional solution. When shading is provided by a special glass, appropriate choice of glass is essential for balancing the advantage of heat gain reduction with that of daylighting (Chenvidyakarn, 2007).

The essential issue that should be considered in design of shading devices is its tendency to conflict with daylighting. The shading device design may result in the decline of daylight penetration and increase the demand for artificial lighting that then help reduce the energy use and heat gains.

2.1.1.5 Anti-glare System

The function of anti-glare system is to control the intensity of sun. This issue is the most effective way of providing visual comfort, which is the difference between the anti-glare and sun protection system. The disadvantage of anti-glare system is that it increases the dependency on artificial light. Anti-glare system has different types that help reduce light intensity:

- 'Curtain
- Horizontal blinds Figure 8
- Vertical blinds Figure 9
- Venetian blinds Figure 10
- Screens Figure 11

- Translucent glazing Figure 12
- Electrochromic glazing (Schittich, 2001)' Figure 13



2.1.1.6 Daylighting and Residence Satisfaction

When considering the selection of windows in building design, climate, orientation, glazing area, window area to floor area ratio, window (frame and glazing) types and shading devices should carefully be considered. Although, it is not always easy for the designer to decide on the best option, it is possible to follow some guidelines for the optimum solution. In the window design of buildings in hot-humid climate, sunlight allowance in winter; and its blockage in summer stand out as important functional requirements of windows and their careful consideration will help increase the comfort level of users and their overall satisfaction from the building.

In terms of increasing the level of residences satisfaction, it is important to consider orientation of windows in hot-humid climates where most of the windows should be located on southern facade of the residential buildings. However, shading devices should also be integrated in order to increase residences' satisfaction.

When considering the daylight issues in summer, it should be noted that the use of daylight shows variations depending on the function of building. Furthermore, size of interior spaces and their ratio to the overall window area is important for gaining proper daylight. The other issues that have an influence on daylighting are size, orientation, and opening types and shape of windows (Santamouris, 2013). In figure 14, for example, daylight income in vertical window is more than horizontal one. These issues have influence on the residences satisfaction in terms of providing proper daylighting in the residential buildings.

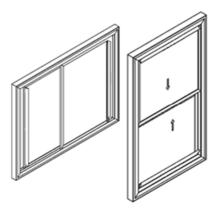


Figure 14: Difference of daylight income between horizontal and vertical windows with same area. Source: (URL10, 2014)

The other important factor in the design of windows is ratio of windows to floor area. Most of the time a certain ratio of window to floor area should be kept which is 1 to 4 or 1 to 5. Furthermore, this ratio for lower and upper floors should be different for gaining proper daylight or shape of room should be considered (Marks & Woodwell, 2010).

All these criteria discussed also have an impact on building codes of countries and building codes are there to make sure that users have an end product which is highest quality. The higher the standards of buildings and in this case windows, the more satisfied the residences feel in the spaces that they use often during their daily lives. However, in some cases, depending on the priorities, not all of these requirements can be achieved. For example, some measures are essential in terms of choosing a material with highest standards such as durability or maintenance of the material. It is indictable that quality of UPVC is better than wooden frame due to its long lifecycle and need of less maintenance but the other issue to consider is the user satisfaction such as user-base quality and the price. In this case, user may be interested to use the wood material for the building construction and durability of the wood material is 20 years, however, the construction company may choose UPVC windows due to its durability or availability in the market.

2.1.2 Ventilation

Ventilation is an important issue in terms of both providing comfortable and healthy indoor environment for the occupants and saving energy in the buildings. Natural ventilation does not only help reduce cooling costs in hot climates but provides people with a feeling of comfort in relation to the supply of oxygen and release of carbon dioxide to outdoor space. Furthermore, natural ventilation reduces the feeling of tiredness due to natural speed of air movement in buildings. Therefore, natural ventilation is better than air conditioners, which can lead to various types of illnesses (Su, Zhang, & Gao, 2009). Many aspects should be considered when providing suitable natural ventilation such as the difference of air pressure between inside and outside of the building and local wind direction. While natural ventilation in hot-humid climates, it may reduce the need for air conditioner during in between seasons. In winter, the challenge is to block the cold air as it is brought into the building. In the summer, the control of humidity is a challenge especially in hot humid climates.

As it is clear windows have essential role to provide natural ventilation in residential buildings in many climates and especially hot-humid climates. Furthermore, as any significant number of operable windows are using in building, in design of windows should be careful about reducing heat gain and glare from the sunlight as well as increasing secure facility meanwhile allowing for income air and escape.

As it is clear, windows have a significant role in providing natural ventilation in residential buildings in many climates; and especially in hot-humid climates.

Furthermore, as any significant number of operable windows are using in building, in design of windows should be careful about reducing heat gain and glare from the sunlight as well as increasing secure facility meanwhile allowing for air income and escape.

In hot-humid climate, one of the essential problems is the control of humidity in indoor environments in summer as it can affect the pattern of energy use if mechanical ventilation has to be used for removal of moisture.

Ventilation is shape of the building, and the occupants distance from the wall where windows are located. For instance, for a person who is living in a room with large area, providing proper ventilation and cooling through natural ventilation to this interior space may cause discomfort or inconvenience and it is significant to consider natural ventilation types that must flow according to interior space perimeter. Then, it is important to provide appropriate natural ventilation in interior spaces that result in residences happiness. Furthermore, if windows are designed properly in a building, this directly affects the use of air condition units in hot days. Consequently, in order to have good natural ventilation, size, location, number, orientation, and size of windows (Givoni, 1998) have to be taken into account in window design in buildings.

Ventilation in spaces takes place through the provision of fresh air, which is realized either by direct comfort ventilation that is through convection to cool and heat the residences, and indirect comfort ventilation (Roaf, Fuentes, & Thomas, 2010).

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However, in modern apartment buildings, windows as passive cooling elements are mostly neglected. Generally, it is often observed that primary prevailing winds are not considered in design of apartment buildings (Ayata & Yıldız, 2006).

According to The Chartered Institution of Building Services Engineers (CIBSE), natural ventilation can be categorized under titles such as cross ventilation, singlesided, stack, and mechanically assisted ventilation. Natural ventilation can be investigated under three headings which are cross, two-sided, and single-sided ventilation (Tantasavasdi, Jareemit, Suwanchaiskul, & Naklada, 2007). Cross ventilation occurs when openings are located opposite to each other and airflows between openings due to difference of air pressure built up by wind. The other ventilation type is single-sided ventilation with just one opening(s) on one side of the space. Another ventilation type is stack ventilation that makes use of density differences as a result of buoyancy in encouraging an outflow from part of a building like roof and creating fresh and cool air from another part of the building like windows and doors.

In general, mechanical systems should be added with other natural ventilation systems described above to increase the airflow in buildings and also, a building might have more than one type of natural ventilation in buildings (Chen, 2004).

2.1.2.1 Cooling techniques

Ventilation is the simplest way of cooling inside of a building and probably the most common passive cooling system. Ventilation has three main functions such as; control of indoor air quality (IAQ), cooling of human body and structural mass. Every function has different requirement for providing cooling and ventilation. However, solar radiation is an essential factor that declines the performance of cooling system. The cooling system performance increases depending on the size and position of windows (Ayata & Yıldız, 2006).

• Ventilation for hot-humid climate

In hot-humid climates, ventilation is one of the best methods to decrease the heat gain in the building. Some techniques are needed and one of them is natural ventilation (La Roche & Milne, 2004). For example, natural ventilation is used for cooling the interior environments in hot-humid climate in New Orleans, LA. US Department of Energy states that exhaust fans may additionally be used for providing ventilation to remove moisture and pollutants in the building (Baechler & Love, 2004). Nighttime ventilation is one of the low-cost passive cooling systems in hot-humid regions. In order to have proper nocturnal ventilation (Nighttime ventilation) some issues are important like ambient climatic conditions such as air exchange rate. Furthermore, cool air obtained during night can decrease the indoor air temperature (Kubota, Toe Hooi Chyee, & Ahmad, 2009).

As an example, Givoni (1998) investigated influence of nighttime cooling in Israel and Pala, California. According to the results, in California nocturnal ventilation (Nighttime ventilation) is more effective by the use of exhaust fans. However, in comparison where both daytime and nighttime is hot, none of these can be adopted to Shanghai due to small daily air temperature rang and high humidity and air temperature. Therefore, nocturnal (Nighttime ventilation) ventilation is proper to use where high daily air temperature and nighttime air temperature is not much cold to cause discomfort (Kubota, Toe Hooi Chyee, & Ahmad, 2009).

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2.1.2.1.1 Ventilative Cooling

Interior spaces can be cooled with ventilation by enabling convective heat transfer from a hot indoor area to a cool exterior. The other method is the sufficiently high indoor air velocity that gives to user direct physical cooling. Furthermore, higher air change among night (cooling period) has influence on decreasing indoor air temperature. This mainly depends on user decision to open window or not (La Roche & Milne, 2004). Ventilation takes place either by wind, buoyancy or a combination of wind and buoyancy in a natural system (Chenvidyakarn, 2007).

2.1.2.1.2 Ventilative Cooling by Wind

This issue takes place when there is enough wind force to produce pressure difference between inside and outside of the building that result in internal air movement and therefore heat removal from the interior. Furthermore, high indoor air velocities increase the convective heat transfer from occupants' skins and clothing and rate of the skin evaporation so, it increases cooling.

There are different ways for providing proper ventilation and this requires the location of at least two openings on opposite sides of a space in order to benefit from the wind - figure 16a. If orientation of the building is not proper to catch wind, wind deflectors as partitions in the building can help to channel air through the occupied zone – figure 16b. Internal spaces should also be designed accordingly to allow maximum amount of air entry - figure 16c (Chenvidyakarn, 2007).

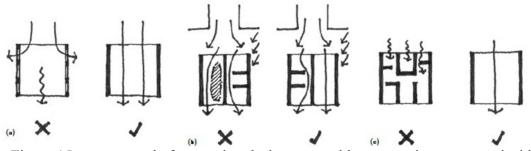


Figure 15: some sample for opening design to provide proper air movement inside buildings. Source: (Chenvidyakarn, 2007)

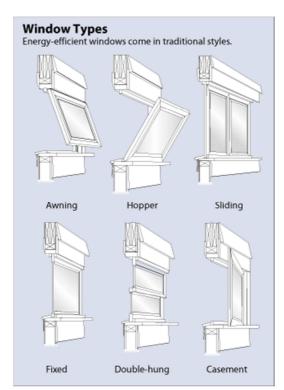
2.1.2.2 Orientation

Orientation of a building affects the amount of solar radiation received and will help ventilation. Furthermore, the ventilation conditions and the window's shading condition have an influence on the cooling of indoor environment (Givoni, 1998). It is significant to minimize solar gain and maximize ventilation in the building design. By orientating the longer sides of the building to intercept prevailing winds and shorter sides of building to face the direction of the strongest solar radiation, proper ventilation can be gained, while the solar gain is minimized. These issues should be applied to design of apartment buildings (Chenvidyakarn, 2007).

2.1.2.3 Windows Opening Types

There are different types of windows opening such as awing, casement, sliding, hopper, double hung, and sliding. In addition, types of window opening influence the amount of natural ventilation gained in the buildings. It is essential to consider window opening types and their features in the design of windows in residential buildings. However, while selecting windows opening types, it should be remembered that some of them have more air leakage than the others and this may cause problems for residences in cold days. Air leakage of casement window is lower than sliding ones as a result of the sash closing by pressing against the frame. Air leakage in sliding one is more than in awing window types. The sash closes by

pressing against the frame in hopper opening types. In addition, function of this opening type is same as awning and casement types. Sliding window has higher air leakage rates than projecting or hinged windows. Double hung window performance is similar to the projecting or hinged windows. Window opening types according to their good performance are categorized below (U.S. Department of Energy, 2012) - figure 17. In Famagusta, most of the buildings have casement opening types that are one of the best opening window types. Natural air ventilation through casement open windows provides cooling at nighttime during hot days (Broniek, 2008).



Awing < Casement < Sliding < Hopper < Double hung < Sliding

Figure 16: Types of energy efficient windows. Source: (URL11, 2012)

2.1.2.4 Control of Air leakage and Condensation

There are many issues to decrease the defects in windows such as control of air leakage so that windows can be airtight. Moreover, it has influence on the heat loss and gain, condensation, comfort and sound insulation. The other issue that needs to be considered in the air leakage of windows is draught excluders which should be placed between the sashes and frame. In order to decline the moisture transport, strip should be placed on the inner side of the window. Otherwise, humidity can have an effect on the layer of double glazed window and cause condensation on the cold pane. To control the dirt accumulation, a dust-absorbing strip can be located between the windows layer but it allows the ventilation in cold days. The other issue is when the condensation appeared on the outer layer of the extremely insulated windows. During the days, that humidity influences formation of condensation, it starts from the coldest part of the window and spreads over the whole window.

2.1.2.5 Dehumidification strategies

Range of relative humidity for human factor is around 20 - 60%. The moisture inside of air is called the wet-bulb temperature, humidity ratio, or dewpoint temperature. Perspiration accumulates on the body skin; when the human body is overheated, then the moisture evaporates and the body is cooled. If the relative humidity is more than 60%, it slows down the evaporation from the skin and this result in both less cooling and more discomfort, particularly at high metabolic rates and higher temperatures. Human is more comfortable, when relative humidity levels are low and temperature is high. Relative humidity levels below 50% provide comfort in activities with higher metabolic rates than deskwork.

In hot-humid regions, most of the time these humidity requirements may be satisfied all or part of the time using natural ventilation, but sometimes to decline relative humidity in humid climates, air conditioning is needed. If relative humidity level is more than 70%, this can cause in growth of mold and mildew spores. This can happen even after reducing humidity to less than 70% that mold and mildew can be subsided in proportion. However, removal of mold and mildew would not happen until relative humidity is reduced less than 30% for a long time, or the growth should be treated with biocide. Fans and operable windows can also provide air circulation and increase the higher temperature limit of comfort by about two degrees. In every place, if air speed is higher than 200 ft/minute, it creates problem for users as explained in figure 18. In hot-humid climate, if relative humidity is high, it can cause evaporation; and this can increase air speed and cause discomfort for users (Design, 1992); (Lstiburek, 2002).

Air Velocity	Probable Impact
Up to 50 ft/minute	Unnoticed.
50 to 100 ft/minute	Pleasant.
100 to 200 ft/minute	Generally pleasant, but causes a constant awareness of air movement.
200 to 300 ft/minute	From slightly drafty to annoyingly drafty.
Above 300 ft/minute	Requires corrective measures if work and health are to be kept in high efficiency.

Figure 17: Influence of Air circulation on users. Source: (Design, 1992)

Consequently, most researchers claim that users prefer naturally ventilated spaces to air-conditioned ones due to feeling more comfortable in them.

In hot-humid climates, humidity should be controlled by dehumidification strategies both during the day and night (Kubota, Toe Hooi Chyee, & Ahmad, 2009). One approach is using air conditioning units to decline humidity in buildings. However, it is an expensive way of declining humidity due to the demand of energy required to operate it. The other strategy is desiccant louvers between glass panes during night to help absorb humidity and absorbed humidity can be dried by solar heating during the day.

2.1.2.6 Ventilation and Residence Satisfaction

During the design of windows, consideration should be given to supplying the occupants with natural ventilation and finding solutions for the removal of humidity so that they can feel comfortable in hot days of the year. For instance, climatic indicators should carefully be considered such as air movement, air speed, and direction. However, in this study, only direction of the wind has been discussed.

Consequently, designing windows for an apartment building with rooms at various directions that all require ventilation is surely a difficult task. Windows should be designed in such a manner that they function properly during winter and summer months. This requires the adoption of strategies for winter and summer periods such as cross ventilation in hot humid climate. However, natural ventilation on its own may not be enough where the need for mechanical ventilation may be required for supplementary cooling in summer. The other important issues that should be considered carefully are the opening types of windows, control of air leakage and condensation in order to remove humidity.

If the building has many of these qualities; they enhance the interior environment and keep the occupants satisfied. Research proves that many of the residents are aware of these qualities and how much they contribute to the saving of energy in their buildings. Therefore, residents of buildings of which windows are more appropriately designed have higher satisfaction than others. However, some of the tenants have problem with ventilation system and space heating. Consequently, through the consideration of some criteria - which has been discussed previously - at the design stage, the level of residence satisfaction can increase considerably.

Summary of Chapter 2

Many aspects have influence on the building performance in terms of providing residences satisfaction in the building and one of them is windows. Two essential features of the windows are providing daylight and connection between inside and outside of the building. In hot humid-climate, windows have the other essential issue to consider the design windows properly in the building such as daylight and natural ventilation. As mentioned before, functional features of windows have effective role on increasing residences satisfaction such as daylighting and natural ventilation in order to provide suitable environment for residences in residential buildings in hot-humid climate. In daylight part, some basic information discussed and accordingly, orientation, glazing area and placement, windows and glazing, sun protection, and anti glare system criteria should be considered in the design. In ventilation part, as mentioned in this chapter have proper natural ventilation in design of windows some issues are important such as cooling techniques (cross or single-sided ventilation), orientation, windows opening types, control of the air leakage, dehumidification system. In the next chapter or in case study part, the functional features of windows are examined in selected residential buildings such as daylighting (e.g. size of windows, ratio of windows area to floor area, placement, and orientation, and shading devices and windows materials), and in ventilation (e.g. natural ventilation type, opening type, and so on) in order to remove humidity and cooling indoor environment to understand criteria of windows design according to residences satisfaction.

Chapter 3

3 AN EVALUATION OF WINDOWS IN SELECTED RESIDENTIAL BUILDINGS IN FAMAGUSTA, NORTH CYPRUS

This part of the thesis discusses the individual cases selected from the city of Famagusta in North Cyprus with a hot-humid climate and presents them in a structured manner. Within this scope, use of windows in mass housing, background of windows, and window design in hot-humid climate is looked at through the collection and analysis of data where the results are discussed at the end of the chapter.

Climate of Famagusta, and significant features that should be considered in the design of windows in apartment buildings are explained. After that use of windows in North Cyprus is elucidated to understand how windows have been used in the history.

In data collection part, case studies are introduced from Uzun, Noyanlar, and Dovec companies and analysis are presented through inventories structured upon the criteria clarified in the second chapter. In data analysis, observations and questionnaires are utilized to arrive at the results. Observation part indicates the information about the windows of selected case studies and residences' conditions. In this part, satisfaction of residences in six apartment buildings (second and third floor) will be investigated in need to understand the level of satisfaction in relation to the design of windows; and the findings will be indicated by varieties of charts and analysis. After that, the whole of this information will be discussed in the discussion part.

3.1 North Cyprus and Famagusta Climate

Cyprus is an island in the Mediterranean Sea and located 65 km from Turkey, 100 km from Syria, 400 km from Egypt and 750 km from Greece. The island is physically divided into two administrative areas; Northern and Southern Cyprus. Northern part of the island has two other major cities - Girne and Famagusta- apart from the capital city Nicosia. Famagusta as the second largest city with the highest international student population has been selected as the case of this study (Darke, 2008) - Figure 19.



Figure 18: Map of North Cyprus. Source: (blogdog, 2013)

Although North Cyprus enjoys the features of Mediterranean climate and has hot, dry summers and cold winters, in coastal cities like Famagusta the climate is hot-humid due to high relative humidity. In this study, April – November is considered as hot months of the year and November – April as cold months of the year.

The climatic data of Famagusta which has been measured in 2001- 2002 is presented (Hançer, 2005). Figure 20, shows information of Famagusta climate during a year.

GAZIMAGUSA Location: 35 ° N Latitude 34 ° E Long	gitude												
Height Above Sea Level: 7 m													
Months	1	2	3	4	5	6	7	8	9	10	11	12	
Sunshine Period (Hour/day)	5.5	6.2	7.0	8.4	10.1	11.8	12.4	11.6	10.2	8.3	6.6	5.1	
Cloud Cover	6	5	5	4.5	4	2.5	2	1.5	2	3	4	5.5	
Solar Radiation Intensity W/m ²													
Total Solar Radiation (MJ/m ² day)	7	10	14	18	23	24	24	23	18	14	9	6.5	
Mean Max Air Temperature (°C)	16.4	16.4	18.4	22.2	26.5	30.6	33.1	33.3	31.1	27.2	22.0	17.6	
Mean Min Air Temperature (°C)	6.9	6.5	7.8	10.5	14.2	18.4	21.1	21.4	16.4	15.3	11.0	7.5	
14.00 Hours Relative Humidity (%)	60	60	57	52	48	47	45	46	48	52	55	60	
Mean Relative Humidity (%)	72.8	71.7	72.8	70.7	67.3	64.3	65.0	67.3	66.6	67.5	70.0	73.2	
7.00 Hours Relative Humidity (%)	88	89	84	89	90	88	85	88	86	86	88	87	
Precipitation (Mm/month)	57.2	54.5	40.9	17.9	10.2	4.1	0.8	0.6	1.1	17.8	45.4	81.9	332
Predominant Wind Direction	W	W	W	W	W	SW	SW	SW	W	W	W	W	

Figure 19: Climate data on Famagusta, North Cyprus. Source: (Özdeniz, 2011)

Due to the climatic features of the island, appropriate types of openings (windows and shading elements) have been used in buildings in order to maximize the amount of daylight; increase ventilation and eliminate humidity as well as protecting the buildings from unwanted solar gains. The following section will investigate types of windows used throughout various periods of island's history.

3.2 Use of Windows in North Cyprus

There are different architectural periods in North Cyprus such as; Ottoman (1571–1878), British (1878–1960) and Modern (1960-present) that imposed their own distinctive styles to everyday life. During the Ottoman period (1571–1878), master builders used to give a great importance to climatic issues in the design of public buildings and houses. For example, when designing houses rooms located around the courtyard with just one side of the building and windows opening to the garden to respond to the features of hot climate. Similarly, British period (1878–1960) was another essential era in Cyprus that has introduced the islanders with new techniques and materials as well as environmentally sensitive design. This period can be categorized in two parts; the first one in between 1878 - 1930 years and the second one in between 1930 - 1960 years. In the second period, right after the World War I, sitting rooms with large openings were popular and they were known as

"Camlik". These spaces were usually positioned at the front facade of houses. Direction of the sun was carefully considered in the design of houses. In the modern period which coincides with the first decade of 1960, houses were built with one or two levels with respect to orientation where sunshades, size of windows and landscape elements were utilized. After 1970s, apartment type residential units became popular, however, the interest in climatic issues in design decreased to a great extend. After 1980s, together with the increase in temporary student population, demand for apartment type housing increased, lowering the quality of design & construction in buildings. Together with the rising need for budget housing especially for renting to students, there were more apartment type housing getting built with mas housing type plans without considering orientation, window size, type and location. From 1990s onwards, mass housing has spread in all major cities of Northern Cyprus including Famagusta. During recent years, we see buildings with larger openings located at randomly selected directions that help increase the heat gain in buildings. It is observed that most of these buildings now use aluminum shutters that absorb high amount of sunlight in summer. Features of windows which responded to the local climate changed drastically after the Ottoman and British period, where less consideration is now given to comfort, natural ventilation and climatic issues in building design (Ozay N., 2005) – Figure 21.

Figure 21 indicates that most of the windows used previously in buildings were vertical but in the modern period until present, shape of the windows have changed to horizontal type. This may be the necessity deriving from more daylight need to keep warm in cold days and have enough natural ventilation in summer.

100	RCHITECTURE	an and the state	WINDOW TYPES	- Alter Instant	MARY REAL PROPERTY AND	WINDOW AREA
RURAL AREAS	VERNACULAR ARCHITECTURE					FAÇADE AREA North: % 10.6 South: % 10.6 East: % 6.6 West: % 5 Total: % 8.2
	OTTOMAN PERIOD (1571-1878)					North: % 9.6 South: %10 East: % 10.4 West: % 6.6 Total: % 9.15
ORBAN AREAS	BRITISH I PERIOD (1878-1930)					North: % 30.2 South: % 23.4 East: % 7 West: % 6.4 Total: % 16.75
DRBAN	BRITISH II PERIOD (1930-1960)				KOUND VENTELATOR IN THE CARLE	North: % 21.2 South: % 12.6 East: % 19.2 West: % 27 Total: % 20
	MODERN PERIOD (1960-)		E			North: % 29.4 South: % 8.8 East: % 24 West: % 14.8 Total: % 19.25

Figure 20: Different types of windows in different architectural period and every side of the building skin. Source: (Ozay N. , 2005)

3.3 Background to Current Window Design

As discussed previously, most of the apartment type buildings located in cities suffer from similar problems that come from standardization of housing design that do not consider the local climate. This is also applicable for current apartments designed and constructed in Famagusta where the characteristics of hot-humid climate are not taken into consideration. This has also been pinpointed by many of the residences questioned in the selected apartment buildings, which are taken as the case of this study.

It is well known that one of the most important components of any building is its skin as it protects the residences from extreme conditions of environment. The components of the building skin like windows and its parts play a significant role in the maintenance of optimum comfort levels, as they are the major contributors to heat gain and loss in buildings. In order to achieve required comfort levels in buildings, criteria such as location of the building, orientation, daylight factor, ventilation, and building components such as windows should be carefully considered during the design stage. If these issues are not well thought out, this will create discomfort for the users and decrease their level of satisfaction.

Most of the residential buildings investigated in Famagusta have proved that major spaces like living rooms and bedrooms lack enough daylight and natural ventilation during the year.

The fact that there is a lack of standards in Northern Cyprus is surely another reason explaining the inconsideration of issues such daylight factor, ventilation, thermal property of materials, etc. Furthermore, the age and function of the building is also a determinant in the selection of windows.

3.4 Window Design in Hot-humid Climates

Climate in Famagusta is a combination of hot dry and warm-humid climate. The hot climate can create challenges for the design of buildings and can cause many failures if appropriate strategies are not used in buildings. The hot-humid climate necessitates the use of natural ventilation to provide air circulation for the elimination of humidity. Therefore, position of the building and openings are important to gain high amount of wind. Moreover, types of the windows are equally significant such as operable windows to provide cross ventilation. The necessary components should be included in order to direct air into the buildings.

It is necessary in hot dry and mixed climates to control the heat transfer into the building using thermal insulation, smaller windows, and bright high reflective external surfaces. Furthermore, in the climate of Famagusta in the east-west side

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shorter facade has to be considered due to the high influence of the sun on this side. Therefore, shading devices should be considered in these faces or shadow casting of every building on each other.

3.5 Data Collection

In this study, six apartment buildings were selected from three construction companies, which are Uzun, Noyanlar and Dovec in Famagusta, North Cyprus. Furthermore, from every company two apartment buildings were chosen of which one is an apartment building with single glazed and the other apartment building with double glazed windows. Apartment buildings have four floors and the same building orientation; their location is not far from each other – figure 22 and Table 1, and all of them have similar window sizes. Furthermore, only second and third level of every apartment building is investigated as the ground and top floors may suffer more from heat loss and gain, which can affect the satisfaction of the residents negatively. Totally, 100 residences are questioned to understand the level of satisfaction relating to window as a building component.



Figure 21: Map of North Cyprus. Source: (URL12, 2014)

Construction Companies	· · · · · · · · · · · · · · · · · · ·	aniar, and Do	Table	Inventory Code	Page Number
- · · · · · · · · · · · · · · · · · · ·				(UZ.M.02.UN.04)	45
				(UZ.M.02.UN.05)	46
				(UZ.M.02.UN.06)	47
				(UZ.M.02.UN.07)	48
				(UZ.M.02.UN.08)	49
	1 (M.Oltan Apt.)	Salamis Yolu	2	(UZ.M.03.UN.09)	50
				(UZ.M.03.UN.10)	50
				(UZ.M.03.UN.11)	52
					53
Uzun				(UZ.M.03.UN.12)	
				(UZ.M.03.UN.13)	54
				(UZ.E.02.UN.03)	55
				(UZ.E.02.UN.03)	56
				(UZ.E.02.UN.04)	57
	2 (Emine Apt.)	Faiz Kaymak SK,	3	(UZ.E.02.UN.04)	58
	2 (Entitle 7 (pt.)	Gülseren (Karakol)	5	(UZ.E.03.UN.05)	59
				(UZ.E.03.UN.05)	60
				(UZ.E.03.UN.06)	61
				(UZ.E.03.UN.06)	62
	3 (Arken 14)	Ulucam Yolu SK,		(NOY.A14.02.UN.04)	63
				(NOY.A14.02.UN.04)	64
				(NOY.A14.02.UN.05)	65
			4	(NOY.A14.02.UN.06)	66
	5 (/ 11Kell 14)	Sakarya	-	(NOY.A14.03.UN.07)	67
		Zafer SK, Sakarya		(NOY.A14.03.UN.08)	68
				(NOY.A14.03.UN.09)	69 70
Noyanlar				(NOY.A12.02.UN.03)	70
				(NOY.A12.02.UN.03)	71
				(NOY.A12.02.UN.04)	72
	4 (Arken 12)		5	(NOY.A12.02.UN.04)	73
		, , , , , , , , , , , , , , , , , , ,		(NOY.A12.03.UN.05)	74
				(NOY.A12.03.UN.05)	75
				(NOY.A12.03.UN.06)	76
				(NOY.A12.03.UN.06)	77
				(DOV.18.02.UN.03)	78
				(DOV.18.02.UN.03)	79
	5 (No. 18)	Akhisar SK,	6	(DOV.18.02.UN.04)	80
		Kaliland (Tuzla)		(DOV.18.03.UN.05)	81
				(DOV.18.03.UN.06)	82
				(DOV.CE.02.UN.03)	83
Dovec				(DOV.CE.02.UN.04)	84
Dorec					85
		Hole CV V-12- 1		(DOV.CE.02.UN.05)	
	6 (Celebi Apt.)	Ilgin SK, Kaliland	7	(DOV.CE.02.UN.06)	86
		(Tuzla)		(DOV.CE.03.UN.07)	87
				(DOV.CE.03.UN.08)	88
				(DOV.CE.03.UN.09)	89
				(DOV.CE.03.UN.10)	90

Table 1: Case studies from three different construction companies like Uzun, Noyanlar, and Dovec

The first and second case studies are built by Uzun Construction Company of which the first one is M. Oltan Apartment building with single glazed windows located along Salamis Yolu. Information in inventories is from observations, and questionnaires. In addition, users' satisfaction level has been measured through questionnaires and orientation of windows has been noted through observations in regards to analysis of ventilation – Table 2. Further information is in appendix B.

Uzun: M				alamis Yolu	2 LIN(0.4)		
		(Single Glaze windows) (UZ.M.02.UN.04) Schematic Plan					
Apartme Building			UNIT 06, 11		NIT 07, 12		
	Second		uit 04 (UZ. ts in each f	M.02.UN.04)			
The Functional Feature	es of Windows	01 (Livi			Satisfaction		
Daylighting :			,	Summer time	Winter time		
Windows Orientation	Northwest			Dissatisfied	Dissatisfied		
WindowsRatio of windowsSizearea to floor area	1.5x1	1.5/4	0=1/26	Neutral	Neutral		
Placement	Salon	Northwes	st	Neutral	Dissatisfied		
Shading Devices	-			Dissatisfied	Dissatisfied		
Ventilation	Single-sideo	d		Dissatisfied	-		
Windows Orientation	Northwest			Dissatisfied	Dissatisfied		
Control of the Air leakage and Condensation	No			Dissatisfied	Dissatisfied		
Windows Opening Types	Double case	ement open	ing	Neutral	Neutral		
The Functional Features	of Windows	02 (Be	droom)	Level of S	Satisfaction		
Daylighting				Summer time	Winter time		
Windows Orientation	Northwest			Neutral	Neutral		
	Southwest	1		Neutral	Neutral		
Windows SizeRatio of windows area to floor area	(1.5x1)x2	3/15=	=1/5	Neutral	Neutral		
Placement	Bedroom	Northwes southwes	,	Neutral Dissatisfied	Neutral Satisfied		
Shading Devices	-			Dissatisfied	Dissatisfied		
Ventilation	Cross and n	atural venti	lation	Satisfied	-		
Windows Orientation	Northwest			Neutral	Neutral		
Control of the Air leakage and	Southwest			Neutral	Neutral		
Condensation	No			Dissatisfied	Dissatisfied		
Windows Opening Types	Double case	i		Neutral	Neutral		
Explanation: Orientation of ur these windows in winter (Win addition, in this unit, daylight shading devices. In bedroom, t	dows size). Windoing and ventilation	ows Size pa	rt in invent m is better	tories just indicate size an	d number of windows. In		

Table 2: M. Oltan Apt., Salamis Yolu

Uzun: M.	Oltan Apt., Salar	mis Yolu (Single Gl	aze windows) (UZ.M.02	2.UN.05)				
Apartm	ent View		Schematic Plan					
	Location	UNIT 08, 11		UNIT 07, 12				
	Second	l floor – Unit 05 (UZ						
	C X // 1	Five units in each						
The Functional Featur	es of windows	01 (Living room)	Summer time	Satisfaction				
Daylighting Windows Orientation	Southeast		Neutral	Winter time Neutral				
Windows Ratio of windows								
Size area to floor area	1.5x1	1.5/30=1/20	Neutral	Neutral				
Placement	Salon	Southeast	Neutral	Dissatisfied				
Shading Devices	-		Dissatisfied	Dissatisfied				
Ventilation	Single-side	1	Dissatisfied	-				
Windows Orientation	Southeast		Neutral	Neutral				
Control of the Air leakage and Condensation	No		Dissatisfied	Dissatisfied				
Windows Opening Types	Double case	ement opening	Neutral	Neutral				
The Functional Features		02 (Bedroom)	Level of S	Satisfaction				
Daylightig			Summer time	Winter time				
	Southwest		Neutral	Neutral				
Windows Orientation	Southeast		Dissatisfied	Neutral				
WindowsRatio of windowsSizearea to floor area	(1.5x1)x2	3/15=1/5	Neutral	Neutral				
Placement	Bedroom	Southeast, and	Dissatisfied	Neutral				
	Beurooni	southwest	Dissatisfied	Satisfied				
Shading Devices	-		Dissatisfied	Dissatisfied				
Ventilation		atural ventilation	Satisfied	-				
Windows Orientation	Southwest		Neutral	Neutral				
	Southeast		Dissatisfied	Neutral				
Control of the Air leakage and Condensation	No		Dissatisfied	Dissatisfied				
Windows Opening Types		ement opening	Neutral	Neutral				
Explanation: Orientation of un have proper daylight and nature								

have proper daylight and natural ventilation. In bedroom daylight and natural ventilation is suitable. This building does not have any shading devices. In this unit, there is glare and unwanted solar gain in summer. Windows Size part in inventories just indicate size and number of windows.

	Uzun: M. C	Oltan Apt., Salaı	nis Yolu (Single Gl	aze windows) (UZ.M.02	2.UN.06)
	Apartmer	nt View		Schematic	Plan
	Building L		UNIT 06, 11		NIT 07, 12
Th	e Functional Features		floor – Unit 06 (UZ. Five units in each f 01 (Bedroom)	floor	atisfaction
			UI (Deuroom)		Winter time
Daylightig Windows O		Northwest		Summer time Dissatisfied	Dissatisfied
Windows Size	Ratio of windows area to floor area	1.5x1	1.5/12=1/8	Neutral	Neutral
Placement		Bedroom	Northwest	Neutral	Dissatisfied
Shading Dev	vices	-		Dissatisfied	Dissatisfied
Ventilatio	n	Single-sideo	1	Dissatisfied	_
Windows O		Northwest	*	Dissatisfied	Dissatisfied
Control of t	he Air leakage and	No		Dissatisfied	Dissatisfied
Condensatio	pening Types	Double case	ement opening	Neutral	Neutral
	unctional Features o		02 (Bedroom)		atisfaction
Daylightig	unctional reatures t		as (activoin)	Summer time	Winter time
<u></u>		Northwest		Neutral	Neutral
Windows O	rientation	Northeast		Neutral	Neutral
Windows Size	Ratio of windows area to floor area	(1.5x1)x2	3/15=1/5	Neutral	Neutral
Placement		Dadasaar	Northwest, and	Neutral	Neutral
racement		Bedroom	northeast	Dissatisfied	Satisfied
Shading Dev	vices	-		Dissatisfied	Dissatisfied
Ventilation		Cross and n	atural ventilation	Satisfied	-
Windows O	rientation	Northwest		Neutral	Neutral
	he Air leakage and	Northeast		Neutral	Neutral
Condensatio	o n	No		Dissatisfied	Dissatisfied
	pening Types		ement opening	Neutral	Neutral
have prope		l ventilation. In	02 (bedroom), dayligh	t, and northeast. In this un ht and natural ventilation i	it, 01 (bedroom) does not is suitable. Windows Size

Uzun: M. Oltan Apt., Salamis Yolu (Single Glaze windows) (UZ.M.02.UN.07)							
Apartme	nt View		Schematic F	lan			
		UNIT 06, 1		IIT 07, 12			
Building I		UNIT 04, 0 J	Balance Robust				
		Five units in eac					
The Functional Features	s of Windows	01 (Bedroom)	Level of Sat				
Daylightig			Summer time	Winter time			
Windows Orientation	Northeast	1	Neutral	Neutral			
WindowsRatio of windowsSizearea to floor area	1.5x1	1.5/12=1/8	Neutral	Neutral			
Placement	Bedroom	Northeast	Neutral	Dissatisfied			
Shading Devices	-		Dissatisfied	Dissatisfied			
Ventilation	Single-sided	1	Dissatisfied	-			
Windows Orientation	Northeast		Neutral	Neutral			
Control of the Air leakage and Condensation	No		Dissatisfied	Dissatisfied			
Windows Opening Types		ment opening	Neutral	-			
Explanation: Orientation of un daylight and natural ventilation							

Uzun: M. Oltan Apt., Salamis Yolu (Single Glaze windows) (UZ.M.02.UN.08)							
Apartı	nent View			Schematic	Plan		
Buildin	g Location		UNIT 06, 11 UNIT 04, 09		UNIT 07, 12		
	Secor			Z.M.02.UN.08)			
		1	its in each	1			
The Functional Features	s of Windows	01 (Bed	lroom)	Level of S			
Daylightig				Summer time	Winter time		
Windows Orientation	Northeast			Neutral	Neutral		
	Southeast	<u>۱</u>		Neutral	Neutral		
Windows SizeRatio of windows area to floor area	(1.5x1)x2	1.5/12	2=1/8	Neutral	Neutral		
Placement	Bedroom	Northeast,	, and	Neutral	Neutral		
	Beardonn	southeast		Dissatisfied	Satisfied		
Shading Devices	-			Dissatisfied	Dissatisfied		
Ventilation	Cross and n	atural ventil	ation	Neutral	-		
Windows Orientation	Northeast			Neutral	Neutral		
	Southeast			Neutral	Neutral		
Control of the Air leakage and Condensation	No			Dissatisfied	Dissatisfied		
Windows Opening Types	Double case	A		Neutral	Neutral		
Explanation: Orientation of un	nit 08 for daylight g	gain is from	northeast,	and southeast. In 01 (bedroo	m), daylight in winter and		

natural ventilation summer is suitable. In bedroom, there is unwanted solar gain in summer. Windows Size part in inventories just indicate size and number of windows.

Uzun: M	. Oltan Apt., Salamis	Yolu (Single Glaze	windows) (UZ.M.03.U	N.09)
Apartm	ent View		Schematic Pla	ın
Building	Location	UNIT 06, 11		07, 12
	Third flo	or – Unit 09 (UZ.M.0.	3 UN 09)	
		ive units in each floor		
The Functional Featu		01 (Living room)	Level of Sa	atisfaction
Daylightig			Summer time	Winter time
Windows Orientation	Northwest		Dissatisfied	Dissatisfied
Windows Ratio of windows Size area to Floor area	1.5x1	1.5/40=1/26	Neutral	Neutral
Placement	Salon	Northwest	Neutral	Dissatisfied
Shading Devices	-		Dissatisfied	Dissatisfied
Ventilation	Single-sided		Dissatisfied	-
Windows Orientation	Northwest		Dissatisfied	Dissatisfied
Control of the Air leakage and Condensation	No		Dissatisfied	Dissatisfied
Windows Opening Types	Double casement	opening	Neutral	Neutral
The Functional Featur	es of Windows	02 (Bedroom)	Level of Sa	atisfaction
Daylightig			Summer time	Winter time
	Northwest		Neutral	Neutral
Windows Orientation	Southwest		Neutral	Neutral
WindowsRatio of windowsSizearea to Floor area	(1.5x1)x2	3/15=1/5	Neutral	Neutral
Placement	Bedroom	Northwest, and southwest	Neutral Dissatisfied	Neutral Satisfied
Shading Devices	-		Dissatisfied	Dissatisfied
Ventilation	Cross and natura	l ventilation	Satisfied	-
	Northwest		Neutral	Neutral
Windows Orientation	Southwest		Neutral	Neutral
Control of the Air leakage and Condensation	No		Dissatisfied	Dissatisfied
Windows Opening Types	Double casement	opening	Neutral	Neutral
Explanation: Orientation of un have proper daylight and natur Windows Size part in inventori	it 09 for daylight gain al ventilation. In 02 (b	is from northwest, an edroom) daylight and r	d southwest. In this unit	01, (bedroom) does not

Uzun: N	I. Oltan Apt., Salamis	Yolu (Single Glaze	windows) (UZ.M.03.U	N.10)				
Apartr	nent View		Schematic Plan					
		UNIT 06, 11		07, 12				
Buildin	g Location			01 (1) (2) (2) (2) (2) (3) (4) (5), 10 (5), 10 (6) (6) (6) (6) (7) (7) (7) (7) (7) (7) (7) (7				
		or – Unit 10 (UZ.M.0.						
		Five units in each floor						
The Functional Feat	ures of Windows	01 (Living room)	Level of S					
Daylightig			Summer time	Winter time				
Windows Orientation	Southeast	7	Neutral	Neutral				
Windows SizeRatio of windows area to floor area	1.5x1	1.5/30=1/20	Neutral	Neutral				
`Placement	Salon	Southeast	Neutral	Satisfied				
Shading Devices	-		Dissatisfied	Dissatisfied				
Ventilation	Single-sided		Dissatisfied	-				
Windows Orientation	Southeast		Neutral	Neutral				
Control of the Air leakage and Condensation	No		Dissatisfied	Dissatisfied				
Windows Opening Types	Double casement	t opening	Neutral	Neutral				
The Functional Feature		02 (Bedroom)	Level of S					
Daylightig			Summer time	Winter time				
	Southwest		Neutral	Neutral				
Windows Orientation	Southeast		Dissatisfied	Neutral				
WindowsRatio of windowsSizearea to floor area	(1.5x1)x2	3/15=1/5	Neutral	Neutral				
Placement	Bedroom	Southeast, and	Dissatisfied	Neutral				
Tacement		southwest	Dissatisfied	Neutral				
Shading Devices	-		Dissatisfied	Dissatisfied				
Ventilation	Cross and natura	l ventilation	Satisfied	-				
Windows Orientation	Southwest Southeast		Neutral Dissatisfied	Neutral Neutral				
Control of the Air leakage and Condensation	No		Dissatisfied	Dissatisfied				
	Double onserver	topening	Neutral	Neutral				
Windows Opening Types Double casement opening Neutral Neutral Explanation: Orientation of unit 10 for daylight gain is from southeast, and southwest. In this unit, 01 (living room) has proper daylight in winter and natural ventilation in summer. In 02 (bedroom) daylight and natural ventilation is enough. In this unit, there is unwanted solar gain in summer. Windows Size part in inventories just indicate size and number of windows.								

Uzun: M	I. Oltan Apt., Salamis	Yolu (Single Glaze	windows) (UZ.M.03.U	N.11)				
Apartn	ent View		Schematic Plan					
Building	Location	UNIT 06, 11	UNIT					
	Third flo	or – Unit 11 (UZ.M.0	3.UN.11)					
	F	five units in each floor	r					
The Functional Feat	ures of Windows	01 (Bedroom)	Level of Satisfaction					
Daylightig			Summer time	Winter time				
Windows Orientation	Northwest		Dissatisfied	Dissatisfied				
Windows SizeRatio of windows area to floor area	1.5x1	1.512=1/8	Neutral	Neutral				
Placement	Bedroom	Northwest	Neutral	Dissatisfied				
Shading Devices	-		Dissatisfied	Dissatisfied				
Ventilation	Single-sided		Dissatisfied					
Windows Orientation	Northwest		Dissatisfied	Dissatisfied				
Control of the Air leakage and Condensation	No		Dissatisfied	Dissatisfied				
Windows Opening Types	Double casement	topening	Neutral	Neutral				
The Functional Featur	es of Windows	02 (Bedroom)	Level of Sa	atisfaction				
Daylightig			Summer time	Winter time				
Windows Orientation	Northwest		Neutral	Neutral				
windows Orientation	Northeast		Neutral	Neutral				
Windows SizeRatio of windows area to floor area	(1.5x1)x2	3/15=1/5	Neutral	Neutral				
Placement	Bedroom	Northwest, and northeast	Neutral	Neutral				
Shading Devices		normeast	Neutral Dissatisfied	Neutral Dissatisfied				
Ventilation	- Cross and natura	l ventilation	Satisfied					
	Northwest	entimation	Neutral	Neutral				
Windows Orientation	Northeast		Neutral	Neutral				
Control of the Air leakage and Condensation	No		Dissatisfied	Dissatisfied				
Windows Opening Types	Double casement	opening	Neutral	Neutral				
Explanation: Orientation of ur have proper daylight and natu in inventories just indicate size	nit 11 for daylight gain ral ventilation. In 02 (b	is from northwest, an edroom) daylight and						

Uzun: M. Oltan Apt., Salamis Yolu (Single Glaze windows) (UZ.M.03.UN.12)							
Apartment View			Schematic Plan				
		UNIT 06, 11 -	UNIT 07, 12				
Building		OOT - Unit 12 (UZ	I UNIT 05.				
		Five units in each					
The Functional Featur	es of Windows	01 (Bedroom)	Level of Sa	atisfaction			
Daylightig			Summer time	Winter time			
Windows Orientation	Northeast		Neutral	Neutral			
Windows SizeRatio of windows area to floor area	1.5x1	1.5/12=1/8	Neutral	Neutral			
Placement	Bedroom	Northeast	Neutral	Dissatisfied			
Shading Devices	-		Dissatisfied	Dissatisfied			
Ventilation	Single-sided		Dissatisfied				
Windows Orientation	Northeast		Neutral	Neutral			
Control of the Air leakage and No			Dissatisfied	Dissatisfied			
Windows Opening Types	Double casem	ent opening	Neutral	Neutral			
Explanation: Orientation of unit 12 for daylight gain is from northeast. In this unit, 01 (bedroom) does not have proper daylight and natural ventilation. Windows Size part in inventories just indicate size and number of windows.							

Uzun: M. Oltan Apt., Salamis Yolu (Single Glaze windows) (UZ.M.03.UN.13)							
Apartm		Schematic Plan					
Building	Location	UNIT 06, 11		JNIT 07, 12			
	Third floo	or – Unit 13 (UZ.M	.03.UN.13)				
	Fi	ive units in each flo	oor				
The Functional Featur	es of Windows	01 (Bedroom)	Level of Satisfaction				
Daylightig		* 	Summer time	Winter time			
Windows Orientation	Northeast		Neutral	Neutral			
	Southeast		Neutral	Neutral			
WindowsRatio of windowsSizearea to floor area	1.5x1	1.5/12=1/8	Neutral	Neutral			
Placement	Bedroom	Northeast, and	Neutral	Neutral			
		southeast	Dissatisfied	Satisfied			
Shading Devices	-		Dissatisfied Neutral	Dissatisfied			
Ventilation		Cross and natural ventilation					
Windows Orientation Northeast			Neutral Neutral	Neutral Neutral			
Control of the Air leakage and Condensation	No			Dissatisfied			
Windows Opening Types	Double casement	<u> </u>	Neutral	Neutral			
Explanation: Orientation of unit 13 for daylight gain is from northeast, and southeast. In 01 (bedroom), daylight in winter and natural ventilation summer is suitable. In bedroom, there is unwanted solar gain in summer. Windows Size part in inventories just indicate size and number of windows.							

The second case study is from Uzun Construction Company, Emine Apartment located in Faiz Kaymak Street, Gülseren region of Famagusta with double glazed windows. Information in inventories is from observations, and questionnaires. In addition, users' satisfaction level is measured using questionnaires and orientation of windows has been noted through observations in regards to analysis of ventilation – Table 3. Further information is in appendix C.

Uzun: Emine Apt., Gülseren, Faiz Kaymak SK (Double Glaze windows) (UZ.E.02.UN.03)							
Apartment View		Schematic Plan					
		10°					
Building Location			UNIT 03, 05				
		Second floor -	- Unit 03 (UZ.E.02.UN	1.03)			
			units in each floor				
	Functional Features	of Windows	01 (Living room) Level of Satisfaction				
Daylightig				Summer time	Winter time		
Windows Orientation		Northeast		Neutral	Satisfied		
		Southeast	1	Dissatisfied	Neutral		
Windows Size	Ratio of windows area to floor area	(1.5x1)x2	3/40=1/13	Neutral	Neutral		
Placement	Placement Salon (2 windows)		Northeast, and Southeast	Neutral Dissatisfied	Neutral Satisfied		
Shading Devices		Shutter (Aluminum with white color)		Neutral	Dissatisfied		
Ventilation Cross ventilation		,	Satisfied	-			
Windows Orientation		Northeast		Neutral	Neutral		
		Southeast		Dissatisfied	Neutral		
Control of the Ai Condensation	r leakage and	Yes		Neutral	Neutral		
Windows Openin			opening	Neutral	Neutral		
The F	The Functional Features of Windows		02 (Bedroom)	Level of S	Level of Satisfaction		
Daylightig				Summer time	Winter time		
Windows Orien					G .: G 1		
	tation	Southeast		Dissatisfied	Satisfied		
Windows Size	tation Ratio of windows area to floor area	1.5x1	1/10	Neutral	Neutral		
Placement	Ratio of windows area to floor area	1.5x1 Bedroom	Southeast	Neutral Dissatisfied	Neutral Satisfied		
Placement Shading Devices	Ratio of windows area to floor area	1.5x1 Bedroom Shutter (Aluminum v	Southeast vith white color)	Neutral Dissatisfied Neutral	Neutral Satisfied Neutral		
Placement Shading Devices Ventilation	Ratio of windows area to floor area	1.5x1 Bedroom Shutter (Aluminum v Cross and natural	Southeast vith white color)	Neutral Dissatisfied Neutral Dissatisfied	Neutral Satisfied Neutral -		
Placement Shading Devices Ventilation Windows Orien	Ratio of windows area to floor area	1.5x1 Bedroom Shutter (Aluminum v	Southeast vith white color)	Neutral Dissatisfied Neutral	Neutral Satisfied Neutral		
Placement Shading Devices Ventilation	Ratio of windows area to floor area ; ; tation r leakage and	1.5x1 Bedroom Shutter (Aluminum v Cross and natural	Southeast vith white color) ventilation	Neutral Dissatisfied Neutral Dissatisfied	Neutral Satisfied Neutral -		

Table 3: Emine Apt., Faiz Kaymak SK, Gülseren

Uzun:	Emine Apt.,	Gülseren, Faiz I	Kaymak SK (Double G	laze windows) (UZ.E.02.U	UN.03)
	Apartment V	iew		Schematic Plan	
I I I I I I I I I I I I I I I I I I I	Building Loca	tion	UNIT 03, 05		UNIT 04, 06
		Second f	loor – Unit 03 (UZ.E.02.U	(IN 03)	
			Two units in each floor		
The Function	al Features of		03 (Bedroom)	Level of Satisfaction	
Daylightig				Summer time	Winter time
Windows Orientation		Southeast		Dissatisfied	Satisfied
	of windows o floor area	1.5x1	1/10	Neutral	Neutral
Placement		Bedroom	Southeast	Neutral	Neutral
Shading Devices			um with white color)	Neutral Neutra	
Ventilation			atural ventilation		
Windows Orientation		Southeast		Dissatisfied	Satisfied
Control of the Air leaka Condensation	age and	Yes		Neutral N	
Windows Opening Type	es	Double case	ment opening	nt opening Neutral Neu	
The Functio	onal Features	of Windows	04 (Bedroom)	Level of Sati	isfaction
Daylightig				Summer time	Winter time
Windows Orientation		Southwest		Dissatisfied	Satisfied
	of windows o floor area	1.5x1	1/10	Neutral	Neutral
Placement		Bedroom	Southwest	Neutral	Neutral
Shading Devices			um with white color)	Neutral	Dissatisfied
Ventilation		Single-sided		Neutral	-
Windows Orientation	and and	Southwest		Satisfied	Neutral
Control of the Air leaka Condensation	age and	Yes		Neutral	Neutral
Windows Opening Type			ment opening	Neutral	Neutral
from northeast, sout	heast, and sout	thwest. This build	ing has shutter shading de	ee orientation of this unit fo evices however, on south side n inventories just indicate size	e of the buildings

Uzun: Emine Apt., Gülseren, Faiz Kaymak SK (Double Glaze windows) (UZ.E.02.UN.04)						
Apartme	nt View		Schematic Pla	n		
		× Star				
Building I	Location	UNIT 03, 05 —		Lave (02) LAVE		
	Secor	nd floor – Unit 04 (UZ	.E.02.UN.04)			
		Two units in each	floor			
The Functional Feature	es of Windows	01 (Living room)	Level of Sa	tisfaction		
Daylightig		•	Summer time	Winter time		
Windows Orientation	Northeast		Neutral	Neutral		
	Northwest		Dissatisfied	Dissatisfied		
WindowsRatio of windowsSizearea to Floor area	(1.5x1)x2	3/40=1/13	Neutral	Neutral		
DI	Salon	Northeast, and	Neutral	Neutral		
Placement	(2 windows)	northwest	Neutral	Dissatisfied		
Shading Devices	Shutter (Alumir	num with white color)				
Ventilation		atural ventilation	Satisfied	-		
	Northeast		Neutral	Neutral		
Windows Orientation	Northwest		Dissatisfied	Dissatisfied		
Control of the Air leakage and Condensation	Yes		Neutral	Neutral		
Windows Opening Types	Double case	ement opening	Neutral	Neutral		
The Functional Features	of Windows	02 (Bedroom)	Level of Sa	tisfaction		
Daylightig			Summer time	Winter time		
Windows Orientation	Northwest		Neutral	Neutral		
WindowsRatio of windowsSizearea to floor area	1.5x1	1/10	Neutral	Neutral		
Placement	Bedroom	Northwest	Neutral	Neutral		
Shading Devices	Shutter (Alumir	um with white color)	Neutral	Neutral		
Ventilation	Single-sideo	1	Dissatisfied	-		
Windows Orientation	Northwest		Neutral	Neutral		
Control of the Air leakage and Condensation	Yes		Neutral	Neutral		
Windows Opening Types	Double case	ement opening	Neutral	Neutral		

Uzun: Emine Apt., Gülseren, Faiz Kaymak SK (Double Glaze windows) (UZ.E.02.UN.04)					
Apartment Vie	w	Schematic Plan			
	Ř.				
Building Locati	UNIT 03, 05		(02) 		
	Second floor	- Unit 04 (UZ.E.0)2.UN.04)		
	Two	units in each floo	r		
The Functional Features of	Windows	03 (Bedroom		Level of Satisfaction	
Daylightig			Summer time	Winter time	
Windows Orientation	Northwest	Ĭ.	Neutral	Neutral	
Windows Size Ratio of windows area to floor area	1.5x1	1/10	Neutral	Neutral	
Placement	Bedroom	Northwest	Neutral	Neutral	
Shading Devices	Shutter (Aluminu	m with white colo	r) Neutral	Neutral	
Ventilation	Cross and na	tural ventilation	Dissatisfied	-	
Windows Orientation	Northwest		Neutral	Neutral	
Control of the Air leakage and Condensation	Yes		Neutral	Neutral	
Windows Opening Types	Double caser	nent opening	Neutral	Neutral	
The Functional Features o		04 (Bedroom)	Level of S	Level of Satisfaction	
Daylightig			Summer time	Winter time	
Windows Orientation	Southwest		Dissatisfied	Satisfied	
Windows Size Ratio of windows area to floor area	1.5x1	1/10	Neutral	Neutral	
Placement	Bedroom	Southwest	Neutral	Neutral	
Shading Devices		m with white colo		Dissatisfied	
Ventilation	Single-sided		Neutral	-	
Windows Orientation	Southwest		Satisfied	Neutral	
Control of the Air leakage and Condensation	Yes		Neutral	Neutral	
Windows Opening Types	Double caser	nent opening	Neutral	Neutral	
Explanation: Unit four is on the righ from northeast, northwest, and south shading devices that used in this bui	west. This building	has shutter shading	g devices however, on south	side of the buildings	

windows.

Uzun: Emine Apt., Gülseren, Faiz Kaymak SK (Double Glaze windows) (UZ.E.03.UN.05)					
Apartme	nt View		Schematic Plan		
	₹ ∂ ¢				
Building	Location	UNIT 03, 05		UNIT 04, 06	
	Third	d floor – Unit 05 (UZ.E	.03.UN.05)		
		Two units in each flo			
The Functional Features	of Windows	01 (Living rooms)		Satisfaction	
Dauliahtia					
Daylightig	- V		Summer time	Winter time	
Windows Orientation	Northeast		Neutral	Satisfied	
Windows Orientation	Northeast Southeast)r			
		3/40=1/13	Neutral	Satisfied	
Windows Orientation Windows Ratio of windows	Southeast	3/40=1/13 Northeast, and Southeast	Neutral Dissatisfied	Satisfied Neutral	
Windows Orientation Windows Ratio of windows Size area to floor area	Southeast (1.5x1)x2 Salon (2 windows)	Northeast, and	Neutral Dissatisfied Neutral Neutral	Satisfied Neutral Neutral Neutral	
Windows Orientation Windows Ratio of windows Size area to floor area Placement	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir	Northeast, and Southeast	Neutral Dissatisfied Neutral Neutral Dissatisfied	Satisfied Neutral Neutral Neutral Satisfied	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir	Northeast, and Southeast num with white color)	Neutral Dissatisfied Neutral Dissatisfied Neutral	Satisfied Neutral Neutral Neutral Satisfied	
Windows Orientation Windows Ratio of windows Size area to floor area Placement Shading Devices	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n	Northeast, and Southeast num with white color)	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied	Satisfied Neutral Neutral Neutral Satisfied Dissatisfied	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast	Northeast, and Southeast num with white color)	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes	Northeast, and Southeast num with white color)	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral Dissatisfied	Satisfied Neutral Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Condensation	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes Double case	Northeast, and Southeast num with white color) atural ventilation	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral Dissatisfied Neutral	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes Double case	Northeast, and Southeast num with white color) atural ventilation	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral Dissatisfied Neutral	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Neutral	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types The Functional Features	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes Double case	Northeast, and Southeast num with white color) atural ventilation	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral Dissatisfied Neutral Neutral Neutral Neutral	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Neutral Satisfaction	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types The Functional Features Daylightig	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes Double case of Windows	Northeast, and Southeast num with white color) atural ventilation	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral Dissatisfied Neutral Neutral Neutral Neutral Dissatisfied Neutral Dissatisfied Neutral Dissatisfied Neutral Satural Neutral Neutral Neutral Neutral	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Neutral Satisfaction Winter time	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types The Functional Features Daylightig Windows Orientation Kindows Orientation	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Southeast Yes Double case of Windows Southeast 1.5x1 Bedroom	Northeast, and Southeast num with white color) atural ventilation ement opening 02 (Bedroom) 1/10 Southeast	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral Dissatisfied Dissatisfied	Satisfied Neutral Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Neutral Satisfaction Winter time Satisfied	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types The Functional Features Daylightig Windows Orientation Windows Orientation	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Southeast Yes Double case of Windows Southeast 1.5x1 Bedroom	Northeast, and Southeast num with white color) atural ventilation ement opening 02 (Bedroom) 1/10	Neutral Dissatisfied Neutral Neutral Neutral Neutral	Satisfied Neutral Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Neutral Satisfaction Winter time Satisfied Neutral	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types The Functional Features Daylightig Windows Orientation Windows Orientation Station Station of windows area to floor area	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Southeast Yes Double case of Windows Southeast 1.5x1 Bedroom	Northeast, and Southeast num with white color) atural ventilation ement opening 02 (Bedroom) 1/10 Southeast num with white color)	Neutral Dissatisfied Neutral	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Satisfaction Winter time Satisfied Neutral Satisfied	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types The Functional Features Daylightig Windows Orientation Ratio of windows area to floor area Placement Shading Devices	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes Double case of Windows Southeast 1.5x1 Bedroom Shutter (Alumir	Northeast, and Southeast num with white color) atural ventilation ement opening 02 (Bedroom) 1/10 Southeast num with white color)	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral Dissatisfied Neutral	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Satisfaction Winter time Satisfied Neutral Satisfied	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types The Functional Features Daylightig Windows Orientation Ratio of windows area to floor area Placement Shading Devices	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes Double case of Windows Southeast 1.5x1 Bedroom Shutter (Alumir Single-sided	Northeast, and Southeast num with white color) atural ventilation ement opening 02 (Bedroom) 1/10 Southeast num with white color)	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral Dissatisfied Neutral Dissatisfied	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Neutral Satisfaction Winter time Satisfied Neutral Satisfied Neutral	

Uzun: Emine Apt., Gülseren, Faiz Kaymak SK (Double Glaze windows) (UZ.E.03.UN.05)					
Apartme	nt View		Schematic Plan		
	₹ ∂ ¢				
Building	Location	UNIT 03, 05		UNIT 04, 06	
	Third	d floor – Unit 05 (UZ.E	.03.UN.05)		
		Two units in each flo			
The Functional Features	of Windows	01 (Living rooms)		Satisfaction	
Dauliahtia					
Daylightig	- V		Summer time	Winter time	
Windows Orientation	Northeast		Neutral	Satisfied	
Windows Orientation	Northeast Southeast)r			
		3/40=1/13	Neutral	Satisfied	
Windows Orientation Windows Ratio of windows	Southeast	3/40=1/13 Northeast, and Southeast	Neutral Dissatisfied	Satisfied Neutral	
Windows Orientation Windows Ratio of windows Size area to floor area	Southeast (1.5x1)x2 Salon (2 windows)	Northeast, and	Neutral Dissatisfied Neutral Neutral	Satisfied Neutral Neutral Neutral	
Windows Orientation Windows Ratio of windows Size area to floor area Placement	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir	Northeast, and Southeast	Neutral Dissatisfied Neutral Neutral Dissatisfied	Satisfied Neutral Neutral Neutral Satisfied	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir	Northeast, and Southeast num with white color)	Neutral Dissatisfied Neutral Dissatisfied Neutral	Satisfied Neutral Neutral Neutral Satisfied	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n	Northeast, and Southeast num with white color)	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied	Satisfied Neutral Neutral Neutral Satisfied Dissatisfied	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast	Northeast, and Southeast num with white color)	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Control of the Air leakage and	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes	Northeast, and Southeast num with white color)	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral Dissatisfied	Satisfied Neutral Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Condensation	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes Double case	Northeast, and Southeast num with white color) atural ventilation	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral Dissatisfied Neutral	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes Double case	Northeast, and Southeast num with white color) atural ventilation	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral Dissatisfied Neutral	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Neutral	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types The Functional Features	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes Double case	Northeast, and Southeast num with white color) atural ventilation	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral Dissatisfied Neutral Neutral Neutral Neutral	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Neutral Satisfaction	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types The Functional Features Daylightig	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes Double case of Windows	Northeast, and Southeast num with white color) atural ventilation	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral Dissatisfied Neutral Neutral Neutral Neutral Dissatisfied Neutral Dissatisfied Neutral Dissatisfied Neutral Satural Neutral Neutral Neutral Neutral	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Neutral Satisfaction Winter time	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types The Functional Features Daylightig Windows Orientation Kindows Orientation	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes Double case of Windows Southeast 1.5x1 Bedroom	Northeast, and Southeast num with white color) atural ventilation ement opening 02 (Bedroom) 1/10 Southeast	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral Dissatisfied Dissatisfied	Satisfied Neutral Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Neutral Satisfaction Winter time Satisfied	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types The Functional Features Daylightig Windows Orientation Windows Orientation	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes Double case of Windows Southeast 1.5x1 Bedroom	Northeast, and Southeast num with white color) atural ventilation ement opening 02 (Bedroom) 1/10	Neutral Dissatisfied Neutral Neutral Neutral Neutral	Satisfied Neutral Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Neutral Satisfaction Winter time Satisfied Neutral	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types The Functional Features Daylightig Windows Orientation Windows Orientation Station Station of windows area to floor area	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes Double case of Windows Southeast 1.5x1 Bedroom	Northeast, and Southeast num with white color) atural ventilation ement opening 02 (Bedroom) 1/10 Southeast num with white color)	Neutral Dissatisfied Neutral	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Satisfaction Winter time Satisfied Neutral Satisfied	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types The Functional Features Daylightig Windows Orientation Ratio of windows area to floor area Placement Shading Devices	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes Double case of Windows Southeast 1.5x1 Bedroom Shutter (Alumir	Northeast, and Southeast num with white color) atural ventilation ement opening 02 (Bedroom) 1/10 Southeast num with white color)	Neutral Dissatisfied Neutral	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Satisfaction Winter time Satisfied Neutral Satisfied	
Windows Orientation Windows Size Ratio of windows area to floor area Placement Shading Devices Ventilation Windows Orientation Control of the Air leakage and Condensation Windows Opening Types The Functional Features Daylightig Windows Orientation Ratio of windows area to floor area Placement Shading Devices	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Northeast Southeast Yes Double case of Windows Southeast 1.5x1 Bedroom Shutter (Alumir Single-sided	Northeast, and Southeast num with white color) atural ventilation ement opening 02 (Bedroom) 1/10 Southeast num with white color)	Neutral Dissatisfied Neutral Dissatisfied Neutral Satisfied Neutral Dissatisfied Neutral Dissatisfied	Satisfied Neutral Neutral Satisfied Dissatisfied - Satisfied Neutral Neutral Neutral Satisfaction Winter time Satisfied Neutral Satisfied Neutral	

	Uzun: Emine Apt., Gülseren, Faiz Kaymak SK (Double Glaze windows) (UZ.E.03.UN.06)					
	Apartment Vi	ew	Schematic Plan			
Building Location			UNIT 03, 05			
	Third floor – Unit 06 (UZ.E.03.UN.06) Two units in each floor					
The	Functional Features	of Windows	01 (Living rooms)	Level of Satisfaction		
Dayligh	itig			Summer time	Winter time	
Windows Ori	entation	Northeast		Neutral	Neutral	
	-	Northwest		Dissatisfied	D'mat' f. 1	
		(1.5x1)x2 3/40=1/13		Dissatisfied	Dissatisfied	
Windows Size	Ratio of windows area to floor area	(1.5x1)x2	3/40=1/13	Neutral	Neutral	
Size		(1.5x1)x2 Salon	3/40=1/13 Northeast, and			
			<u> </u>	Neutral	Neutral	
Size	to floor area	Salon	Northeast, and northwest	Neutral Neutral	Neutral Neutral	
Size Placement	to floor area	Salon (2 windows)	Northeast, and northwest with white color)	Neutral Neutral Neutral	Neutral Neutral Dissatisfied	
Size Placement Shading Devi Ventilation	to floor area	Salon (2 windows) Shutter (Aluminum	Northeast, and northwest with white color)	Neutral Neutral Neutral Neutral	Neutral Neutral Dissatisfied	
Size Placement Shading Devi	to floor area	Salon (2 windows) Shutter (Aluminum Cross and natur	Northeast, and northwest with white color)	Neutral Neutral Neutral Neutral Satisfied	Neutral Neutral Dissatisfied Dissatisfied	
Size Placement Shading Devi Ventilation Windows Ori	to floor area	Salon (2 windows) Shutter (Aluminum Cross and natur Northeast	Northeast, and northwest with white color)	Neutral Neutral Neutral Neutral Satisfied Neutral	Neutral Neutral Dissatisfied Dissatisfied - Neutral	
Size Placement Shading Devi Ventilation Windows Ori Control of the	to floor area	Salon (2 windows) Shutter (Aluminum Cross and natur Northeast Northwest	Northeast, and northwest with white color) ral ventilation	Neutral Neutral Neutral Satisfied Neutral Dissatisfied	Neutral Neutral Dissatisfied Dissatisfied - Neutral Dissatisfied	
Size Placement Shading Devi Ventilation Windows Ori Control of the Condensation Windows Ope	to floor area	Salon (2 windows) Shutter (Aluminum Cross and natur Northeast Northwest Yes Double caseme	Northeast, and northwest with white color) ral ventilation	Neutral Neutral Neutral Satisfied Neutral Dissatisfied Dissatisfied	Neutral Neutral Dissatisfied Dissatisfied - Neutral Dissatisfied Dissatisfied Neutral	
Size Placement Shading Devi Ventilation Windows Ori Control of the Condensation Windows Ope	to floor area	Salon (2 windows) Shutter (Aluminum Cross and natur Northeast Northwest Yes Double caseme	Northeast, and northwest with white color) ral ventilation	Neutral Neutral Neutral Satisfied Neutral Dissatisfied Dissatisfied Neutral	Neutral Neutral Dissatisfied Dissatisfied - Neutral Dissatisfied Dissatisfied Neutral	
Size Placement Shading Devi Ventilation Windows Ori Control of the Condensation Windows Op T	to floor area	Salon (2 windows) Shutter (Aluminum Cross and natur Northeast Northwest Yes Double caseme	Northeast, and northwest with white color) ral ventilation	Neutral Neutral Neutral Satisfied Neutral Dissatisfied Dissatisfied Neutral Level of Sa	Neutral Neutral Dissatisfied Dissatisfied - Neutral Dissatisfied Dissatisfied Neutral tisfaction	
Size Placement Shading Devi Ventilation Windows Ori Control of the Condensation Windows Ope T Dayligh	to floor area	Salon (2 windows) Shutter (Aluminum Cross and natur Northeast Northwest Yes Double caseme s of Windows	Northeast, and northwest with white color) ral ventilation	Neutral Neutral Neutral Satisfied Neutral Dissatisfied Dissatisfied Neutral Level of Satisfied	Neutral Neutral Dissatisfied Dissatisfied - Neutral Dissatisfied Neutral tisfaction Winter time	
Size Placement Shading Devi Ventilation Windows Ori Control of the Condensation Windows Ope T Dayligh Windows Ori Windows	to floor area	Salon (2 windows) Shutter (Aluminum Cross and natur Northeast Northwest Yes Double caseme s of Windows Northwest	Northeast, and northwest with white color) al ventilation nt opening 02 (Bedroom)	Neutral Neutral Neutral Satisfied Neutral Dissatisfied Dissatisfied Neutral Level of Sa Summer time Neutral	Neutral Neutral Dissatisfied Dissatisfied - Neutral Dissatisfied Dissatisfied Neutral Meutral Winter time Neutral	
Size Placement Shading Devi Ventilation Windows Ori Control of the Condensation Windows Ope T Dayligh Windows Ori Windows Size	to floor area	Salon (2 windows) Shutter (Aluminum Cross and natur Northeast Northwest Yes Double caseme s of Windows Northwest 1.5x1	Northeast, and northwest with white color) ral ventilation nt opening 02 (Bedroom) 1/10 Northwest	Neutral Neutral Neutral Satisfied Neutral Dissatisfied Dissatisfied Neutral Level of Sa Summer time Neutral Neutral	Neutral Neutral Dissatisfied Dissatisfied - Neutral Dissatisfied Dissatisfied Neutral tisfaction Winter time Neutral Neutral	
Size Placement Shading Devi Ventilation Windows Ori Control of the Condensation Windows Ope T Dayligh Windows Ori Windows Size Placement	to floor area	Salon (2 windows) Shutter (Aluminum Cross and natur Northeast Northwest Yes Double caseme s of Windows Northwest 1.5x1 Bedroom	Northeast, and northwest with white color) ral ventilation nt opening 02 (Bedroom) 1/10 Northwest	Neutral Neutral Neutral Satisfied Neutral Dissatisfied Dissatisfied Neutral Level of Sa Summer time Neutral Neutral Neutral Neutral	Neutral Neutral Dissatisfied Dissatisfied - Neutral Dissatisfied Dissatisfied Neutral tisfaction Winter time Neutral Neutral Neutral Neutral	
Size Placement Shading Devi Ventilation Windows Ori Control of the Condensation Windows Ope T Dayligh Windows Ori Windows Size Placement Shading Devi	to floor area	Salon (2 windows) Shutter (Aluminum Cross and natur Northeast Northwest Yes Double caseme s of Windows Northwest 1.5x1 Bedroom Shutter (Aluminum	Northeast, and northwest with white color) ral ventilation nt opening 02 (Bedroom) 1/10 Northwest	Neutral Neutral Neutral Satisfied Neutral Dissatisfied Dissatisfied Neutral Level of Sz Summer time Neutral Neutral Neutral Neutral Neutral	Neutral Neutral Dissatisfied Dissatisfied - Neutral Dissatisfied Dissatisfied Neutral tisfaction Winter time Neutral Neutral Neutral Neutral	
Size Placement Shading Devi Ventilation Windows Ori Control of the Condensation Windows Opp T Dayligh Windows Ori Windows Ori Windows Size Placement Shading Devi Ventilation Windows Ori	to floor area	Salon (2 windows) Shutter (Aluminum Cross and natur Northeast Northwest Yes Double caseme s of Windows Northwest 1.5x1 Bedroom Shutter (Aluminum Single-sided	Northeast, and northwest with white color) ral ventilation nt opening 02 (Bedroom) 1/10 Northwest	Neutral Neutral Neutral Satisfied Neutral Dissatisfied Dissatisfied Neutral Level of Sa Summer time Neutral Neutral Neutral Neutral Neutral Neutral Neutral Neutral Neutral	Neutral Neutral Dissatisfied Dissatisfied Neutral Dissatisfied Dissatisfied Neutral Winter time Neutral Neutral Neutral Neutral Neutral Neutral Neutral	

	Uzun: Emine Apt.,	Gülseren, Faiz Kayma	ak SK (Double Gl	aze windows) (UZ.E	.03.UN.06)
	Apartment '	View	Schematic Plan		
Building Location					
			UNIT 03, 05		
		Third floor – U	Jnit 06 (UZ.E.03.UI	N.06)	
		Two ur	nits in each floor	1	
	he Functional Featur	res of Windows	03 (Bedroom)		Satisfaction
Daylight	<u> </u>			Summer time	Winter time
Windows Orie		Northwest	n	Neutral	Neutral
Windows Size	Ratio of windows area to floor area	1.5x1	1/10	Neutral	Neutral
Placement		Bedroom	Northwest	Neutral	Neutral
Shading Device	es	Shutter (Aluminum wit	th white color)	Neutral Neutral	
Ventilation		Cross and natural v	rentilation	Dissatisfied -	
Windows Orien		Northwest		Neutral Neutral	
Control of the Condensation	Air leakage and	Yes	Neutral Neutral		
Windows Oper	ning Types	Double casement o	pening	Neutral	Neutral
Т	he Functional Featur	res of Windows	04 (Bedroom)	Level of S	Satisfaction
Daylight	ig			Summer time	Winter time
Windows Orie	ntation	Southwest		Dissatisfied	Satisfied
Windows Size	Ratio of windows area to floor area	1.5x1	1/10	Neutral	Neutral
Placement		Bedroom	Southwest	Neutral	Neutral
Shading Device	es	Shutter (Aluminum wit	h white color)	Neutral	Dissatisfied
Ventilation		Single-sided		Satisfied	-
Windows Orie	ntation	Southwest		Dissatisfied	Neutral
Control of the Condensation	Air leakage and	Yes		Dissatisfied	Dissatisfied
Windows Open	ning Types	Double casement o	pening	Neutral	Neutral
northeast, no	orthwest, and southwe	t hand of Emine apartment est. This building has shuilding are not proper. W	nutter shading device	ces however, on south	side of the buildings

The third and fourth case studies are constructed by Noyanlar Construction Company. The third one is Arken 14 Apartment building with single glazed windows which is located along Ulucam Street, Sakarya region of Famagusta. Information in inventories is from observations, and questionnaires. In addition, users' satisfaction level has been measured through questionnaires and orientation of windows has been noted through observations in regards to analysis of ventilation – Table 4. Further information is in appendix D.

Noyanlar	: Arken 14 Apt., Ul	ucam Yolu SK, Sa	karya (Single Glaze windows) (NOY.A14.02.UN.04)			
	Apartment View	V	Schematic Plan			
			* 2 , /	UNIT 06, 09		
	Building Locatio		UNIT 04, 07		UNIT 05, 08	
			t 04 (NOY.A14.02.UN.0	4)		
- TL - F	national Easterna CA		its in each floor	I and a fig	a diafa adian	
The Fu Daylightig	nctional Features of V	vindows	01 (Living room)	Level of San Summer time	Winter time	
		Northwest		Dissatisfied	Dissatisfied	
Windows Orientatio	n	Southwest		Neutral	Neutral	
Windows Size	Ratio of windows area to floor area	(1.5x1)x2	3/40=1/13	Neutral	Neutral	
Placement		Salon (2 windows)	Northwest, and southwest	Neutral Neutral	Dissatisfied Neutral	
Shading Devices		Shutter (Aluminun	n with white color)	Neutral	Dissatisfied	
Ventilation		Cross and natu			-	
		Northwest			Dissatisfied	
Windows Orientatio	'n	Southwest			Neutral	
Control of the Air le Condensation	akage and	No		Dissatisfied	Dissatisfied	
Windows Opening T	ypes	Double caseme	ent opening	Neutral	Neutral	
The Fu	nctional Features of V	Vindows	02 (Bedroom)	Level of S	atisfaction	
Daylightig				Summer time	Winter time	
Windows Orientatio	n	Northwest		Dissatisfied	Dissatisfied	
Windows Size	Ratio of windows area to floor area	Northeast (1.5x1)x2	3/15=1/5	Neutral Satisfied	Neutral Neutral	
Placement	area to noor area	Bedroom	Northwest, and	Neutral	Dissatisfied	
		Shoutton (Allows)	northeast	Neutral	Neutral	
Shading Devices		Shutter (Aluminun		Neutral	Dissatisfied	
Ventilation		Cross and natu	rai ventilation	Satisfied Dissatisfied	- Dissotiatied	
Windows Orientatio	n	Northwest Northeast		Neutral	Dissatisfied Neutral	
Control of the Air le Condensation	akage and	No		Dissatisfied	Dissatisfied	
Windows Opening T	vnes	Double caseme	ent opening	Neutral	Neutral	
- muows Opening I	JPCS	Double casellie	an opening	redutat	Incuttat	

Table 4: Arken 14 Apt., Ulucam Yolu SK, Sakarya

Noyanlar: Arken 14 Apt., Ulucam Yolu SK, Sakarya (Single Glaze windows) (NOY.A14.02.UN.04)						
Apartme	nt View		Schematic Pl	an		
		₹Ø,		6, 09		
Building	Location	UNIT 04, 07 -				
		ee units in each fl				
The Functional Feature		03 (Bedroom)	Level of Sa	tisfaction		
Daylightig			Summer time	Winter time		
Windows Orientation	Northeast		Neutral	Neutral		
WindowsRatio of windowsSizearea to floor area	1.5x1	1.5/12=1/8	Neutral	Neutral		
Placement	Bedroom	Northeast	Neutral	Dissatisfied		
Shading Devices	Shutter (Aluminum v	with white color)	Neutral	Dissatisfied		
Ventilation	Single-sided		Dissatisfied	-		
Windows Orientation	Northeast		Neutral	Neutral		
Control of the Air leakage and Condensation	No		Dissatisfied	Dissatisfied		
Windows Opening Types	Double casement		Neutral	Neutral		
Explanation: Orientation of this shading devices however, on so						

Windows Size part in inventories just indicate size and number of windows.

Noyanlar:	Arken 14 Apt., Ulu	cam Yolu SK, S	Sakarya (Single Glaze windows) (NOY.A14.02.UN.05)			
	Apartment View		Schematic Plan			
Apartment View Apartment View Building Location				UNIT 06, 09	Name (0) UNIT 05, 08	
	s	econd floor – Ui	nit 05 (NOY.A14.02.UN	(.05)		
			inits in each floor			
	ional Features of Wine	dows	01 (Living room)	Level of Sa		
Daylightig		Southeast		Summer time Dissatisfied	Winter time Satisfied	
Windows Orientation		Southwest		Neutral	Neutral	
Windows Size	Ratio of windows area to floor area	(1.5x1)x 2	3/40=1/13	Neutral	Neutral	
Placement	л <u>.</u>	Salon (2 windows)	Southeast, and southwest	Neutral	Neutral	
Shading Devices		Shutter (Aluminum with white color)		Neutral Neutral	Neutral Dissatisfied	
Ventilation			natural ventilation	Satisfied	-	
		Southeast		Dissatisfied	Neutral	
Windows Orientation		Southwest		Neutral	Neutral	
Control of the Air leaka	ge and Condensation	No		Dissatisfied	Dissatisfied	
Windows Opening Type		Double casement opening		Neutral	Neutral	
	ional Features of Wind	dows 02 (Bedroom)		Level of Sa		
Daylightig		See the set		Summer time Neutral	Winter time Neutral	
Windows Orientation		Southeast Northeast		Neutral	Dissatisfied	
Windows Size	Ratio of windows area to floor area	(1.5x1)x 2	3/15=1/5	Satisfied	Neutral	
Placement		Bedroom	Southeast, and northeast	Dissatisfied	Satisfied	
Shading Devices		Shutter (Alumi	num with white color)	Neutral Neutral	Neutral Dissatisfied	
Ventilation			natural ventilation	Satisfied	-	
Windows (Driontation	Southeast		Neutral	Neutral	
		Northeast		Neutral	Neutral	
Control of the Air leaka		No		Dissatisfied	Dissatisfied	
Windows Opening Type			ement opening	Neutral	Neutral	
The Funct Daylightig	tional Features of Win	uows	03 (Bedroom)	Level of Sa Summer time	tisfaction Winter time	
Windows Orientation		Northeast		Neutral	Neutral	
Windows Size	Ratio of windows	1.5x1	1.5/12=1/8	Neutral	Neutral	
	area to floor area		ļ			
Placement Shading Devices		Bedroom Shutter (Alumir	Northeast	Neutral Neutral	Dissatisfied Dissatisfied	
Ventilation		Single-side		Dissatisfied	-	
Windows Orientation		Northeast		Neutral	Neutral	
Control of the Air leaka	ge and Condensation	No		Dissatisfied	Dissatisfied	
Windows Opening Type			ement opening	Neutral	Neutral	
devices (shutter) how	vever; on south side of	f the buildings th	om northeast, southeast, lese shading devices are in summer. Windows Si	not proper in this buil	ding in summer. In	

Noyanlar: Arken 14 Apt., Ulucam Yolu SK, Sakarya				arya (Single Glaze windows) (NOY.A14.02.UN.06)		
	Apartm	ent View		Schematic I	Plan	
Apartment View					106, 09	
		Second flo	or – Unit 06 (NOY	A 14 02 LIN 06		
			or – Unit 06 (NO Y Chree units in each			
Т	he Functional Featur		01 (Living room)		atisfaction	
Daylightig	ţ			Summer time	Winter time	
Windows O	rientation	Northeast		Neutral	Dissatisfied	
Windows	Ratio of windows	1.5x1	3/45=1/15	Neutral	Neutral	
Size Placement	area to floor area	Salon	Northeast	Neutral	Neutral	
Shading Dev	vices	Shutter (Aluminum		Neutral	Dissatisfied	
Ventilation		Single-sided	(inter millio conci)	Neutral	-	
Windows O	rientation	Northeast		Neutral	Neutral	
	he Air leakage and	No		Dissatisfied	Dissatisfied	
Condensatio	pening Types	Double casemer	nt opening	Neutral	Neutral	
	e Functional Features		02 (Bedroom)		atisfaction	
Daylightig				Summer time	Winter time	
Windows O		Northeast		Neutral	Dissatisfied	
Windows Size	Ratio of windows area to floor area	1.5x2	3/15=1/5	Neutral	Neutral	
Placement	area to noor area	Bedroom	Northeast	Neutral	Neutral	
Shading Dev	vices	Shutter (Aluminum		Neutral	Dissatisfied	
Ventilation	n	Single-sided	,	Dissatisfied -		
Windows O	rientation	Northeast		Neutral	Neutral	
Control of the Condensation	he Air leakage and	No		Dissatisfied	Dissatisfied	
	pening Types	Double casemer	nt opening	Neutral	Neutral	
	he Functional Featur		03 (Bedroom)		atisfaction	
Daylightig	<u>;</u>			Summer time	Winter time	
Windows O		Northeast		Neutral	Neutral	
Windows Size	Ratio of windows area to floor area	1.5x1	3/15=1/5	Neutral	Neutral	
Placement		Salon	Northeast	Neutral	Neutral	
Shading Dev		Shutter (Aluminum	,	Neutral	Dissatisfied	
Ventilation		Cross and natur	al ventilation	Satisfied	-	
Windows Or	rientation he Air leakage and	Northeast		Neutral	Neutral	
Condensatio		No		Dissatisfied	Dissatisfied	
	pening Types	Double casemer	1 0	Neutral	Neutral	
				This building has shutter sha building in summer. Window		

Explanation: Orientation of unit 06 for daylight gain is from northeast. This building has shutter shading devices although, on south side of the buildings these shading devices are not proper in this building in summer. Windows Size part in inventories just indicate size and number of windows.

Noyanlar: Aı	tken 14 Apt., Uluc	am Yolu SK, Saka	rya (Single Glaze win	dows) (NOY.A14.	03.UN.07)
	Apartment View		Schematic Plan		
	Building Location			01 Bathuan	
		hird floor . Linit 67			Linux Linux Linux Linux
	T		(NOY.A14.03.UN.07)		
The Funct	ional Features of Wi		in each floor 01 (Living room)	Level of Sa	tisfaction
Daylightig	ional reactives of wr	Iuows	of (Living room)	Summer time	Winter time
		Northwest		Dissatisfied	Dissatisfied
Windows Orientation		Southwest		Neutral	Neutral
Windows Size	Ratio of windows area to floor area	(1.5x1)x2	3/40=1/13	Neutral	Neutral
Placement		Salon	Northwest, and	Neutral	Dissatisfied
		(2 windows)	southwest	Neutral	Neutral
Shading Devices		Shutter (Aluminun	,	Neutral	Dissatisfied
Ventilation		Cross and natural ventilation Northwest		Satisfied	-
Windows Orientation		Southwest		Dissatisfied Neutral	Neutral Neutral
Control of the Air leakage	and Condensation	No		Dissatisfied	Dissatisfied
Windows Opening Types		Double casement opening		Neutral	Neutral
The Funct	ional Features of Wi		02 (Bedroom)	Level of Sa	tisfaction
Daylightig				Summer time	Winter time
Windows Orientation		Northwest		Neutral	Dissatisfied
windows Offentation	1	Northeast		Neutral	Neutral
Windows Size	Ratio of windows area to floor area	(1.5x1)x2	3/15=1/5	Satisfied	Neutral
Placement		Bedroom	Northwest, and	Neutral	Dissatisfied
Placement			northeast	Neutral	Neutral
Shading Devices		Shutter (Aluminum with white color)		Neutral	Dissatisfied
Ventilation		Cross and natu	ral ventilation	Satisfied	-
Windows Orientation		Northwest Northeast		Neutral Neutral	Neutral Neutral
Control of the Air leakage	and Condensation	Northeast No		Dissatisfied	Dissatisfied
Windows Opening Types		Double casemo	ent opening	Neutral	Neutral
	ional Features of Wi		03 (Bedroom)	Level of Sa	
Daylightig				Summer time	Winter time
Windows Orientation		Northeast		Neutral	Neutral
Windows Size	Ratio of windows area to floor area	1.5x1	1.5/12=1/8	Neutral	Neutral
Placement		Bedroom	Northeast	Neutral	Dissatisfied
Shading Devices		<u>`</u>	m with white color)	Neutral	Dissatisfied
Ventilation Windows Orientation		Single-sided Northeast		Neutral Neutral	- Neutral
Control of the Air leakage	and Condensation	No		Dissatisfied	Dissatisfied
Windows Opening Types	and contensation	Double casem	ent opening	Neutral	Neutral
Explanation: Orientation		ylight gain is from n	orthwest, southwest, and shading devices are no	d northeast. This bu	ilding has shutter
Windows Size part in in				. proper in this out	ang in summer.

Noyanlar: A	Arken 14 Apt., Ulu	icam Yolu SK, Sak	arya (Single Glaze windows) (NOY.A14.03.UN.08)			
	Apartment View	7	Schematic Plan			
<section-header><section-header></section-header></section-header>			UNIT 04, 07		09	
	ALC V Cor					
		Third floor – Unit (Three unit	08 (NOY.A14.03.U ts in each floor	N.08)		
The Fund	ctional Features of V		01 (Living room)	Level of S	Satisfaction	
Daylightig				Summer time	Winter time	
Windows Orientation		Southeast		Dissatisfied	Satisfied	
Windows Size	Ratio of windows	Southwest (1.5x1)x2	3/40=1/13	Neutral Neutral	Neutral Neutral	
	area to floor area	Salon	Southeast, and	Neutral	Neutral	
Placement		(2 windows) southwest		Neutral	Neutral	
Shading Devices		Shutter (Aluminun color)	with white Neutral Dissat		Dissatisfied	
Ventilation		Cross and natu	ral ventilation	al ventilation Satisfied -		
Windows Orientation		Southeast Southwest	Dissatisfied Neutral			
Control of the Air leak	age and	No		<u>Neutral</u> Neutral		
Condensation Windows Opening Typ	Des	Double caseme	ent opening	Neutral	Neutral	
1 0 11	ctional Features of V		O2 (Bedroom) Level of Satisfaction			
Daylightig				Summer time	Winter time	
Windows Orientation		Southeast		Neutral	Neutral	
	Ratio of windows	Northeast	1	Neutral	Neutral	
Windows Size	area to floor area	(1.5x1)x2	3/15=1/5	Satisfied	Neutral	
Placement		Bedroom	Southeast, and northeast	Dissatisfied Neutral	Satisfied Neutral	
Shading Devices		Shutter (Aluminun	n with white	Neutral	Dissatisfied	
Ventilation		color) Cross and natu	ral ventilation	Satisfied	-	
Windows Orientation		Southeast		Neutral	Neutral	
Control of the Air leak	ago and	Northeast		Neutral	Dissatisfied	
Condensation	0	No		Dissatisfied	Dissatisfied	
Windows Opening Typ		Double casemo	- i i	Neutral	Neutral	
The Func Daylightig	tional Features of V	vindows	03 (Bedroom)	Level of S Summer time	Satisfaction Winter time	
Windows Orientation		Northeast		Neutral	Dissatisfied	
Windows Size	Ratio of windows area to floor area	1.5x1	1.5/12=1/8	Neutral	Neutral	
Placement	area to noor area	Bedroom	Northeast	Neutral	Dissatisfied	
Shading Devices		Shutter (Aluminun color)	n with white	Neutral	Dissatisfied	
Ventilation		Single-sided		Dissatisfied	-	
Windows Orientation		Northeast		Neutral	Neutral	
Control of the Air leak Condensation	age and	No		Dissatisfied	Dissatisfied	
Windows Opening Typ		Double caseme	<u> </u>	Neutral	Neutral	
Explanation: Orient	ation of this unit for	or daylight gain is f	rom northeast sou	thwest and southeas	st This building has	

Explanation: Orientation of this unit for daylight gain is from northeast, southwest, and southeast. This building has shading devices (shutter) however; on south side of the buildings these shading devices are not proper in this building in summer. Windows Size part in inventories just indicate size and number of windows.

Noyanlar: Arken 1	4 Apt., Ulucam Yolu	SK, Sakarya (Sing	gle Glaze windows) (NO	Y.A14.03.UN.09)
Apart	ment View		Schematic F	lan
			(06, 09	
Building Location				
	Third floo	r – Unit 09 (NOY.A	.14.03.UN.09)	
		hree units in each f		
The Functional Feat	ures of Windows	01 (Living room)		atisfaction
Daylightig Windows Orientation	Northaast		Summer time	Winter time
Windows Orientation Windows Ratio of windows	Northeast		Neutral	Neutral
Size area to floor area	(1.5x1)x2	3/45=1/15	Neutral	Neutral
Placement	Salon	Northeast	Neutral	Neutral
Shading Devices	Shutter (Aluminum	,	Neutral	Dissatisfied
Ventilation Windows Orientation	Cross and natura	al ventilation	Dissatisfied Neutral	 Dissatisfied
Control of the Air leakage and	No		Dissatisfied	Dissatisfied
Condensation				
Windows Opening Types	Double casemen	1 0	Neutral	Neutral
The Functional Featur Daylightig	es of Windows	02 (Bedroom)	Summer time	atisfaction Winter time
Windows Orientation	Northeast		Neutral	Dissatisfied
Windows Ratio of windows	(1.5x1)x2	3/15=1/5	Neutral	Neutral
Size area to floor area	Bedroom			Neutral
Placement Shading Devices	Shutter (Aluminum	Northeast with white color)	Neutral Neutral	Dissatisfied
Ventilation	Cross and natura	,	Neutral	-
Windows Orientation	Northeast		Neutral	Neutral
Control of the Air leakage and Condensation	No		Dissatisfied	Dissatisfied
Windows Opening Types	Double casemen	t opening	Neutral	Neutral
The Functional Feat		03 (Bedroom)		atisfaction
Daylightig			Summer time	Winter time
Windows Orientation	Northeast		Neutral	Neutral
WindowsRatio of windowsSizearea to floor area	(1.5x1)x2	3/15=1/5	Neutral	Neutral
Placement	Salon	Northeast	Neutral	Dissatisfied
Shading Devices	Shutter (Aluminum	with white color)	Neutral	Dissatisfied
Ventilation	Cross and natura	al ventilation	Neutral	-
Windows Orientation Control of the Air leakage and	Northeast		Neutral	Neutral
Control of the Air leakage and Condensation	No		Dissatisfied	Dissatisfied
Windows Opening Types	Double casemen	<u> </u>	Neutral	Neutral
Explanation: Orientation of although, on south side of the inventories just indicate size a	buildings these shading	devices are not pro		

The fourth case is Arken 12 Apartment building with double glazed windows which is located in Zafer Street, Sakarya region of Famagusta. Information in inventories is from observations, and questionnaires. In addition, users' satisfaction level has been measured through questionnaires and orientation of windows has been noted through observations in regards to analysis of ventilation – Table 5. Further information is in appendix E.

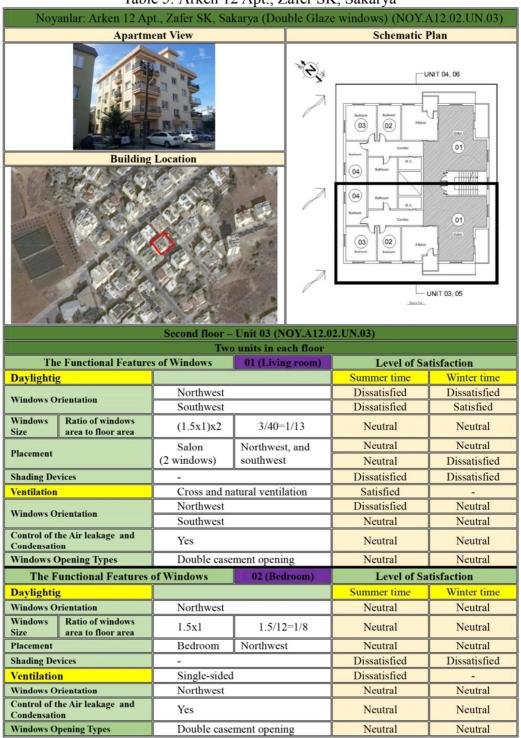


Table 5: Arken 12 Apt., Zafer SK, Sakarya

Noyanlar: Arken 12 Apt.,	Zafer SK, Saka	rya (Double Glaze	windows) (NOY.A12.	02.UN.03)
Apartment View			Schematic Plan	
	₹ G *	UNIT 04	.06	
Building Location	7		01	
		nit 03 (NOY.A12.02.	UN.03)	
The Equational Eastmas of Wi		nits in each floor 03 (Bedroom)	Level of Sa	tisfaction
The Functional Features of Wi	naows	US (Bedroom)	Summer time	Winter time
Daylightig	Northwest		Neutral	Neutral
Windows Orientation	Northeast		Neutral	Neutral
Windows Size Ratio of windows area to floor area	(1.5x1)x2	1/5	Neutral	Neutral
Placement	Bedroom	Northwest, and northeast	Neutral Neutral	Neutral Neutral
Shading Devices	-	1	Dissatisfied	Dissatisfied
Ventilation	Cross and n	atural ventilation	Satisfied	-
	Northwest		Neutral	Neutral
Windows Orientation	Northeast		Neutral	Neutral
Control of the Air leakage and Condensation	Yes		Neutral	Neutral
Windows Opening Types	Double case	ement opening	Neutral	Neutral
The Functional Features of W	indows	04 (Bedroom)	Level of Sa	tisfaction
Daylightig			Summer time	Winter time
Windows Orientation	Northeast		Neutral	Neutral
Windows Size Ratio of windows area to floor area	1.5x1	1/8	Neutral	Neutral
Placement	Bedroom	Northeast	Neutral	Neutral
Shading Devices	-		Dissatisfied	Dissatisfied
Ventilation	Single-sideo	1	Dissatisfied	-
Windows Orientation Control of the Air leakage and	Northeast Yes		Neutral Neutral	Neutral Neutral
Condensation		mant an an in -		
Windows Opening Types Explanation: Unit 03 is on the left hand northeast, northwest, and southwest. Th indicate size and number of windows.	of Arken 12 apar			

	Noyanlar: Arken 12 Apt., Zafer SK, Sakarya (Double Glaze windows) (NOY.A12.02.UN.04)						
	Apartmen	nt View				Schematic Plan	
					UNIT 04, 06		
Building Location						NG NG NG NG NG NG NG NG NG NG	
		Second f	loor – Uni	it 04 (NOY.A1	12.02	2.UN.04)	
				its in each floo			
The	Functional Features of	f Windows	01 (I	Living room)		Level of S	atisfaction
Davlightig							
Dayngntiş	5					Summer time	Winter time
	<u> </u>	Southwest				Summer time Dissatisfied	Winter time Satisfied
Windows O	<u> </u>	Southwest Southeast					
	<u> </u>		3/40	=1/13		Dissatisfied	Satisfied
Windows O Windows Size	Prientation Ratio of windows area	Southeast (1.5x1)x2 Salon	Southwe	est, and		Dissatisfied Dissatisfied	Satisfied Neutral
Windows O Windows	Prientation Ratio of windows area	Southeast (1.5x1)x2 Salon (2 windows)	Southwe Southea	est, and st		Dissatisfied Dissatisfied Neutral Neutral Dissatisfied	Satisfied Neutral Neutral Dissatisfied Satisfied
Windows O Windows Size Placement Shading De	vices	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumin	Southwe Southea num with y	est, and st white color)		Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Neutral	Satisfied Neutral Neutral Dissatisfied
Windows O Windows Size Placement	vices	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n	Southwe Southea num with y	est, and st white color)		Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Neutral Satisfied	Satisfied Neutral Dissatisfied Satisfied Dissatisfied
Windows O Windows Size Placement Shading De	Prientation Ratio of windows area to floor area vices	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest	Southwe Southea num with y	est, and st white color)		Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Neutral Satisfied Satisfied	Satisfied Neutral Dissatisfied Satisfied Dissatisfied - Neutral
Windows O Windows Size Placement Shading De Ventilatio Windows O	rientation Ratio of windows area to floor area vices n	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n	Southwe Southea num with y	est, and st white color)		Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Neutral Satisfied	Satisfied Neutral Dissatisfied Satisfied Dissatisfied
Windows O Windows Size Placement Shading De Ventilatio Windows O	Prientation Ratio of windows area to floor area vices n Prientation the Air leakage and	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest	Southwe Southea num with y	est, and st white color)		Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Neutral Satisfied Satisfied	Satisfied Neutral Dissatisfied Satisfied Dissatisfied - Neutral
Windows O Windows Size Placement Shading De Ventilatio Windows O Control of t Condensatio	Prientation Ratio of windows area to floor area vices n Prientation the Air leakage and	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumin Cross and n Southwest Southeast	Southwe Southea num with v atural ven	est, and st white color) tilation		Dissatisfied Dissatisfied Neutral Dissatisfied Neutral Satisfied Satisfied Dissatisfied	Satisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied - Neutral Neutral
Windows O Windows Size Placement Shading De Ventilatio Windows O Control of t Condensatio Windows O	Prientation Ratio of windows area to floor area vices n Prientation the Air leakage and on	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case	Southwe Southea num with v atural vent	est, and st white color) tilation		Dissatisfied Dissatisfied Neutral Dissatisfied Neutral Satisfied Satisfied Dissatisfied Neutral Neutral	Satisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied - Neutral Neutral
Windows O Windows Size Placement Shading De Ventilatio Windows O Control of t Condensatio Windows O	rientation Ratio of windows area to floor area vices n rientation the Air leakage and on opening Types Functional Features of	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case	Southwe Southea num with v atural vent	est, and st white color) tilation		Dissatisfied Dissatisfied Neutral Dissatisfied Neutral Satisfied Dissatisfied Dissatisfied Neutral Neutral Level of S Summer time	Satisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied - Neutral Neutral Neutral Neutral
Windows O Windows Size Placement Shading De Ventilatio Windows O Control of t Condensati Windows O The Daylightig Windows O	rientation Ratio of windows area to floor area vices n rientation the Air leakage and on pening Types Functional Features of g brientation	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case	Southwe Southea num with v atural vent	est, and st white color) tilation		Dissatisfied Dissatisfied Neutral Dissatisfied Neutral Satisfied Dissatisfied Dissatisfied Neutral Neutral Neutral Level of S	Satisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied - Neutral Neutral Neutral Neutral atisfaction
Windows O Windows Size Placement Shading De Ventilatio Windows O Control of t Condensati Windows O The Daylightig	rientation Ratio of windows area to floor area vices n rientation the Air leakage and on opening Types Functional Features of g	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumin Cross and n Southwest Southeast Yes Double case Windows	Southwe Southea num with v atural vent	est, and st white color) tilation		Dissatisfied Dissatisfied Neutral Dissatisfied Neutral Satisfied Dissatisfied Dissatisfied Neutral Neutral Level of S Summer time	Satisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied - Neutral Neutral Neutral Neutral atisfaction Winter time
Windows O Windows Size Placement Shading De Ventilatio Windows O Control of t Condensatio Windows O The Daylightig Windows O Windows O	Prientation Ratio of windows area to floor area vices n Prientation the Air leakage and on opening Types Functional Features of g prientation	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case Windows Southeast	Southwe Southea num with v atural vent	est, and st white color) tilation ning (Bedroom)		Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Neutral Satisfied Dissatisfied Neutral Neutral Neutral Level of S Summer time Dissatisfied	Satisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied - Neutral Neutral Neutral Neutral Atisfaction Winter time Satisfied
Windows O Windows Size Placement Shading De Ventilatio Windows O Control of t Condensatio Windows O The Daylightig Windows O Windows O	rientation Ratio of windows area to floor area vices n Prientation the Air leakage and on Preining Types Functional Features of g rientation Ratio of windows area to floor area	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case Windows Southeast 1.5x1	Southwe Southea num with v atural ven ement oper 02 1/8 Southea	est, and st white color) tilation ning (Bedroom) st		Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Neutral Satisfied Dissatisfied Neutral Neutral Level of S Summer time Dissatisfied Neutral	Satisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied - Neutral Neutral Neutral Neutral atisfaction Winter time Satisfied Neutral
Windows O Windows Size Placement Shading De Ventilatio Windows O Control of t Condensatio Windows O The Daylightig Windows O Windows O Windows O	rientation Ratio of windows area to floor area vices n Prientation the Air leakage and on Ppening Types Functional Features of g Prientation Ratio of windows area to floor area vices	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case Windows Southeast 1.5x1 Bedroom	Southwe Southea num with v atural ven ement oper 02 1/8 Southea num with v	est, and st white color) tilation ning (Bedroom) st		Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Neutral Satisfied Dissatisfied Neutral Neutral Level of S Summer time Dissatisfied Neutral Dissatisfied	Satisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied - Neutral Neutral Neutral Neutral atisfaction Winter time Satisfied Neutral Satisfied
Windows O Windows Size Placement Shading De Ventilatio Windows O Control of t Condensatie Windows O The Daylightig Windows O Windows O Size Placement Shading De	rientation Ratio of windows area to floor area vices n Prientation the Air leakage and on Ppening Types Functional Features of g Prientation Ratio of windows area to floor area vices n	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case Windows Southeast 1.5x1 Bedroom Shutter (Alumir	Southwe Southea num with v atural ven ement oper 02 1/8 Southea num with v	est, and st white color) tilation ning (Bedroom) st		Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Neutral Satisfied Dissatisfied Neutral Neutral Level of S Summer time Dissatisfied Neutral Dissatisfied Neutral	Satisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied - Neutral Neutral Neutral Neutral atisfaction Winter time Satisfied Neutral Satisfied Neutral
Windows O Windows Size Placement Shading De Ventilatio Windows O Control of t Condensatio Windows O The Daylightig Windows O Windows O Windows Size Placement Shading De Ventilatio Windows O	rientation Ratio of windows area to floor area vices n rientation rientation rientation Functional Features of g rientation Ratio of windows area to floor area vices n vices n the Air leakage and the Air leakage and	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case Windows Southeast 1.5x1 Bedroom Shutter (Alumir Single-sideo	Southwe Southea num with v atural ven ement oper 02 1/8 Southea num with v	est, and st white color) tilation ning (Bedroom) st		Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Neutral Satisfied Dissatisfied Neutral Neutral Level of S Summer time Dissatisfied Neutral Dissatisfied Neutral Dissatisfied	Satisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied - Neutral Neutral Neutral Neutral Meutral Meutral Satisfied Neutral Satisfied Neutral

Noyanlar: Arken	12 Apt., Zafer SK, Sa	karya (Double Glaz	e windows) (NOY.A1	2.02.UN.04)
Apartme	nt View		Schematic Pla	in and a second s
Building I	₹ E }		04, 06	
		<u>-7µ14200.</u>	00	
		- Unit 04 (NOY.A12.0)2.UN.04)	
The Development Development		o units in each floor	I was here to	<i></i>
The Functional Feature	s of windows	03 (Bedroom)	Summer time	atisfaction Winter time
Daylightig	Southeast		Dissatisfied	Satisfied
Windows Orientation	Northeast		Neutral	Neutral
Windows Size Ratio of windows area to floor area	(1.5x1)x2	1/5	Neutral	Neutral
Placement	Bedroom (2 windows)	Southeast, and northeast	Neutral Neutral	Neutral Neutral
Shading Devices	Shutter (Aluminum w	with white color)	Neutral	Neutral
Ventilation	Cross and natural	ventilation	Neutral	-
Window Oniversities	Southeast		Dissatisfied	Neutral
Windows Orientation	Northeast		Neutral	Neutral
Control of the Air leakage and Condensation	Yes		Neutral	Neutral
Windows Opening Types	Double casement	opening	Neutral	Neutral
The Functional Featu	res of Windows	04 (Bedroom)	Level of	Satisfaction
Daylightig			Summer time	Winter time
Windows Orientation	Northeast		Neutral	Neutral
Windows Size Ratio of windows area to floor area	1.5x1	1/8	Neutral	Neutral
Placement	Bedroom	Northeast	Neutral	Neutral
Shading Devices	Shutter (Aluminum w	with white color)	Neutral	Dissatisfied
Ventilation	Single-sided		Dissatisfied	-
Windows Orientation	Northeast		Neutral	Neutral
Control of the Air leakage and Condensation	Yes		Neutral	Neutral
Windows Opening Types	Double casement	1 0	Neutral	Neutral
Explanation: Unit 04 is on the ri northeast, southeast, and southwe devices that used in this building	est. This Unit has shad	ing devices (shutter) a	lthough, on south side o	f the buildings shading

N	Noyanlar: Arken 12	Apt., Zafer SK, S	akarya (Double Gla	aze windows) (NOY.A1	2.03.UN.05)
	Apartment	View		Schematic Pla	in
Building Location			J.		04, 06
Building Location					0 1 03. 05
		Third floor -	– Unit 05 (NOY.A12	.03.UN.05)	
			vo units in each floo	r	
The	Functional Features	s of Windows	01 (Living room)	Level of Sa	tisfaction
Daylightig				Summer time	Winter time
Daylightig Windows Orien	tation	Northwest		Summer time Dissatisfied	Winter time Dissatisfied
		Northwest Southwest		Summer time	Winter time
	tation Ratio of windows area to floor area		3/40=1/13	Summer time Dissatisfied	Winter time Dissatisfied
Windows Orien Windows Size	Ratio of windows	Southwest	řena za	Summer time Dissatisfied Dissatisfied	Winter time Dissatisfied Satisfied
Windows Orien	Ratio of windows	Southwest (1.5x1)x2	3/40=1/13	Summer time Dissatisfied Dissatisfied Neutral	Winter time Dissatisfied Satisfied Neutral
Windows Orien Windows Size Placement Shading Devices	Ratio of windows area to floor area	Southwest (1.5x1)x2 Salon (2 windows) -	3/40=1/13 Northwest, and southwest	Summer time Dissatisfied Dissatisfied Neutral Neutral Neutral Dissatisfied	Winter time Dissatisfied Satisfied Neutral Neutral
Windows Orien Windows Size Placement	Ratio of windows area to floor area	Southwest (1.5x1)x2 Salon (2 windows) - Cross and natu	3/40=1/13 Northwest, and southwest	Summer time Dissatisfied Dissatisfied Neutral Neutral Neutral Dissatisfied Satisfied	Winter time Dissatisfied Satisfied Neutral Neutral Dissatisfied Dissatisfied
Windows Orien Windows Size Placement Shading Devices	Ratio of windows area to floor area	Southwest (1.5x1)x2 Salon (2 windows) - Cross and natu Northwest	3/40=1/13 Northwest, and southwest	Summer time Dissatisfied Dissatisfied Neutral Neutral Neutral Dissatisfied Satisfied Dissatisfied	Winter time Dissatisfied Satisfied Neutral Dissatisfied Dissatisfied Dissatisfied Dissatisfied Dissatisfied Dissatisfied
Windows Orien Windows Size Placement Shading Devices Ventilation Windows Orien	Ratio of windows area to floor area s tation	Southwest (1.5x1)x2 Salon (2 windows) - Cross and natu Northwest Southwest	3/40=1/13 Northwest, and southwest	Summer time Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied Satisfied	Winter time Dissatisfied Satisfied Neutral Dissatisfied Dissatisfied - Dissatisfied Neutral
Windows Orien Windows Size Placement Shading Devices Ventilation	Ratio of windows area to floor area s tation	Southwest (1.5x1)x2 Salon (2 windows) - Cross and natu Northwest	3/40=1/13 Northwest, and southwest	Summer time Dissatisfied Dissatisfied Neutral Neutral Neutral Dissatisfied Satisfied Dissatisfied	Winter time Dissatisfied Satisfied Neutral Dissatisfied Dissatisfied Dissatisfied Dissatisfied Dissatisfied Dissatisfied
Windows Orien Windows Size Placement Shading Devices Ventilation Windows Orien Control of the A	Ratio of windows area to floor area s tation xir leakage and	Southwest (1.5x1)x2 Salon (2 windows) - Cross and natu Northwest Southwest	3/40=1/13 Northwest, and southwest	Summer time Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied Satisfied	Winter time Dissatisfied Satisfied Neutral Dissatisfied Dissatisfied - Dissatisfied Neutral
Windows Orien Windows Size Placement Shading Devices Ventilation Windows Orien Control of the A Condensation Windows Oper	Ratio of windows area to floor area s tation xir leakage and	Southwest (1.5x1)x2 Salon (2 windows) - Cross and natu Northwest Southwest Yes Double casem	3/40=1/13 Northwest, and southwest	Summer time Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied Satisfied Neutral	Winter time Dissatisfied Satisfied Neutral Neutral Dissatisfied Dissatisfied Dissatisfied Neutral
Windows Orien Windows Size Placement Shading Devices Ventilation Windows Orien Control of the A Condensation Windows Oper	Ratio of windows area to floor area s tation tir leakage and ting Types	Southwest (1.5x1)x2 Salon (2 windows) - Cross and natu Northwest Southwest Yes Double casem	3/40=1/13 Northwest, and southwest iral ventilation	Summer time Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied Satisfied Neutral Neutral	Winter time Dissatisfied Satisfied Neutral Neutral Dissatisfied Dissatisfied Dissatisfied Neutral
Windows Orien Windows Size Placement Shading Devices Ventilation Windows Orien Control of the A Condensation Windows Oper The Fu	Ratio of windows area to floor area s tation hir leakage and hing Types unctional Features of tation	Southwest (1.5x1)x2 Salon (2 windows) - Cross and natu Northwest Southwest Yes Double casem	3/40=1/13 Northwest, and southwest iral ventilation	Summer time Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied Satisfied Neutral Neutral Level of Sa	Winter time Dissatisfied Satisfied Neutral Dissatisfied Dissatisfied Dissatisfied Neutral
Windows Orien Windows Size Placement Shading Devices Ventilation Windows Orien Control of the A Condensation Windows Oper The Ft Daylightig	Ratio of windows area to floor area s tation tir leakage and ning Types unctional Features of	Southwest (1.5x1)x2 Salon (2 windows) - Cross and natu Northwest Southwest Yes Double casem of Windows	3/40=1/13 Northwest, and southwest iral ventilation	Summer time Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied Satisfied Neutral Neutral Level of Sa Summer time	Winter time Dissatisfied Satisfied Neutral Dissatisfied Dissatisfied Dissatisfied Neutral Winter time
Windows Orien Windows Size Placement Shading Devices Ventilation Windows Orien Control of the A Condensation Windows Oper The Ft Daylightig Windows Orien	Ratio of windows area to floor area s tation ir leakage and hing Types Inctional Features of tation Ratio of windows	Southwest (1.5x1)x2 Salon (2 windows) - Cross and natu Northwest Southwest Yes Double casem f Windows Northwest	3/40=1/13 Northwest, and southwest iral ventilation ent opening 02 (Bedroom)	Summer time Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Satisfied Satisfied Neutral Neutral Neutral Level of Sa Summer time Neutral	Winter time Dissatisfied Satisfied Neutral Dissatisfied Dissatisfied Oissatisfied Neutral Neutral Neutral Dissatisfied Neutral Neutral Neutral Neutral Neutral Neutral Neutral Neutral Neutral
Windows Orien Windows Size Placement Shading Devices Ventilation Windows Orien Control of the A Condensation Windows Oper The Ft Daylightig Windows Orien Windows Size	Ratio of windows area to floor area	Southwest (1.5x1)x2 Salon (2 windows) - Cross and natu Northwest Southwest Yes Double casem of Windows Northwest 1.5x1	3/40=1/13 Northwest, and southwest iral ventilation ent opening 02 (Bedroom) 1.5/12=1/8	Summer time Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied Satisfied Neutral Neutral Level of Sa Summer time Neutral Neutral	Winter time Dissatisfied Satisfied Neutral Dissatisfied Dissatisfied Dissatisfied Neutral
Windows Orien Windows Size Placement Shading Devices Ventilation Windows Orien Control of the A Condensation Windows Oper The Ft Daylightig Windows Orien Windows Size Placement	Ratio of windows area to floor area	Southwest (1.5x1)x2 Salon (2 windows) - Cross and natu Northwest Southwest Yes Double casem of Windows Northwest 1.5x1 Bedroom	3/40=1/13 Northwest, and southwest iral ventilation ent opening 02 (Bedroom) 1.5/12=1/8	Summer time Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied Satisfied Neutral Neutral Neutral Neutral Neutral Neutral Neutral Neutral Neutral Neutral	Winter time Dissatisfied Satisfied Neutral Neutral Dissatisfied Dissatisfied Oissatisfied Neutral
Windows Orien Windows Size Placement Shading Devices Ventilation Windows Orien Control of the A Condensation Windows Oper The Ft Daylightig Windows Orien Windows Size Placement Shading Devices	Ratio of windows area to floor area s tation ir leakage and ning Types inctional Features of tation Ratio of windows area to floor area	Southwest (1.5x1)x2 Salon (2 windows) - Cross and natu Northwest Southwest Yes Double casem of Windows Northwest 1.5x1 Bedroom -	3/40=1/13 Northwest, and southwest iral ventilation ent opening 02 (Bedroom) 1.5/12=1/8	Summer time Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied Satisfied Neutral Neutral Dissatisfied Satisfied Neutral	Winter time Dissatisfied Satisfied Neutral Neutral Dissatisfied Dissatisfied Oissatisfied Neutral
Windows Orien Windows Size Placement Shading Devices Ventilation Windows Orien Control of the A Condensation Windows Oper The Ft Daylightig Windows Orien Windows Size Placement Shading Devices Ventilation	Ratio of windows area to floor area s tation ir leakage and ning Types inctional Features of tation Ratio of windows area to floor area s	Southwest (1.5x1)x2 Salon (2 windows) - Cross and natu Northwest Southwest Yes Double casem of Windows Northwest 1.5x1 Bedroom - Single-sided	3/40=1/13 Northwest, and southwest iral ventilation ent opening 02 (Bedroom) 1.5/12=1/8	Summer time Dissatisfied Dissatisfied Neutral Neutral Dissatisfied Satisfied Dissatisfied Satisfied Neutral Neutral Dissatisfied Satisfied Neutral Neutral	Winter time Dissatisfied Satisfied Neutral Neutral Dissatisfied Dissatisfied Oissatisfied Neutral Neutral

Noyanlar: Arken 12 Apt.,	Zafer SK, Saka	rya (Double Glaze	windows) (NOY.A12.	03.UN.05)
Apartment View			Schematic Plan	
	¢€	UNIT DA	0.06	
Building Location				
		hit 05 (NOY.A12.03. nits in each floor	_ <u>5994*6</u> _	
The Functional Features of W	indows	03 (Bedroom)	Level of Sa	tisfaction
Daylightig			Summer time	Winter time
Windows Orientation	Northwest		Neutral	Neutral
	Northeast		Neutral	Neutral
Windows Size Ratio of windows area to floor area	(1.5x1)x2	1/5	Neutral	Neutral
Placement	Bedroom	Northwest, and northeast	Neutral Neutral	Neutral Neutral
Shading Devices		nortifeust	Dissatisfied	Dissatisfied
Ventilation	- Cross and n	atural ventilation	Satisfied	
	Northwest	atural ventilation	Neutral	Neutral
Windows Orientation	Northeast		Neutral Neutral	
Control of the Air leakage and	Yes		Neutral	Neutral
Condensation Windows Operating Transa			Neutral	Neutral
Windows Opening Types The Functional Features of V		ement opening 04 (Bedroom)	Level of Sa	
Daylightig	VIIIdows	04 (Beuroom)	Summer time	Winter time
Windows Orientation	Northeast		Neutral	Neutral
Windows Size Ratio of windows area	1.5x1	1/8	Neutral	Neutral
to floor area Placement	Bedroom	Northeast	Neutral	Neutral
Shading Devices	-		Dissatisfied	Dissatisfied
Ventilation	Single-sideo	1	Dissatisfied	-
	Northwest		Neutral	Neutral
Windows Orientation	Northeast		Neutral	Neutral
Control of the Air leakage and Condensation	Yes		Neutral	Neutral
Windows Opening Types	Double case	ement opening	Neutral	Neutral
Explanation: Unit 05 is on the left hand northeast, northwest, and southwest. T indicate size and number of windows.				

	Noyanlar: Arken 1	12 Apt., Zafer Sl	K, Sakarya (Double Gla	ze windows) (NOY.A	2.03.UN.06)
	Apartmen	nt View		Schematic Pla	an
Building Location			*jaj	UNIT	04, 06
Building Location				<u>Justo</u>	0 1 03, 05
		Third fl	oor – Unit 06 (NOY.A12		
			Two units in each floor		
	Functional Features of	f Windows	01 (Living room)		Satisfaction
Daylighti	g			Summer time	Winter time
		Conthrugat		Dissetiafied	Satisfied
Windows O	rientation	Southwest Southeast		Dissatisfied	Satisfied
Windows	Ratio of windows area	Southwest Southeast (1.5x1)x2	3/40=1/13	Dissatisfied Dissatisfied Neutral	Satisfied Neutral Neutral
		Southeast (1.5x1)x2 Salon	Southwest, and	Dissatisfied Neutral Neutral	Neutral Neutral Dissatisfied
Windows Size Placement	Ratio of windows area to floor area	Southeast (1.5x1)x2 Salon (2 windows)	Southwest, and Southeast	Dissatisfied Neutral Neutral Dissatisfied	Neutral Neutral Dissatisfied Satisfied
Windows Size Placement Shading De	Ratio of windows area to floor area	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir	Southwest, and Southeast num with white color)	Dissatisfied Neutral Neutral Dissatisfied Neutral	Neutral Neutral Dissatisfied
Windows Size Placement Shading De Ventilatio	Ratio of windows area to floor area wiccs n	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n	Southwest, and Southeast	Dissatisfied Neutral Neutral Dissatisfied Neutral Satisfied	Neutral Neutral Dissatisfied Satisfied Dissatisfied
Windows Size Placement Shading De	Ratio of windows area to floor area wiccs n	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir	Southwest, and Southeast num with white color)	Dissatisfied Neutral Neutral Dissatisfied Neutral	Neutral Neutral Dissatisfied Satisfied
Windows Size Placement Shading De Ventilatio Windows O Control of f	Ratio of windows area to floor area vices n Drientation the Air leakage and	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest	Southwest, and Southeast num with white color)	Dissatisfied Neutral Neutral Dissatisfied Neutral Satisfied Satisfied	Neutral Neutral Dissatisfied Satisfied Dissatisfied - Neutral
Windows Size Placement Shading De Ventilatio Windows O Control of t Condensati	Ratio of windows area to floor area vices n Drientation the Air leakage and	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes	Southwest, and Southeast num with white color)	Dissatisfied Neutral Dissatisfied Neutral Satisfied Satisfied Dissatisfied	Neutral Neutral Dissatisfied Satisfied Dissatisfied - Neutral Neutral
Windows Size Placement Shading De Ventilatio Windows O Control of t Condensati Windows O	Ratio of windows area to floor area vices on Drientation the Air leakage and on	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case	Southwest, and Southeast num with white color) atural ventilation	Dissatisfied Neutral Neutral Dissatisfied Satisfied Satisfied Dissatisfied Dissatisfied Neutral Neutral Neutral Neutral	Neutral Neutral Dissatisfied Satisfied Dissatisfied - Neutral Neutral Neutral
Windows Size Placement Shading De Ventilatio Windows O Control of t Condensati Windows O	Ratio of windows area to floor area vvices n Prientation the Air leakage and on Opening Types Functional Features of	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case	Southwest, and Southeast num with white color) atural ventilation	Dissatisfied Neutral Neutral Dissatisfied Satisfied Satisfied Dissatisfied Dissatisfied Neutral Neutral Neutral Neutral	Neutral Neutral Dissatisfied Satisfied Dissatisfied - Neutral Neutral Neutral Neutral
Windows Size Placement Shading De Ventilatio Windows O Control of t Condensati Windows O The Daylighti Windows O	Ratio of windows area to floor area vvices n Prientation the Air leakage and on Opening Types Functional Features of g Drientation	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case	Southwest, and Southeast num with white color) atural ventilation	Dissatisfied Neutral Dissatisfied Dissatisfied Satisfied Satisfied Dissatisfied Neutral Level of S	Neutral Neutral Dissatisfied Satisfied Dissatisfied - Neutral Neutral Neutral Neutral Satisfied
Windows Size Placement Shading De Ventilatio Windows O Control of t Condensati Windows O The Daylighti	Ratio of windows area to floor area vvices n Prientation the Air leakage and on Opening Types Functional Features of g	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case f Windows	Southwest, and Southeast num with white color) atural ventilation	Dissatisfied Neutral Dissatisfied Dissatisfied Satisfied Satisfied Dissatisfied Neutral Neutral Level of S Summer time	Neutral Neutral Dissatisfied Satisfied Dissatisfied Neutral Neutral Neutral Neutral Satisfied Weutral Neutral Neutral Winter time
Windows Size Placement Shading De Ventilatio Windows O Control of 1 Condensati Windows O The Daylighti Windows O	Ratio of windows area to floor area vices on Drientation the Air leakage and on Depening Types Functional Features of g rientation	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case Windows Southeast	Southwest, and Southeast num with white color) atural ventilation ement opening 02 (Bedroom)	Dissatisfied Neutral Dissatisfied Dissatisfied Satisfied Satisfied Dissatisfied Neutral Level of S Summer time Dissatisfied	Neutral Neutral Dissatisfied Satisfied Dissatisfied Neutral Neutral Neutral Neutral Neutral Neutral Neutral Neutral Satisfaction Winter time Satisfied
Windows Size Placement Shading De Ventilatio Windows O Control of t Condensati Windows O The Daylighti Windows O Windows Size	Ratio of windows area to floor area vices on Drientation the Air leakage and on Depening Types Functional Features of g prientation Ratio of windows area to floor area	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case Windows Southeast 1.5x1 Bedroom	Southwest, and Southeast num with white color) atural ventilation ement opening 02 (Bedroom) 1/8	Dissatisfied Neutral Dissatisfied Neutral Satisfied Satisfied Dissatisfied Neutral Neutral Level of S Summer time Dissatisfied Neutral	Neutral Neutral Dissatisfied Satisfied Dissatisfied Oissatisfied - Neutral Neutral Neutral Satisfaction Winter time Satisfied Neutral
Windows Size Placement Shading De Ventilatio Windows O Control of t Condensati Windows O The Daylighti Windows Size Placement	Ratio of windows area to floor area vices on Drientation the Air leakage and on Opening Types Functional Features of g rientation Ratio of windows area to floor area	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case Windows Southeast 1.5x1 Bedroom Shutter (Alumir Single-sided	Southwest, and Southeast num with white color) atural ventilation ement opening 02 (Bedroom) 1/8 Southeast num with white color)	Dissatisfied Neutral Dissatisfied Dissatisfied Satisfied Satisfied Dissatisfied Neutral Neutral Satisfied Dissatisfied Dissatisfied Neutral Satisfied Neutral Summer time Dissatisfied Neutral Dissatisfied Neutral Dissatisfied Neutral Dissatisfied Neutral Dissatisfied Neutral Dissatisfied	Neutral Neutral Dissatisfied Satisfied Dissatisfied Oissatisfied - Neutral Neutral Neutral Satisfaction Winter time Satisfied Neutral Satisfied
Windows Size Placement Shading De Ventilatio Windows O Control of t Condensati Windows O The Daylighti Windows O Windows Size Placement Shading De Ventilatio	Ratio of windows area to floor area vices on Drientation the Air leakage and on Depening Types Functional Features of g rientation Ratio of windows area to floor area	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case Windows Southeast 1.5x1 Bedroom Shutter (Alumir	Southwest, and Southeast num with white color) atural ventilation ement opening 02 (Bedroom) 1/8 Southeast num with white color)	Dissatisfied Neutral Dissatisfied Dissatisfied Satisfied Satisfied Dissatisfied Neutral Neutral Level of S Summer time Dissatisfied Neutral Level of S Summer time Dissatisfied Neutral Level of S Summer time Dissatisfied Neutral Dissatisfied Neutral	Neutral Neutral Dissatisfied Satisfied Dissatisfied Oissatisfied - Neutral Neutral Neutral Satisfied Satisfied Satisfied Satisfied Satisfied Neutral Satisfied Neutral Satisfied Neutral Satisfied Neutral
Windows Size Placement Shading De Ventilatio Windows O Otontrol of t Condensati Windows O The Daylighti Windows O Windows Size Placement Shading De Ventilatio Windows O Control of t Condensati	Ratio of windows area to floor area to floor area vvices on prientation the Air leakage and on oppening Types Functional Features of g Drientation Ratio of windows area to floor area vvices n prientation Ratio of windows area to floor area vvices n prientation to floor area vvices n prientation the Air leakage and	Southeast (1.5x1)x2 Salon (2 windows) Shutter (Alumir Cross and n Southwest Southeast Yes Double case Windows Southeast 1.5x1 Bedroom Shutter (Alumir Single-sidec Southeast Yes	Southwest, and Southeast num with white color) atural ventilation ement opening 02 (Bedroom) 1/8 Southeast num with white color)	Dissatisfied Neutral Dissatisfied Dissatisfied Satisfied Satisfied Dissatisfied Neutral Neutral Satisfied Dissatisfied Dissatisfied Neutral Satisfied Neutral Summer time Dissatisfied Neutral Dissatisfied Neutral Dissatisfied Neutral Dissatisfied Neutral Dissatisfied Neutral Dissatisfied	Neutral Neutral Dissatisfied Satisfied Dissatisfied Oissatisfied - Neutral Neutral Neutral Satisfaction Winter time Satisfied Neutral Satisfied Neutral

Noyanlar: Arken 1	2 Apt., Zafer SK, Sa	karya (Double Glaz	e windows) (NOY.A1	2.03.UN.06)	
Apartme	nt View		Schematic Plan		
	×E*		04, 06		
Building I		<u>hasta</u>	00		
		Unit 06 (NOY.A12.0	3.UN.06)		
		o units in each floor			
The Functional Feature	s of Windows	03 (Bedroom)		atisfaction	
Daylightig	Southeast		Summer time Dissatisfied	Winter time Satisfied	
Windows Orientation	Northeast		Neutral	Neutral	
Windows Size Ratio of windows area to floor area	1.5x1	1/10	Neutral	Neutral	
Placement	Bedroom (2 windows)	Southeast, and northeast	Neutral Neutral	Neutral Neutral	
Shading Devices	Shutter (Aluminum w	vith white color)	Neutral	Neutral	
Ventilation	Cross and natural	ventilation	Neutral	-	
	Southeast		Dissatisfied	Neutral	
Windows Orientation	Northeast		Neutral	Neutral	
Control of the Air leakage and Condensation	Yes		Neutral	Neutral	
Windows Opening Types	Double casement	opening	Neutral	Neutral	
The Functional Featu	res of Windows	04 (Bedroom)		Satisfaction	
Daylightig			Summer time	Winter time	
Windows Orientation	Northeast		Neutral	Neutral	
Windows Size Ratio of windows area to floor area	1.5x1	1/10	Neutral	Neutral	
Placement	Bedroom	Northeast	Neutral	Neutral	
Shading Devices	Shutter (Aluminum w	vith white color)	Neutral	Dissatisfied	
Ventilation	Single-sided		Dissatisfied	-	
Windows Orientation	Northeast		Neutral	Neutral	
Control of the Air leakage and Condensation	Yes		Neutral	Neutral	
Windows Opening Types	Double casement		Neutral	Neutral	
Explanation: Unit 06 is on the ri northeast, southeast, and southwo devices that used in this building	est. This Unit has shadi	ing devices (shutter) a	lthough, on south side o	f the buildings shading	

The fifth and sixth case studies are apartment buildings constructed by Dovec Company, of which the fifth one is Apartment building 18 with single glazed windows located in the Akhisar SK, Kaliland. Information in inventories is from observations, and questionnaires. In addition, satisfaction of users' level is from questionnaires and just window orientation in ventilation part information is from observations – Table 6. Further information is in appendix F.

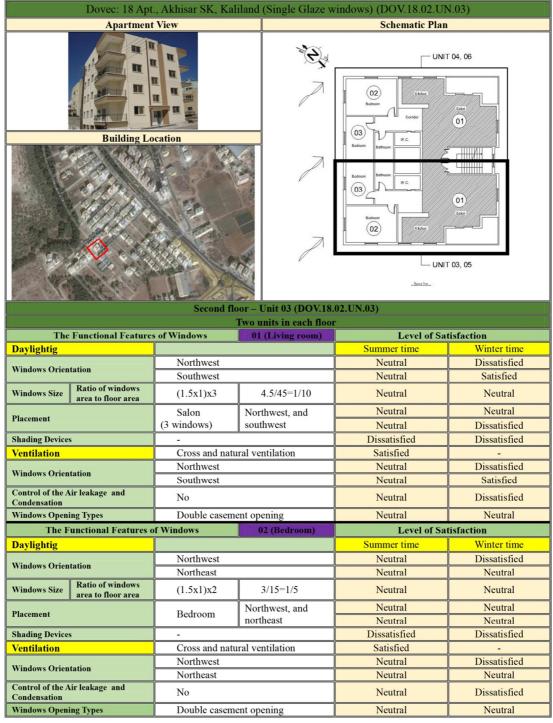
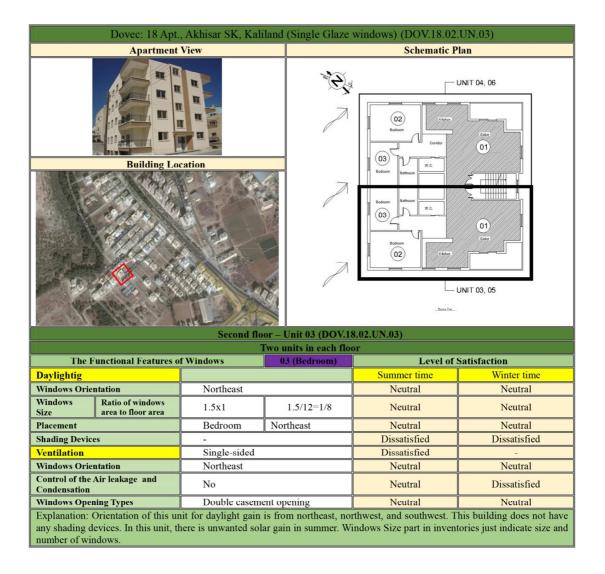


Table 6: 18 Apt., Akhisar SK, Kaliland



	Dovec: 18	8 Apt., Akhisar	SK, Kaliland	(Single Glaze	e windows) (DOV.18	.02.UN.04)
	Apartm	ent View			Schematic	Plan
					- UNIT 04, 06	
Building Location			7		- UNIT 03, 05	
	A CONTRACT	Sec	ond floor – Un	nit 04 (DOV.18	3.02.UN.04)	
				its in each floo		
	Functional Features	s of Windows	01 (Living 1	room)		Satisfaction
Daylightig	<u>, </u>				Summer time	Winter time
Windows Or	rientation	Southeast			Dissatisfied	Neutral
Win dame	Detie of stie down	Southwest	1		Neutral	Satisfied
Windows Size	Ratio of windows area to floor area	(1.5x1)x3	4.5/45=1/	/10	Neutral	Neutral
	<u>,</u>	Salon	Southeast, an	d	Neutral	Neutral
Placement		(3 windows)	southwest	u –	Neutral	Dissatisfied
Shading Dev	riaan	(* **********************			Dissatisfied	Dissatisfied
Ventilation		- Cross and r	natural ventilati	on	Satisfied	Dissausticu
ventilation	<u>n</u>	Southeast	latural ventilati	on	Dissatisfied	 Neutral
Windows Or	rientation	Southeast				Neutral
Control of th	he Air leakage and				·	
Condensatio		No			Neutral	Dissatisfied
Windows O	pening Types	Double cas	ement opening		Neutral	Neutral
The Fu	inctional Features	of Windows	02 (Bedro	om)	Level of S	Satisfaction
Daylightig	Į.				Summer time	Winter time
	,	Carthant				
Windows Or		Southeast			Dissatisfied	Satisfied
Windows Or	rientation	Northeast			Dissatisfied Neutral	Satisfied Neutral
Windows	rientation Ratio of windows		1/5			
Windows Size	rientation	Northeast (1.5x1)x2		d	Neutral Neutral	Neutral Neutral
Windows	rientation Ratio of windows	Northeast	1/5 Northeast, an southeast	d	Neutral	Neutral
Windows Size	rientation Ratio of windows area to floor area	Northeast (1.5x1)x2	Northeast, an	d	Neutral Neutral Neutral	Neutral Neutral Neutral
Windows Size Placement	rientation Ratio of windows area to floor area	Northeast (1.5x1)x2 Bedroom -	Northeast, an		Neutral Neutral Neutral Neutral	Neutral Neutral Neutral Neutral
Windows Size Placement Shading Dev Ventilatior	rientation Ratio of windows area to floor area vices	Northeast (1.5x1)x2 Bedroom -	Northeast, an southeast		Neutral Neutral Neutral Neutral Dissatisfied	Neutral Neutral Neutral Neutral
Windows Size Placement Shading Dev	rientation Ratio of windows area to floor area vices	Northeast (1.5x1)x2 Bedroom - Cross and b	Northeast, an southeast		Neutral Neutral Neutral Neutral Dissatisfied Satisfied	Neutral Neutral Neutral Neutral Neutral -
Windows Size Placement Shading Dev Ventilation Windows On Control of th	rientation Ratio of windows area to floor area vices n rientation he Air leakage and	Northeast (1.5x1)x2 Bedroom - Cross and Southeast Northeast	Northeast, an southeast		Neutral Neutral Neutral Dissatisfied Satisfied Dissatisfied	Neutral Neutral Neutral Neutral - - Neutral Neutral
Windows Size Placement Shading Dev Ventilation Windows On Control of th Condensatio	rientation Ratio of windows area to floor area vices n rientation he Air leakage and on	Northeast (1.5x1)x2 Bedroom - Cross and D Southeast Northeast No	Northeast, an southeast natural ventilati		Neutral Neutral Neutral Dissatisfied Satisfied Dissatisfied Neutral Neutral	Neutral Neutral Neutral Neutral - Neutral Neutral Dissatisfied
Windows Size Placement Shading Dev <mark>Ventilation</mark> Windows On Control of th <u>Condensatio</u> Windows Op	rientation Ratio of windows area to floor area vices n rientation he Air leakage and on pening Types	Northeast (1.5x1)x2 Bedroom - Cross and Southeast Northeast No Double cas	Northeast, an southeast natural ventilati	on I	Neutral Neutral Neutral Dissatisfied Satisfied Dissatisfied Neutral Neutral Neutral	Neutral Neutral Neutral Neutral Neutral Neutral Dissatisfied Neutral
Windows Size Placement Shading Dev Ventilation Windows Or Control of th Condensatio Windows Op The Fu	rientation Ratio of windows area to floor area vices n rientation he Air leakage and on pening Types unctional Features of	Northeast (1.5x1)x2 Bedroom - Cross and Southeast Northeast No Double cas	Northeast, an southeast natural ventilati	on I	Neutral Neutral Neutral Dissatisfied Satisfied Dissatisfied Neutral Neutral Neutral Neutral	Neutral Neutral Neutral Neutral Neutral - Neutral Dissatisfied Neutral
Windows Size Placement Shading Dev Ventilation Windows Or Control of th Condensatio Windows Op The Fu Daylightig	rientation Ratio of windows area to floor area rices n rientation he Air leakage and on pening Types unctional Features of	Northeast (1.5x1)x2 Bedroom - Cross and r Southeast Northeast No Double cas of Windows	Northeast, an southeast natural ventilati	on I	Neutral Neutral Neutral Dissatisfied Satisfied Dissatisfied Neutral Neutral Neutral Neutral ELevel of S	Neutral Neutral Neutral Neutral Neutral Neutral Neutral Object Neutral Neutral Dissatisfied Neutral Satisfaction Winter time
Windows Size Placement Shading Dev Ventilation Windows On Control of th Condensatio Windows Op The Fu Daylightig Windows On	rientation Ratio of windows area to floor area vices n rientation he Air leakage and on pening Types unctional Features of the second secon	Northeast (1.5x1)x2 Bedroom - Cross and 1 Southeast Northeast No Double cas of Windows	Northeast, an southeast natural ventilati ement opening 03 (Bedro	on I	Neutral Neutral Neutral Dissatisfied Satisfied Dissatisfied Neutral Neutral Neutral Neutral Level of S Summer time Neutral	Neutral Neutral Neutral Neutral Neutral - Neutral Dissatisfied Neutral Object Winter time Neutral
Windows Size Placement Shading Dev Ventilation Windows Or Control of th Condensatio Windows Op The Fu Daylightig	rientation Ratio of windows area to floor area rices n rientation he Air leakage and on pening Types unctional Features of	Northeast (1.5x1)x2 Bedroom - Cross and r Southeast Northeast No Double cas of Windows	Northeast, an southeast natural ventilati	on I	Neutral Neutral Neutral Dissatisfied Satisfied Dissatisfied Neutral Neutral Neutral Neutral ELevel of S	Neutral Neutral Neutral Neutral Neutral Neutral Neutral Object Neutral Neutral Dissatisfied Neutral Satisfaction Winter time
Windows Size Placement Shading Dev Ventilation Windows Or Control of th Condensatio Windows Or Daylightig Windows Or	rientation Ratio of windows area to floor area area to floor area vices n rientation he Air leakage and on pening Types unctional Features of rientation Ratio of windows	Northeast (1.5x1)x2 Bedroom - Cross and 1 Southeast Northeast No Double cas of Windows	Northeast, an southeast natural ventilati ement opening 03 (Bedro	on	Neutral Neutral Neutral Dissatisfied Satisfied Dissatisfied Neutral Neutral Neutral Neutral Level of S Summer time Neutral	Neutral Neutral Neutral Neutral Neutral - Neutral Dissatisfied Neutral Object Winter time Neutral
Windows Size Placement Shading Dev Ventilation Windows On Control of th Condensatio Windows On Daylightig Windows On Windows Size Placement	rientation Ratio of windows area to floor area area to floor area vices n rientation he Air leakage and on pening Types unctional Features of trientation rientation Ratio of windows area to floor area	Northeast (1.5x1)x2 Bedroom - Cross and Southeast Northeast No Double cas f Windows Northeast 1.5x1	Northeast, an southeast natural ventilati ement opening 03 (Bedro	on	Neutral Neutral Neutral Dissatisfied Satisfied Dissatisfied Neutral Neutral Neutral Level of 9 Summer time Neutral Neutral	Neutral Neutral Neutral Neutral Neutral Neutral Oregan Neutral Dissatisfied Neutral Satisfaction Winter time Neutral Neutral
Windows Size Placement Shading Dev Ventilation Windows On Control of th Condensatio Windows On Daylightig Windows On Windows Size	rientation Ratio of windows area to floor area vices n rientation he Air leakage and on pening Types unctional Features of circulation rientation rientation an pening Types unctional Features of circulation rientation	Northeast (1.5x1)x2 Bedroom - Cross and b Southeast Northeast No Double cas f Windows Northeast 1.5x1 Bedroom	Northeast, an southeast natural ventilati eement opening 03 (Bedro 1/8 Northeast	on	Neutral Neutral Neutral Dissatisfied Satisfied Dissatisfied Neutral Neutral Neutral Level of 9 Summer time Neutral Neutral Neutral Neutral Neutral	Neutral Neutral Neutral Neutral Neutral - Neutral Dissatisfied Neutral Satisfaction Winter time Neutral Neutral Neutral
Windows Size Placement Shading Dev Ventilation Windows On Control of th Condensatio Windows On Daylightig Windows On Windows Size Placement Shading Dev Ventilation	rientation Ratio of windows area to floor area vices n rientation he Air leakage and on pening Types unctional Features of scientation Ratio of windows area to floor area vices n rientation Ratio of windows area to floor area vices n	Northeast (1.5x1)x2 Bedroom - Cross and Southeast Northeast No Double cas f Windows Northeast 1.5x1 Bedroom -	Northeast, an southeast natural ventilati eement opening 03 (Bedro 1/8 Northeast	on	Neutral Neutral Neutral Dissatisfied Satisfied Dissatisfied Neutral Neutral Neutral Summer time Neutral Neutral Neutral Neutral Neutral Neutral Neutral Neutral Neutral Neutral Neutral Dissatisfied	Neutral Neutral Neutral Neutral Neutral - Neutral Dissatisfied Neutral atisfaction Winter time Neutral Neutral Neutral
Windows Size Placement Shading Dev Ventilation Windows Or Control of th Condensatio Windows Of The Fu Daylightig Windows Size Placement Shading Dev Ventilation Windows Of Control of th	rientation Ratio of windows area to floor area vices n rientation he Air leakage and on pening Types unctional Features of rientation Ratio of windows area to floor area vices n vices n vices n vices n vices n vices n rientation he Air leakage and	Northeast (1.5x1)x2 Bedroom - Cross and r Southeast Northeast No Double cas f Windows Northeast 1.5x1 Bedroom - Single-side	Northeast, an southeast natural ventilati eement opening 03 (Bedro 1/8 Northeast	on	Neutral Neutral Neutral Dissatisfied Satisfied Dissatisfied Neutral Neutral Neutral Summer time Neutral Neutral Neutral Neutral Neutral Neutral Neutral Neutral Dissatisfied Dissatisfied	Neutral Neutral Neutral Neutral Neutral Neutral Neutral Neutral Dissatisfied Neutral Satisfaction Winter time Neutral
Windows Size Placement Shading Dev Ventilation Windows On Control of th Condensatio Windows Of Windows Of Windows Size Placement Shading Dev Ventilation Windows Of Control of th Condensatio	rientation Ratio of windows area to floor area vices n rientation he Air leakage and on pening Types unctional Features of rientation Ratio of windows area to floor area vices n vices n vices n vices n vices n vices n rientation he Air leakage and	Northeast (1.5x1)x2 Bedroom - Cross and 1 Southeast Northeast No Double cas of Windows Mortheast 1.5x1 Bedroom - Single-side Northeast No	Northeast, an southeast natural ventilati eement opening 03 (Bedro 1/8 Northeast	on	Neutral Neutral Neutral Neutral Dissatisfied Satisfied Dissatisfied Neutral Neutral Neutral Neutral Summer time Neutral Neutral Neutral Neutral Neutral Dissatisfied Dissatisfied Dissatisfied Dissatisfied Neutral	Neutral Neutral Neutral Neutral Neutral - Neutral Dissatisfied Neutral Satisfaction Winter time Neutral

shading devices. In this unit, there is unwanted solar gain in summer. Windows Size part in inventories just indicate size and number of windows.

	Dovec: 18 Apt	., Akhisar SK, Kal	iland (Single Glaze	windows) (DOV.18.03.U	N.05)		
	Apartment	View		Schematic Pla	Schematic Plan		
	Building Lo	cation	₹Ę.	UN (02) Bottom Contact UN Contact Contact UN Contact Cont	IT 04, 06		
			1 deleter W.C. 1 deleter W.C.	01 5 mm			
9 COLON	Market	Third flo	or – Unit 05 (DOV.18	03 UN 05)			
			Two units in each floo				
The	Functional Features		01 (Living room)	Level of Sa	tisfaction		
Daylightig				Summer time	Winter time		
Windows Orient	tation	Northwest		Neutral Neutral	Dissatisfied		
W' I C'	Ratio of windows	Southwest	4.5/45-1/10		Satisfied		
Windows Size	area to floor area	$(1.5x1)x3 \qquad 4.5/45 = 1/1$		Neutral	Neutral		
Placement		Salon (3 windows)	Northwest, and southwest	Neutral	Neutral		
Shading Devices		(5 windows)	southwest	Neutral Dissatisfied	Dissatisfied Dissatisfied		
Ventilation	•	Cross and natu	ural ventilation	Satisfied	-		
	andr d	Northwest		Dissatisfied	Neutral		
Windows Orient	tation	Southwest		Satisfied	Neutral		
Control of the A Condensation	ir leakage and	No		Neutral	Dissatisfied		
Windows Openi	ng Types	Double casem	ent opening	Neutral	Neutral		
The F	unctional Features o	f Windows	02 (Bedroom)	Level of Sa	atisfaction		
Daylightig				Summer time	Winter time		
Windows Orier	ntation	Northwest		Neutral	Dissatisfied		
	Ratio of windows	Northeast	0	Neutral	Neutral		
Windows Size	area to floor area	(1.5x1)x2	3/15=1/5	Neutral	Neutral		
Placement		Bedroom	Northwest, and	Neutral	Neutral		
		Letitolii	northeast	Neutral	Neutral		
Shading Device	es	- Cross and natu	unal mantilation	Dissatisfied	Dissatisfied		
Ventilation		Northwest	iral ventilation	Satisfied Neutral	Dissatisfied		
Windows Orien	ntation	Northeast		Neutral	Neutral		
	Air leakage and	No		Neutral	Dissatisfied		
Condensation Windows Open	ing Types	Double casem	ent opening	Neutral	Neutral		
	unctional Features of		03 (Bedroom)	Level of Sa			
Daylightig	interioriar r catures o		or (bear only)	Summer time	Winter time		
Windows Orien	tation	Northeast		Neutral	Neutral		
	tio of windows area to	1.5x1	1.5/12=1/8	Neutral	Neutral		
Size floo Placement	or area	Bedroom	Northeast	Neutral	Neutral		
Shading Devices	5	-		Dissatisfied	Dissatisfied		
Ventilation		Single-sided		Dissatisfied	-		
Windows Orien		Northeast		Neutral	Neutral		
Control of the A Condensation	ar leakage and	No		Neutral	Dissatisfied		
Windows Openi	ing Types	Double casem	ent opening	Neutral	Neutral		
any shading	Orientation of this u devices. Windows S st indicate size and n	Size part in invento	is from northeast, no ories just indicate size	rthwest, and southwest. Thi e and number of windows	s building does not have . Windows Size part in		

Dovec	: 18 Apt., Akhisar	SK, Kaliland	I (Single)	Glaze	windows) (DOV.18.	03.UN.06)	
	rtment View		(0	Schematic Plan			
Building Location				D' N N	Conter Balacer Balacer Balacer Balacer Balacer Balacer Balacer Conter Co	- UNIT 04, 06	
	13456N	and the second	0				
and the second s			,		<u></u>	- UNIT 03, 05 -	
	Th	nird floor – Ur	nit 06 (DC	DV.18.0	3.UN.06)		
			nits in eac	h floor			
The Functional Feat Daylightig	ares of Windows	01 (Living	room)		Level of Sammer time	atisfaction Winter time	
	Southeast				Dissatisfied	Neutral	
Windows Orientation	Southwest				Neutral	Satisfied	
WindowsRatio of windowSizearea to floor are		4.5/45=1	1/10		Neutral	Neutral	
Placement	Salon	Southeast, an	nd		Neutral	Neutral	
	(3 windows)	southwest			Neutral	Dissatisfied	
Shading Devices	-			Dissatisfied		Dissatisfied	
Ventilation		natural ventilat	tion		Satisfied	- Nautrol	
Windows Orientation	Southeast Southwest			Dissatisfied Neutral		Neutral Neutral	
Control of the Air leakage and					Dissatisfied	Dissatisfied	
Condensation Windows Opening Types	Double cas	sement opening	<u>a</u>	Neutral		Neutral	
The Functional Featur		02 (Bedr		Level of Satisfaction			
Daylightig					Summer time	Winter time	
Windows Orientation	Southeast				Dissatisfied	Satisfied	
	Northeast	1			Neutral	Neutral	
Windows Ratio of window Size area to floor are		1/5			Neutral	Neutral	
Placement	Bedroom	Northeast, an	nd		Neutral	Neutral	
Shading Devices		southeast			Neutral Dissatisfied	Neutral Neutral	
Ventilation	- Single-side	ed			Dissatisfied	-	
	Southeast				Dissatisfied	Neutral	
Windows Orientation	Northeast			Neutral		Neutral	
Control of the Air leakage and Condensation	No				Dissatisfied	Dissatisfied	
Windows Opening Types	Double cas	sement opening	g		Neutral	Neutral	
The Functional Featur	es of Windows	03 (Bedro	oom)		Level of S	atisfaction	
Daylightig					Summer time	Winter time	
Windows Orientation	Northeast	1			Neutral	Neutral	
WindowsRatio of windowSizearea to floor area		1/8			Neutral	Neutral	
Placement	Bedroom	Northeas	st		Neutral	Neutral	
Shading Devices	-				Dissatisfied	Dissatisfied	
Ventilation	Single-side	ed			Dissatisfied	-	
Windows Orientation Control of the Air leakage and	Northeast				Neutral	Neutral	
Condensation	No				Neutral	Dissatisfied	
Windows Opening Types		sement opening	·		Neutral	Neutral	
Explanation: Orientation of shading devices. In this uninumber of windows.						building does not have any es just indicate size and	

The sixth one is Celebi Apartment building with double glazed windows that is located in the Ilgin SK, Kaliland. Information in inventories is from observations, and questionnaires. In addition, satisfaction of users' level is from questionnaires and just window orientation in ventilation part information is from observations – Table 7. Further information is in appendix G.

Dovec: Celebi Apt., Ilgin SK, Kaliland (Double Glaze windows) (DOV.CE.02.UN.03)								
Apartment View				Schematic P				
				UNIT 04, 08	UNIT 06, 10			
Building Location				UNIT 03, 07				
	Second	l floor – Uni	it 03 (DO)	V.CE.02.UN.03)				
Four units in each floor								
The Functional Features of	of Windows	01 (Bed		Level of Sat	isfaction			
Daylightig				Summer time	Winter time			
Window Online the	Northwest		Neutral		Neutral			
Windows Orientation	Southwest			Neutral	Neutral			
WindowsRatio of windowsSizearea to floor area	(1.5x1)x2	3/15=1	/5	Neutral	Neutral			
Placement	Bedroom	Northwest southwest	, and	Neutral Dissatisfied	Neutral Satisfied			
Shading Devices	-			Dissatisfied	Dissatisfied			
Ventilation	Cross and n	atural ventila	ation	Satisfied	-			
	Northwest			Neutral	Neutral			
Windows Orientation	Southwest			Neutral	Neutral			
Control of the Air leakage and	Yes			Satisfied	Satisfied			
Condensation Windows Opening Types	Double case	ement openin	σ	Neutral	Neutral			
The Functional Features		02 (Bed	-	Level of Sat				
Daylightig			, ooniy	Summer time	Winter time			
Windows Orientation	Northwest			Neutral	Neutral			
Windows Ratio of windows	1.5x1	1.5/12-1/8	;	Neutral	Neutral			
Size area to floor area Placement	Bedroom	Northwest		Neutral	Neutral			
Shading Devices	-	Tioniwest		Dissatisfied	Dissatisfied			
Ventilation	Single-sided	1		Dissatisfied	-			
Windows Orientation	Northwest	-		Neutral	Neutral			
Control of the Air leakage and Condensation	Yes			Satisfied	Satisfied			
Windows Opening Types	Double case	ement openin	ıg	Neutral	Neutral			
Explanation: Orientation of uni daylight and natural ventilation have any shading devices which	t 03 for daylight g . In 02 (bedroom) ch makes problem	Windows Opening Types Double casement opening Neutral Explanation: Orientation of unit 03 for daylight gain is from northwest, and southwest. In this unit, 01 (bedroom) have proper daylight and natural ventilation is less than the other room. Windows do not have any shading devices which makes problem for this flat due to increase the heat gain in summer. In this unit, there is unwanted solar gain in summer. Windows Size part in inventories just indicate size and number of windows.						

Table 7: Celebi Apt., Ilgin SK, Kaliland

Indows reading bevices Northeast Neutral Neutral ading Devices - Satisfied Neutral Northwest Northwest Neutral Neutral	Dovec: Celebi Apt., Ilgin SK, Kaliland (Double Glaze windows) (DOV.CE.02.UN.04)						
Image: Second December 2 Building Location Image: Second December 2 Image: Second December 2 Image: Second December 2 Second December 2 Image: Second December 2 Image: Second December 2 Second December 2 Image: Second December 2 Second December 2 Image: Second December 2 Second December 2 Second December 2 Image: Second December 2 Second December 2 <th>Apartm</th> <th>ent View</th> <th></th> <th></th> <th colspan="3">Schematic Plan</th>	Apartm	ent View			Schematic Plan		
indows Ratio of windows area to floor area (1.5x1)x2 3/15=1/10 Neutral Neutral indows Ratio of windows area to floor area (1.5x1)x2 3/15=1/10 Neutral Neutral indows Cross and natural ventilation Northwest Neutral Neutral indig Devices - Dissatisfied Dissatisfied - Northwest Northwest Neutral Neutral Northwest - Neutral Neutral Northwest - Neutral Neutral Northwest - Northwest Neutral Northwest - Neutral Neutral Northwest - Northwest Neutral							
Four units in each floor Four units in each floor Level of Satisfaction Summer time Winter time aylightig Northwest Neutral Neutral indows Orientation Northwest Neutral Neutral Neutral indows Orientation Ratio of windows area to floor area (1.5x1)x2 $3/15=1/10$ Neutral Neutral acement Bedroom Northwest, and northeast Neutral Neutral Neutral ading Devices - Dissatisfied Cross and natural ventilation Satisfied - Northwest Neutral Northwest, and northeast Dissatisfied Origon area - Northwest, and northeast Dissatisfied Origon area - Northwest Dissatisfied Origon area - Northwest - Northwest Northw	Building Location				Conduct Bacherine (C) Bacherine Statuse Statuse		
The Functional Features of Windows 01 (Bedroom) Level of Satisfaction aylightig Summer time Winter time aylightig Northwest Neutral Neutral indows Orientation Northwest Neutral Neutral indows Orientation Ratio of windows area to floor area $(1.5x1)x2$ $3/15=1/10$ Neutral Neutral acement Bedroom Northwest, and northeast Neutral Neutral Neutral ading Devices - Cross and natural ventilation Satisfied - - Northwest Northwest Neutral Neutral Neutral							
Aylightig Summer time Winter time indows Orientation Northwest Northwest Neutral Neutral indows Orientation Northwest Neutral Neutral indows area to floor area Origon (1.5x1)x2 3/15=1/10 Neutral Neutral acement Dedroom Northwest, and northeast Neutral Neutral ading Devices - Dissatisfied Dissatisfied - Interview of the set of the se							
Northwest Neutral Neutral Northwest Northwest Northwest Neutral Neutral Northwest, and northeast Neutral Neutral Bedroom Northwest, and northeast Neutral Neutral ading Devices - Dissatisfied Orss and natural ventilation Satisfied - Northwest Neutral		I WINDOWS		room)		1	
indows Orientation Northeast Neutral Neutral indows area Ratio of windows area to floor area (1.5x1)x2 3/15=1/10 Neutral Neutral acement Bedroom Northwest, and northeast Neutral Neutral Neutral ading Devices - Dissatisfied Dissatisfied - entilation Cross and natural ventilation Satisfied -		Northwest					
indows re Ratio of windows area to floor area (1.5x1)x2 3/15=1/10 Neutral Neutral acement Bedroom Northwest, and northeast Neutral Neutral Neutral ading Devices - Dissatisfied Dissatisfied entilation Cross and natural ventilation Satisfied - Northwest Neutral Neutral Neutral	Windows Orientation						
acement Bedroom Northwest, and northeast Neutral Neutral ading Devices - Dissatisfied Dissatisfied entilation Cross and natural ventilation Satisfied -	Windows Ratio of windows		2/15 1	(1.0			
accement Bedroom northeast Neutral Neutral ading Devices - Dissatisfied Dissatisfied entilation Cross and natural ventilation Satisfied - Northwest Neutral Neutral Neutral	Size area to floor area	(1.5x1)x2	3/15=1/10		Neutral	Neutral	
ading Devices - Dissatisfied Dissatisfied entilation Cross and natural ventilation Satisfied - Northwest Neutral Neutral	Placement	Redroom Northwest,		and			
entilation Cross and natural ventilation Satisfied - Northwest Neutral Neutral Neutral		Bedroom	northeast				
Northwest Neutral Neutral	Shading Devices	-				Dissatisfied	
Northwest Neutral Neutral	Ventilation		atural ventila	tion		-	
indows Orientation	Windows Orientation	Northwest		Neutral		Neutral	
Northeast Neutral Neutral Neutral		Northeast		Neutral		Neutral	
	Control of the Air leakage and Condensation	Yes			Satisfied	Satisfied	
indows Opening Types Double casement opening Neutral Neutral	Windows Opening Types	Double case	ment openin	g	Neutral	Neutral	
The Functional Features of Windows 02 (Bedroom) Level of Satisfaction	The Functional Features o	f Windows	02 (Bedi	room)	Level of Satisfaction		
avlightig Summer time Winter time	Daylightig		1		Summer time	Winter time	
	Windows Orientation	Northwest				Dissatisfied	
indows Ratio of windows 1.5x1 1.5/12=1/8 Neutral Neutral			1.5/12=1/8				
area to noor area							
	Placement Shading Devices	Bedroom	Inorthwest				
	Ventilation	- Single sided	1			Dissatisticu	
	Windows Orientation					Neutral	
ntrol of the Air leakage and Ves Satisfied Satisfied	Control of the Air leakage and					i	
ndensation	Condensation Windows Opening Types		mant cnoni-	<i>a</i>			
indows Opening Types Double casement opening Neutral Neutral Splanation: Orientation of unit 04 for daylight gain is from northwest, and southwest. In bedroom 01, daylight and nature	Windows Opening Types	Double case	ment openin		Neutral	Incutral	

ventilation is a bit suitable. In 02 (bedroom), daylight and natural ventilation is less than the other room. This building does not have any shading devices. Windows Size part in inventories just indicate size and number of windows.

Dovec: Celebi Apt., Ilgin SK, Kaliland (Double Glaze windows) (DOV.CE.02.UN.05)								
	Apartm	ent View			Schematic P	an		
				A. N.	UNIT 04, 08	UNIT 06, 10		
Building Location				With Market Mark	ener UNIT 05, 09			
Second floor – Unit 05 (DOV.CE.02.UN.05)								
				its in each				
The F	unctional Footures o	fWindows	01 (Bed		Level of Sat	isfaction		
			roomy	Summer time	Winter time			
Daylightig Southwood				Neutral	Neutral			
Windows O	rientation	Southwest						
Windows	Ratio of windows	Southeast			Neutral	Neutral		
Size	area to floor area	(1.5x1)x2	3/15=1/10		Neutral	Neutral		
		D 1	Southwest, and		Neutral	Neutral		
Placement		Bedroom	southeast		Neutral	Neutral		
Shading De	vices	-			Dissatisfied	Dissatisfied		
Ventilatio	n	Cross and na	atural ventila	ation	Satisfied	-		
		Southwest			Neutral	Neutral		
Windows O	rientation	Southeast			Neutral	Neutral		
Control of t Condensation	he Air leakage and	Yes		Satisfied		Satisfied		
	pening Types	Double case	ment openin	σ	Neutral	Neutral		
	e Functional Features		02 (Bed	0				
Daylightig		or windows	02 (Bed	i oom)	Summer time	Winter time		
Windows O		Southeast			Dissatisfied	Satisfied		
Windows	Ratio of windows			1 /0				
Size	area to floor area	1.5x1	1.5/12=1/8		Neutral	Neutral		
Placement		Bedroom	n Southeast		Southeast		Neutral	Dissatisfied
Shading De		-		Dissatisfied		Dissatisfied		
Ventilatio		Single-sided	1		Dissatisfied	-		
Windows O		Southeast			Dissatisfied	Neutral		
Control of t Condensation	he Air leakage and on	Yes			Satisfied	Satisfied		
		Double case	ment openin	ıg	Neutral	Neutral		
ventilation	Windows Opening Types Double casement opening Neutral Neutral Explanation: Orientation of unit 05 for daylight gain is from Southwest, and Southeast In 01 (bedroom), daylight and natural ventilation is suitable. In 02 (bedroom), daylight and natural ventilation is not as good as the other bedroom. In this unit, there is unwanted solar gain in summer. Windows Size part in inventories just indicate size and number of windows.							

Dovec: Celebi Apt., Ilgin SK, Kaliland (Double Glaze windows) (DOV.CE.02.UN.06)							
	Apartm	ent View			Schematic P	lan	
				J.	UNIT 04, 08	UNIT 06, 10	
Building Location				7	UNIT 03, 07		
Second floor – Unit 06 (DOV.CE.02.UN.06)							
			Four uni	its in each	floor		
The F	functional Features of	of Windows	01 (Bed	room)	Level of Sat	isfaction	
Daylighti	g				Summer time	Winter time	
Windows O	rientation	Northeast			Neutral	Dissatisfied	
		Southeast	1		Neutral	Neutral	
Windows Size	Ratio of windows area to floor area	(1.5x1)x2	3/15=1/5		Neutral	Neutral	
Placement		Bedroom	Northeast, southeast	and	Neutral	Neutral	
Shading Da		-	southeast		Neutral Dissatisfied	Satisfied	
Shading De Ventilatio		- Cross and na	atural vantila	tion	Satisfied	Dissatisfied	
ventnatio	<u>n</u>	Northeast	aturar ventna		Neutral	Neutral	
Windows O	rientation	Southeast			Neutral	Neutral	
Control of t Condensation	he Air leakage and	Yes		Satisfied		Satisfied	
	pening Types	Double case	ment openin	σ	Neutral	Neutral	
	e Functional Features		02 (Bed		Level of Sat		
Daylightig					Summer time	Winter time	
Windows O		Southeast			Satisfied	Satisfied	
Windows Size	Ratio of windows area to floor area	1.5x1	1.5/12=1/8		Neutral	Neutral	
Placement		Bedroom	Southeast		Neutral	Satisfied	
Shading De	vices	-			Dissatisfied	Dissatisfied	
Ventilatio	n	Single-sided	1	Dissatisfied		-	
Windows O	rientation	Southeast			Dissatisfied	Neutral	
Control of t Condensatio	he Air leakage and on	Yes			Satisfied	Satisfied	
Windows O	pening Types	Double case	ment openin	g	Neutral	Neutral	
ventilation	Explanation: Orientation of unit 06 for daylight gain is from southeast, and northeast. In 01 (bedroom), daylight and natural ventilation is suitable. In 02 (bedroom), daylight and natural ventilation is not as good as the other bedroom. In this unit, there is unwanted solar gain in summer. Windows Size part in inventories just indicate size and number of windows.						

Dovec: Celebi Apt., Ilgin SK, Kaliland (Double Glaze windows) (DOV.CE.03.UN.07)						
Apartment View				Schematic P	lan	
Building Location				UNIT 04, 08	UNIT 66, 10	
Gould				UNIT 03, 07	Sales (01) (01) (01) (01) (02) (02) (03) (03) (04) (04) (04) (04) (04) (04) (04) (04	
Third floor – Unit 07 (DOV.CE.03.UN.07) Four units in each floor						
The Functional Featur	a of Windows	floor Level of Satisfaction				
		01 (Bed	room)	Summer time	Winter time	
Daylightig	Northwest		Neutral		Neutral	
Windows Orientation	Southwest			Neutral	Neutral	
Windows Ratio of windows						
Size area to floor area	(1.5x1)x2	3/15=1	/5	Neutral	Neutral	
Placement	Bedroom	Northwest	, and	Neutral	Neutral	
	Dearoom	southwest		Dissatisfied	Satisfied	
Shading Devices	-			Dissatisfied	Dissatisfied	
Ventilation		atural ventila	ation	Satisfied	<u> </u>	
Windows Orientation	Northwest			Neutral	Neutral	
	Southwest			Neutral	Neutral	
Control of the Air leakage and Condensation	Yes			Satisfied	Satisfied	
Windows Opening Types	Double cas	ement openir	ng	Neutral	Neutral	
The Functional Featur	es of Windows	02 (Bed	room)	Level of Satisfaction		
Daylightig				Summer time	Winter time	
Windows Orientation	Northwest			Neutral	Neutral	
WindowsRatio of windowsSizearea to floor area	1.5x1	1.5/12=1/8	3	Neutral	Neutral	
Placement	Bedroom	Northwest	Neutral		Neutral	
Shading Devices	-			Dissatisfied	Dissatisfied	
Ventilation	Single-side	d		Dissatisfied	1	
Windows Orientation	Northwest			Neutral	Neutral	
Control of the Air leakage and Condensation	Yes			Satisfied	Satisfied	
Windows Opening Types		ement openir	<u> </u>	Neutral	Neutral	
Explanation: Orientation of unit 07 for daylight gain is from northwest, and southwest. In this unit 01 (bedroom) have proper daylight and natural ventilation. In 02 (bedroom) daylight and natural ventilation is less than the other room. Windows do not have any shading devices which makes problem for this flat due to increase the heat gain in summer. In this unit, there is unwanted solar gain in summer. Windows Size part in inventories just indicate size and number of windows.						

Dovec: Celebi Apt., Ilgin SK, Kaliland (Double Glaze windows) (DOV.CE.03.UN.08)							
Apartment View				Schematic Pl	an		
				UNIT 04, 08	UNIT 06, 10		
Building Location				UNIT 03, 07			
The Functional Features	CE.03.UN.08) floor Level of Sati	isfaction					
Daylightig		01 (Bed		Summer time	Winter time		
	Northwest			Neutral	Neutral		
Windows Orientation	Northeast			Neutral	Neutral		
WindowsRatio of windowsSizearea to floor area	(1.5x1)x2	3/15=1	/5	Neutral	Neutral		
Placement	Bedroom	Northwest, northeast	and	Neutral Neutral	Neutral Neutral		
Shading Devices	-			Dissatisfied	Dissatisfied		
Ventilation	Cross and n	atural ventila	tion	Satisfied	-		
Windows Orientation	Northwest			Neutral	Neutral		
	Northeast			Neutral	Neutral		
Control of the Air leakage and Condensation	Yes			Satisfied	Satisfied		
Windows Opening Types		ment openin	C .	Neutral	Neutral		
The Functional Features	of Windows	02 (Bed	room)	Level of Sati			
Daylightig				Summer time	Winter time		
Windows Orientation	Northwest	1	Neutral		Dissatisfied		
Windows Ratio of windows Size area to floor area	1.5x1	1.5/12=1/8		Neutral	Neutral		
Placement	Bedroom	Northwest	Neutral		Neutral		
Shading Devices	- Single-sideo	1		Dissatisfied Dissatisfied	Dissatisfied		
Ventilation Windows Orientation	Northwest	1		Neutral	- Neutral		
Control of the Air leakage and	Yes			Satisfied	Neutral Satisfied		
Condensation Windows Opening Types	Double case	ment openin	σ				
Explanation: Orientation of un ventilation is a bit suitable. In	Windows Opening Types Double casement opening Neutral Neutral Explanation: Orientation of unit 08 for daylight gain is from northwest, and northeast. In bedroom 01, daylight and natural ventilation is a bit suitable. In 02 (bedroom), daylight and natural ventilation is less than the other room. This building does not have any shading devices. Windows Size part in inventories just indicate size and number of windows.						

Dovec: Celebi Apt., Ilgin SK, Kaliland (Double Glaze windows) (DOV.CE.03.UN.09)							
	ent View			Schematic Plan			
					UNIT 06, 10		
Building	Location				w.c. Bodroom (02)		
			7		Contact Contac		
	Gould Barrier			UNIT 03, 07	UNIT 05, 09		
Third floor – Unit 09 (DOV.CE.03.UN.09)							
		Four uni	ts in each	floor			
The Functional Features	of Windows	room)	Level of Sat				
Daylightig				Summer time	Winter time		
Windows Orientation	Southwest			Neutral	Neutral		
	Southeast	1		Neutral	Neutral		
WindowsRatio of windowsSizearea to floor area	(1.5x1)x2	3/15=1/5		Neutral	Neutral		
Placement	Bedroom	Southwest,	and	Neutral	Neutral		
Tracement	southeas			Neutral	Neutral		
Shading Devices	-			Dissatisfied	Dissatisfied		
Ventilation		atural ventila	ition	Satisfied	-		
Windows Orientation	Southwest		Neutral		Neutral		
Control of the Air leakage and	Southeast			Neutral	Neutral Satisfied		
Condensation Windows Opening Types	Yes	mont crossi-	~	Satisfied	Satisfied		
Windows Opening Types	Double case			Neutral	Neutral		
The Functional Features	s of windows	02 (Bedi	(00m)	Level of Sat			
Daylightig Placement	Southeast			Summer time Dissatisfied	Winter time Satisfied		
Windows Ratio of windows	1.5x1	1.5/12=	=1/8	Neutral	Neutral		
Size area to floor area							
Placement	Bedroom	Southe	ast	Neutral	Dissatisfied		
Shading Devices	-	1		Dissatisfied	Dissatisfied		
Ventilation	Single-sided	1		Dissatisfied	-		
Placement	Southeast			Neutral	Neutral		
Control of the Air leakage and Condensation	Yes			Satisfied	Satisfied		
Windows Opening Types		ment openin	<u> </u>	Neutral	Neutral		
Explanation: Orientation of unit 09 for daylight gain is from Southwest, and Southeast In 01 (bedroom), daylight and natural ventilation is suitable. In 02 (bedroom), daylight and natural ventilation is not as good as the other bedroom. In this unit, there							

ventilation is suitable. In 02 (bedroom), daylight and natural ventilation is not as good as the other bedroom. In this unit, there is unwanted solar gain in summer. Windows Size part in inventories just indicate size and number of windows.

Dovec: Celebi Apt., Ilgin SK, Kaliland (Double Glaze windows) (DOV.CE.03.UN.10)							
Apartment View				Schematic P	an		
				UNIT 04, 08	UNIT 06, 10		
Building Location				UNIT 03, 07			
Third floor – Unit 10 (DOV.CE.03.UN.10)							
			ts in each				
The Functional Features of Windows 01 (Bed							
Daylightig				Summer time	Winter time		
Windows Orientation	Northeast			Neutral	Dissatisfied		
	Southeast			Neutral	Neutral		
WindowsRatio of windowsSizearea to floor area	1.5x1	3/15=1	/10	Neutral	Neutral		
		Northeast, and		Neutral	Neutral		
Placement	Bedroom	southeast			Satisfied		
Shading Devices	-	JL		Dissatisfied	Dissatisfied		
Ventilation	Cross and na	atural ventila	tion	Satisfied	-		
With Others	Northeast			Neutral	Dissatisfied		
Windows Orientation	Southeast		Neutral		Neutral		
Control of the Air leakage and Condensation	Yes		Satisfied		Satisfied		
Windows Opening Types	Double case	ement openin	g	Neutral	Neutral		
The Functional Feature	s of Windows	02 (Bed	room)	Level of Sat			
Daylightig				Summer time	Winter time		
Windows Orientation	Northeast			Neutral	Neutral		
WindowsRatio of windowsSizearea to floor area	1.5x1	1.5/12=	=1/8	Neutral	Neutral		
Placement	Bedroom	oom Northeast		Neutral	Satisfied		
Shading Devices	-			Dissatisfied	Dissatisfied		
Ventilation	Single-sided	1	Dissatisfied		-		
Windows Orientation	Northeast			Neutral	Neutral		
Control of the Air leakage and Condensation	Yes			Satisfied	Satisfied		
Windows Opening Types	Double case	-	~	Neutral	Neutral		
Explanation: Orientation of unit 10 for daylight gain is from northwest, and northeast. In 01 (bedroom) daylight and natural ventilation is suitable. In 02 (bedroom) daylight and natural ventilation is not as good as the other bedroom. In this unit, there is unwanted solar gain in summer.							

Appendix H indicates the information, which has been used for the analysis in the questionnaire part. This chart shows functional features of windows so residence satisfaction about ventilation and daylight can be understood.

3.6 Data Analysis

In this study, windows of selected apartment buildings were investigated with different techniques like observations, questionnaires with the residences (e.g. students and local residences; totally 100 persons). 36 flats from selected apartment buildings from three main construction companies - Uzun, Noyanlar, and Dovec-were chosen. Furthermore, from each company second and third levels from each of the two apartment buildings have been taken as the cases of this study due to more heat loss and gain on the ground and top floors. Accordingly, windows of the six apartment buildings in Famagusta have been investigated to understand the level of residence satisfaction relating to ventilation and daylighting issues. Finally, the results of the analysis will be indicated to understand the important role of daylighting and ventilation in window design.

3.6.1 Observations

It is a challenging task to design buildings that finally meet a variety of residences' satisfaction, decrease energy consumption and provide thermal comfort in hot-humid climates. According to observations, selected cases suffer from unventilated rooms that increase the possibility of condensation, and therefore mold in buildings.

Most of the residences have complained about the conditions of their indoor environment and the high electricity price they pay. Furthermore, they experience problems such as too much sunlight gain in hot days and most of the buildings do not have shading devices. Additionally, due to the design and location of their windows, users complain from the quality of natural ventilation, especially due to lack of windows located crossways that increase the possibility of ventilation. Similarly, throughout the year residences experienced problems relating to passive cooling and heating the environment in their flat, which increased the use of electricity.

Apartment buildings with single glazed windows have more problems than the apartment buildings with double glazed windows due to the quality of the material of double glazed windows. The other essential issue that should not be forgotten is the installation of the windows and their material. Although, designers select the best type of windows and owner pay high amount of money to purchase the best type of energy efficient windows, if the construction companies do not implement the windows properly, it does not have any influence on decreasing of energy consumption. Another important aspect is the orientation of the building. If the building is not properly oriented in terms of gaining daylight in winter, this will again affect the energy use and physical and psychological health of users. The other essential issue is the windows size, which is important for allowing natural and cross ventilation in buildings. However, this issue is not well considered in buildings investigated. In addition, mold and mildew were observed especially on ground floor level floors where humidity was higher – Figure 23.



Figure 22: Case studies from three different construction companies - Uzun, Noyanlar, and Dovec

3.6.2 Questionnaire Relating to Windows' Functional Features

Aim of the questionnaire is to understand the level of the satisfaction of the residences in selected apartment buildings from Uzun, Noyanlar, and Dovec construction companies in Famagusta, Northern Cyprus. These information are from the evaluation of 100 questionnaire including 64 students (28 female, and 36 male), and citizen 36 (14 housewives, 22 men). Information has been categorized according to window features including daylighting and natural ventilation.

In chart 1, percentage of number of residences questioned from each construction company is given.

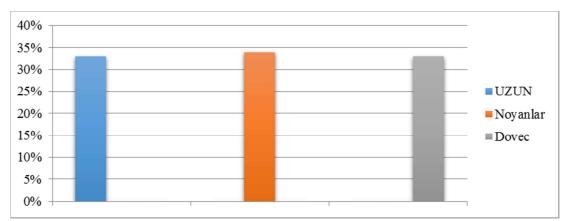


Chart 1: Percentage of the questionnaire of the different residences of different companies (Uzun, Noyanlar, Dovec)

3.6.2.1 Daylighting

In this part, the residences are questioned in relation to their satisfaction with daylighting and natural ventilation.

In the selected apartment buildings, residences are generally dissatisfied (61%) with shading devices due to not having any shading devices. However, some of the residential buildings have shutters with white color which result in absorption of heat in hot days. Consequently, residences are not generally satisfied even if some units possess have shading devices – Chart 2.

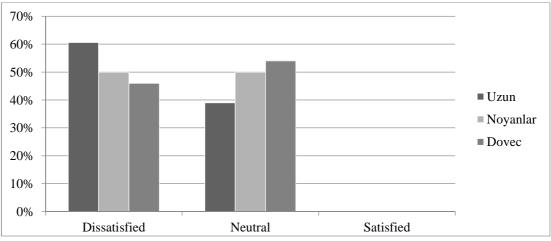


Chart 2: Satisfaction of residences with shading devices

In summer and winter time, residences' satisfaction relating to various orientation of windows are investigated in bedrooms with single glazed windows. Chart 04 indicates that residences are not satisfied with windows' orientation in summer time and only 5% are satisfied with windows located in southeast direction in bedrooms on the second and third floors during winter time. Approximately 5% of the residences are satisfied with windows looking to northwest and northeast on the second floor in summer, as well as northwest, northeast, and southeast on second floor in winter. On third floor, approximately 5% of the residences are not satisfied with windows located in summer as well as northwest and northwest in winter – Chart 3.

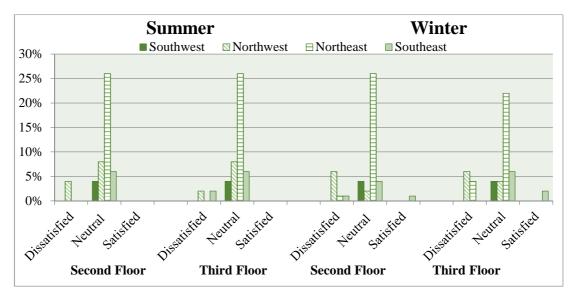


Chart 3: Satisfaction of residences with windows orientation in bedrooms with single glazed windows in summer and winter time

In summer and winter time, residences satisfaction in relation to different orientations is investigated in bedrooms with double glazed window. Chart 4 indicates that residences are more satisfied with windows' orientation in summer. Residences are more satisfied with double glazed windows in winter time. The residence satisfaction from southwestern windows is around 5% on third floor (summer time), around 5% on the second floor (winter time), and less than 5% on the third floor on southeastern façade on the second floor. In third floor (winter time), residences are satisfied with windows located on southeast direction in bedrooms on second and third floors during the winter time.

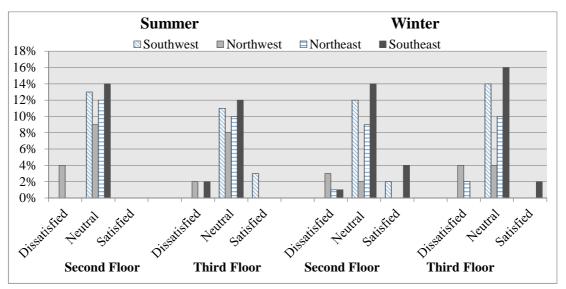


Chart 4: Satisfaction of residences with windows orientation in bedrooms with double glazed windows in summer and winter time

In summer and winter time, residences' satisfaction with different orientation of single glazed windows is investigated in living rooms. Chart 5 indicates that residences are not satisfied with windows orientation on northwest and southeast (8%) direction on the second floor in summer and winter time; southwest around 6%; northwest 10% and northeast 6% on the second floor. On the third floor, residences are not satisfied with windows located on southwest (2%) and northwest (8%) in summer, as well as southwest (2%), northwest (12%) and northeast (4%) in winter time. 20% of the residences are satisfied with windows located on southeast direction in living rooms on second and third floors during the winter time. Consequently, residences are not satisfied with windows located on the southern façade of their flats which is the most important facade of building in hot-humid climate for daylight gain

during cold days. Furthermore, in the design of windows this issue should carefully be considered.

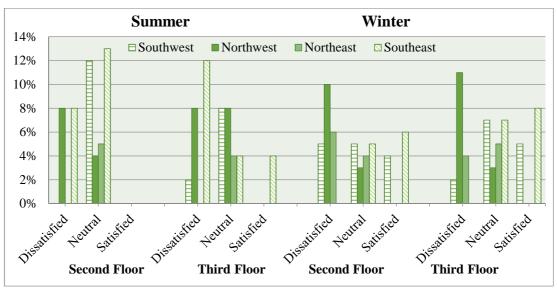


Chart 5: Satisfaction of residences with windows orientation in living rooms with single glazed windows in summer and winter time

In summer and winter time, residences' satisfaction with different orientation of double glazed windows has been investigated in living rooms. Chart 6 indicates that residences are more satisfied with windows' orientation in summer and winter time with double glazed windows than single glazed windows. This value is around 14% on the second floor in southeast (summer time), and around 10% on the third floor in southeast (summer time), and around 10% on the third floor in southeast (summer time); 8% on the second floor in southeast (winter time) are satisfied with windows in southeast orientation in bedrooms on second and third floors in winter time.

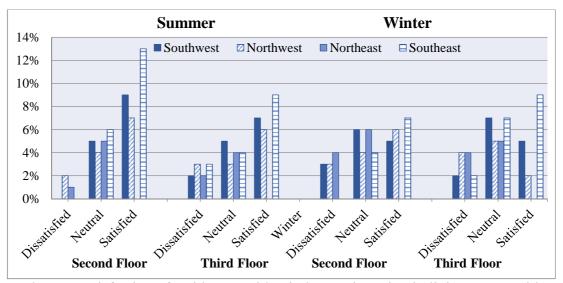


Chart 6: Satisfaction of residences with windows orientation in living rooms with double glazed windows in summer and winter time

In the selected apartments, 49% of the residences are satisfied with the size of their flat windows, 36% are not satisfied, and 15% wish to have a larger window than their current windows (single and double glaze) – Chart 7.

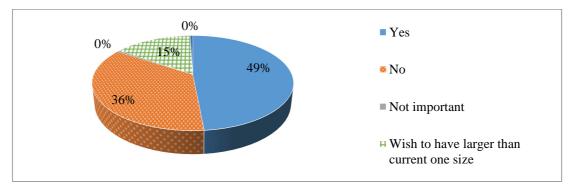


Chart 7: Satisfaction of residences with size of windows

In this chart, ratio of windows area to floor area is investigated so that ratio of windows area to floor area for bedrooms can be clarified and residences' are satisfactions from these conditions are investigated. In hot-humid climate, ratio of windows area to floor area should be in between 15 - 20% in order to have enough daylight. Bedrooms in the selected residential buildings have different ratio of

window area to floor area like 1/5, 1/8, and 1/10. Most of the residences did not have any idea about what should be the ideal ratio of windows area to floor in their bedrooms on second and third floors. Chart 8 shows that some of them wish to have larger windows than the existing one. In summer time, around 5% on second floor and third floor are satisfied with the ratio of 1/5 that is 20% in bedrooms. In addition, the other ratio of window area to floor area is less than 15 to 20 % – Chart 8.

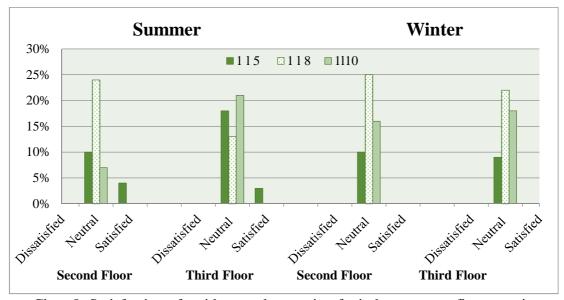


Chart 8: Satisfaction of residences about ratio of windows area to floor area in bedrooms in winter and summer time

In this chart, ratio of window area to floor area is investigated to understand user satisfaction and the proper ratio of window area to floor area for living rooms. Living rooms in the selected residential buildings have different ratio of windows area to floor area like 1/10, 1/13, 1/15, 1/20, and 1/26. In the living rooms, criteria for ratio of windows area to floor area did not consider. In summer and winter time, most of the residences do not have any idea about ratio of windows area to floor in their bedrooms in second and third floor – Chart 9.

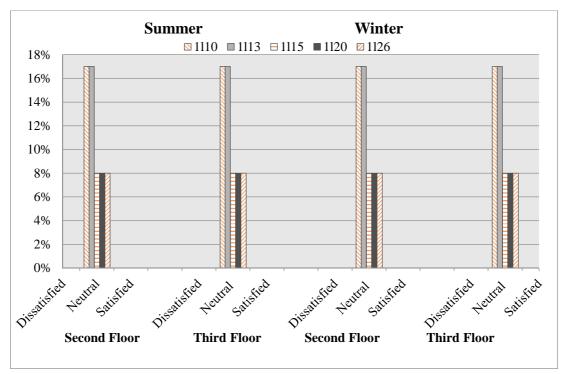


Chart 9: Satisfaction of residences about ratio of windows to floor area in living rooms in winter and summer time

Some of the residences do not have any idea about placement of windows in their bedrooms in residential buildings (Single glazed). Residences are not satisfied with southeast and northeast windows in summer on second and third floor – Chart 10. Further information (horizontal axis) relating to sampling is in Appendix I.

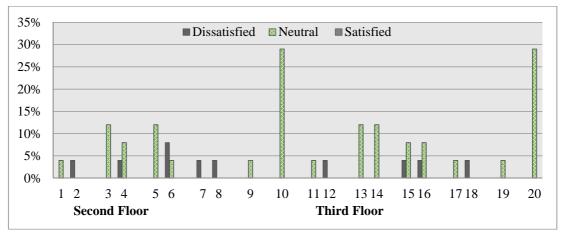


Chart 10: Satisfaction of residences about placement of windows in bedrooms with single glazed in summer time – Appendix I

Some of the residences do not have any idea about placement of windows in their bedrooms in residential buildings (double glazed). Residences are not satisfied with southwest and southeast windows in summer on second and third floor – Chart 11. Further information (horizontal axis) relating to sampling is in Appendix J.

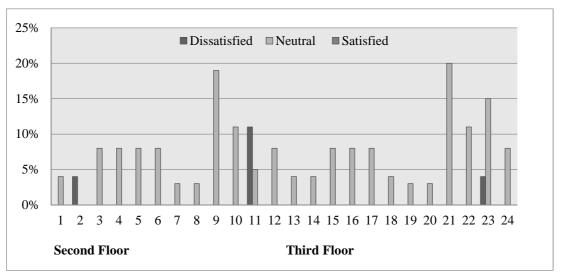
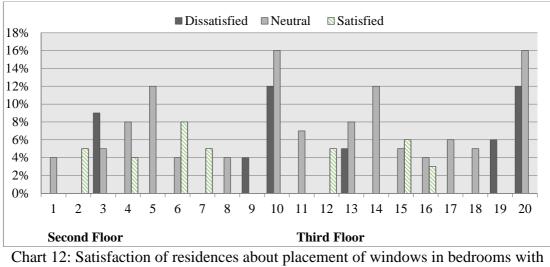


Chart 11: Satisfaction of residences about placement of windows in bedrooms with double glazed windows in summer time – Appendix J

Some of the residences do not have any idea about placement of windows in their bedrooms in residential buildings (single glazed). Residences are satisfied with southeast southwest and northeast windows in bedrooms more than other windows on other faces in winter on second and third floor – Chart 12. Further information (horizontal axis) relating to sampling is in Appendix I.



single glaze windows in winter time – Appendix I

Some of the residences do not have any idea about placement of windows in their bedrooms (double glazed). Residences are not satisfied with southeast and northeast windows in bedrooms more than other windows on other faces in winter on second and third floors – Chart 13. Further information (horizontal axis) relating to sampling is in Appendix J.

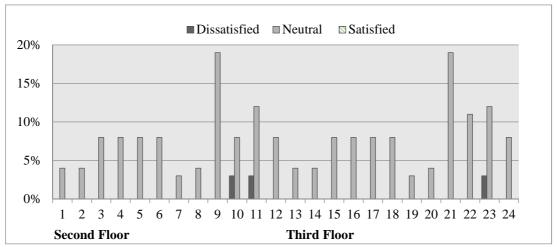


Chart 13: Satisfaction of residences about placement of windows in bedrooms with double glazed windows in winter time – Appendix J

Some of the residences do not have any idea about placement of windows in their living rooms in residential buildings in summer time (single glazed) – Chart 14.

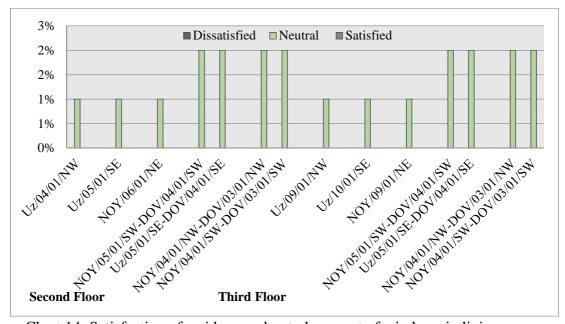


Chart 14: Satisfaction of residences about placement of windows in living rooms with single glazed windows in summer time

Some of the residences do not have any idea about placement of windows in their living rooms in residential buildings in summer time (double glazed). Residences are not satisfied with southeast and northwest windows in living rooms more than other windows on other faces in summer in second and third floor – Chart 15.

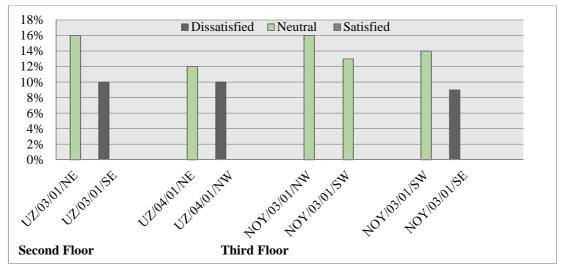


Chart 15: Satisfaction of residences about placement of windows in living rooms with double glazed windows in summer time

Some of the residences are not satisfied about placement of windows in northwest, northeast, and southwest in their living rooms in residential buildings in winter time (Single glazed) – Chart 16.

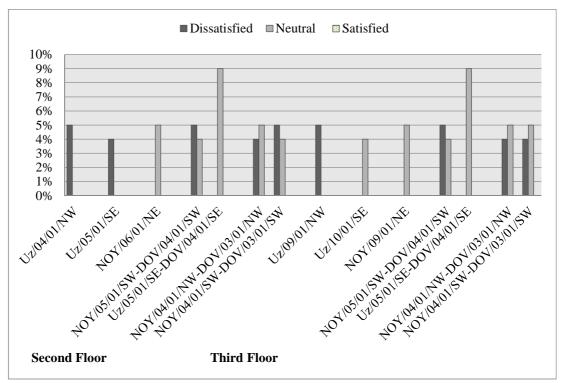


Chart 16: Satisfaction of residences about placement of windows in living rooms with single glazed windows in winter time

Some of the residences are not satisfied about placement of windows in northwest, northeast, and southwest in their living rooms in residential buildings in winter time (double glazed). Residences are not satisfied with southwest and northwest windows in living rooms more than other windows on other faces in winter in second and third floor – Chart 17.

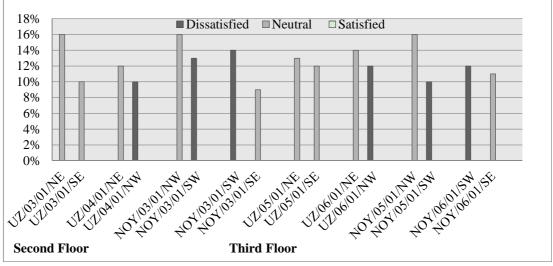


Chart 17: Satisfaction of residences about placement of windows in living rooms with double glazed windows in winter time

In next page (pine chart), 59% of the residences are satisfied with the placement of the windows in their flats. However, 41% of the residences are not satisfied with location of their windows, as they do not gain suitable daylight in cold days or do not provide ventilation in summer – Chart 18. Size of windows and location of the windows are mentioned before in data collection part.

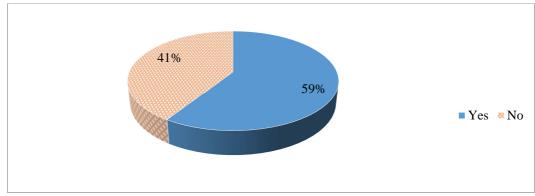


Chart 18: Satisfaction of residences with the placement of their windows

3.6.2.2 Natural Ventilation

Residences are more satisfied with cross ventilation of windows in southwestnorthwest and northeast-southeast in their bedrooms in residential buildings in summer time. In single sided rooms, inhabitants are not satisfied with this type of natural ventilation. Moreover, this problem on the second floor is more than second floor – Chart 19. Further information (horizontal axis) relating to sampling is in Appendix K.



Chart 19: Satisfaction of residences about natural ventilation of windows in bedrooms in summer time – Appendix K

Residences are more satisfied with cross ventilation of windows in southwestsoutheast, and northwest-southwest in second floor is same as second floor in summer time. In single sided rooms, residences are not satisfied with natural ventilation. Moreover, this problem on the third floor is more than second floor – Chart 20. Further information (horizontal axis) relating to sampling is in Appendix L.

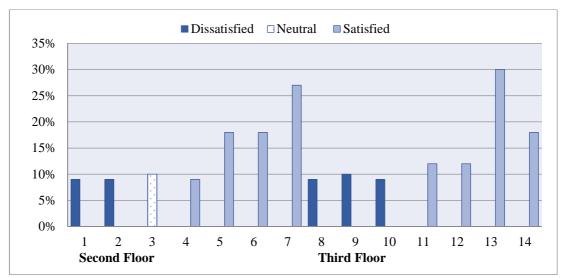


Chart 20: Satisfaction of residences about natural ventilation of windows in living rooms in summer time – Appendix L

In chart 21, generally 67% of the windows are not airtight that directly have an impact on energy consumption of the residential buildings in cold days.

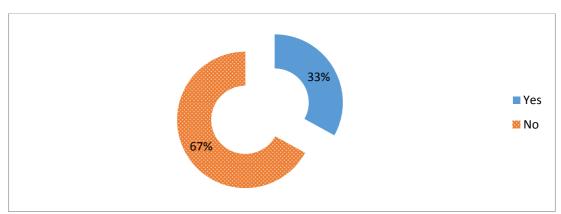


Chart 21: Airtight in windows

In this chart, user satisfaction about windows' opening types indicated that users do not have any idea about types of opening in their bedrooms in summer and winter time on the second and third floors – Chart 22 and 23. Further information (horizontal axis) relating to sampling is in Appendix I.

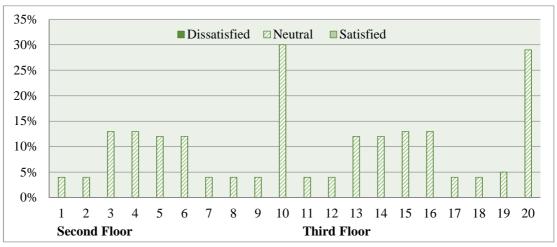


Chart 22: Satisfaction of residences windows opening type in bedrooms in summer time – Appendix I

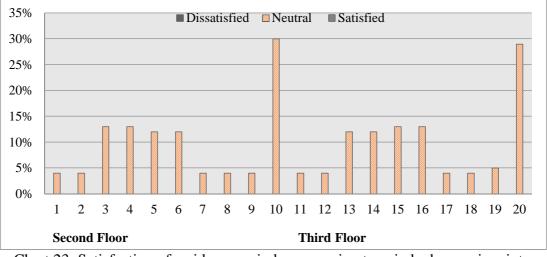


Chart 23: Satisfaction of residences windows opening type in bedrooms in winter time – Appendix I

In this chart, user satisfaction about windows' opening types indicated that users do not have any idea about types of opening in their living rooms in summer and winter time on the second and third floors – Chart 24 and 25.

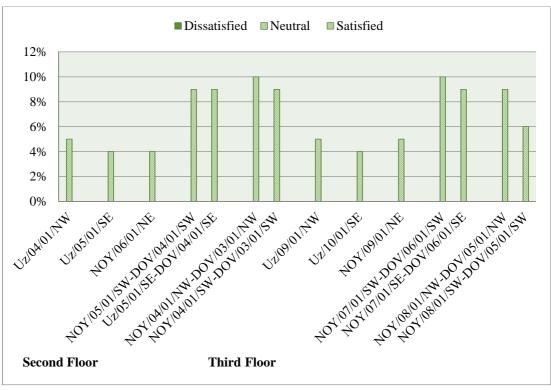


Chart 24: Satisfaction of residences windows opening type in living rooms in summer time

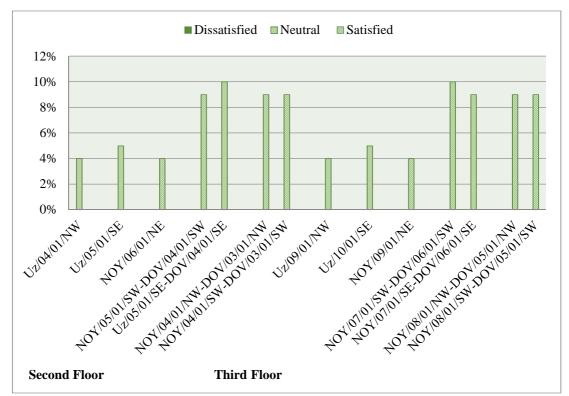


Chart 25: Satisfaction of residences windows opening type in living rooms in winter time

According to the opinion of the residences, performance to control (Daylight) heat gain and heat loss of single glazed windows in every side of their flats in summer and wintertime is indicated in Chart 26. Consequently, southern facade of residential buildings has an essential role in providing heat to buildings; accordingly 18% of the residences in hot days and 33% of the residences in cold days are satisfied from southern orientation.

In Chart 27, satisfaction of the residences through double glazed windows in different sides of the apartment buildings is indicated. In comparison between satisfaction of residences in apartment buildings with single glazed windows and double glazed windows shows that residences are more satisfied with double glazed windows performance in summer and winter that is 29% in summer and 47% in winter.

Consequently, performance of the double glazed windows is better than single glazed windows in the south side of the selected residential buildings in summer and wintertime.

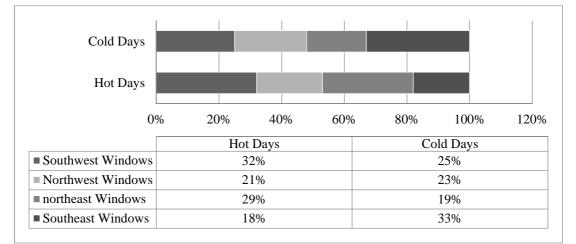


Chart 26: Satisfaction of the residences about different direction of the single glaze windows performance in hot and cold seasons

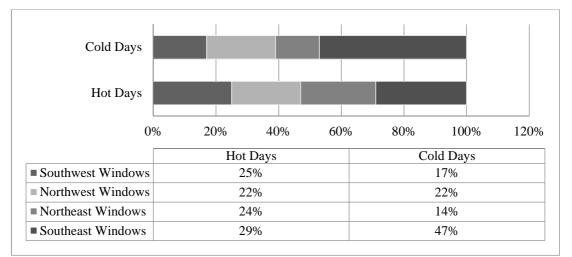


Chart 27: Satisfaction of the residences about different direction of the double glaze windows performance in hot and cold seasons

Chart 28 indicates that performance of the single glazed windows is not good in terms of providing suitable indoor temperature, which has influence on the energy consumption in the residential building. On the other hand, in the residential building the situation is better than buildings with single glazed windows.

Solely, 33% of the residences who are living in the apartment buildings with single glazed windows are satisfied with performance of the windows in winter and similarly 55% for the summer.

Chart 29, indicate that in flats with double glazed windows 42% of the residences are satisfied with the performance of the windows in winter and 36% of the residences are satisfied with the energy performance of the windows in summer.

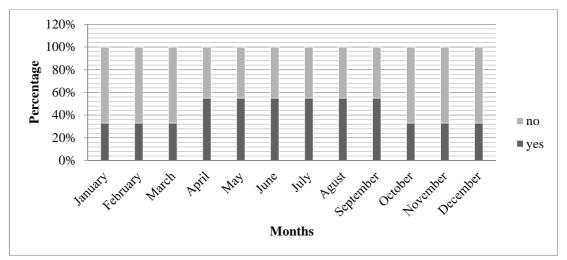


Chart 28: Satisfaction of the residences about single glaze windows performance in hot and cold seasons

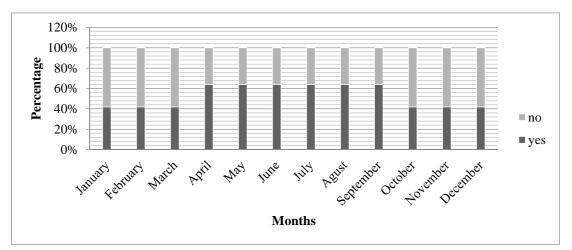


Chart 29: Satisfaction of the residences about double glaze windows performance in hot and cold seasons

In the selected residential building, most of the windows are single and double glazed. In addition, single glazed windows are around 50% where the remaining 50% of the windows are double glazed in the selected residential buildings, in Famagusta, North Cyprus – Chart 30.

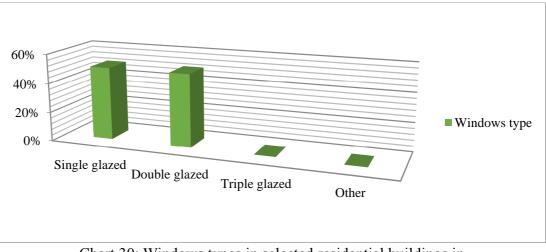


Chart 30: Windows types in selected residential buildings in Famagusta, North Cyprus

3.7 Discussion

Residential buildings are investigated according to daylighting issues which include window orientation, window size, ratio of window area to floor area, placement, window glazing and shading devices of windows; and ventilation which includes ventilation types, window orientation, control of the air leakage and condensation, and windows opening type in order to understand level of residences satisfaction for window design to provide proper daylight, and ventilation (heating in cold days and cooling in cold days) in the residential buildings to realize proper criteria for design of windows in hot-humid climate in selected residential buildings due to importance of creating appropriate place and indoor environment for human being by considering windows design.

At first, four orientations of windows with different windows types (e.g. single and double glazed) are investigated to realize the proper orientation of windows for residential buildings in Famagusta, North Cyprus. Most of the residences satisfaction level is neutral. Consequently, it indicates that orientation of window does not have

any influence on the single glazed windows. In general, it is essential to orient window towards south side of the buildings to have enough daylight especially in living rooms because most of the residences spend their time in living room during the day. Moreover, sunshades and sun breakers should be applied to windows on south side to block undesired daylight income in summer.

In Famagusta, size of the windows in each selected residential buildings are same as each other which is 1.5x1 and designers do not consider the area of the places in every flat to have proper daylight. However, most of the residences are satisfied with the size of windows. Another issue is window area to floor area, and results show that residences do not have enough information about ratio of window to floor area in their bedrooms and living rooms. Furthermore, some of them mentioned that they wish to have larger windows than the existing one. In addition, they were more satisfied with ratio of window area to floor area in bedrooms (second and third floor) in summer. Consequently, in the living room ratio of window area to floor area should be changed to gain proper daylight during cold days. It is preferable to consider 15 - 20% ratio in living rooms and bedrooms.

Window placement is another important issue that should be considered in window design of apartment buildings, because it has high influence on residences' satisfaction. Some of residences are not satisfied with window placement on southwest, southeast, and northeast in bedrooms in summer as well as southwest, southeast in bedrooms in winter. Some of residences are not satisfied with window placement on southeast, northwest side in living rooms in summer as well as southwest, northeast, and northeast in living rooms in winter. These results indicate that in placement of windows it is important (e.g. southeast and southwest)

to consider the direction in winter and summer. It is important to locate windows to south in order to have proper daylight during cold days.

The other important issue is those designers just use available material of windows in market that are not much expensive such as single glazed and double glazed windows. They should know that installation of windows is important in terms of controlling heat and cool gain/loss. Influence on the double glaze windows is more than single glaze windows. If high-performance windows with low-solar-gain low-E coatings are used, the window orientation can decrease energy use in the building.

In this study, results indicate that shading devices type is also an important issue in especially in hot-humid climate during the summer time. However, important role of shading devices has not been considered in windows design of selected residential buildings in Famagusta, North Cyprus. Furthermore, some of the residential buildings have shading devices which is shutters. Residences are not satisfied with this type of shading devices due to it blocking daylight gain during cold days. The best type is the exterior shading devices and overhangs in south side. However, sunlight has impact on the quality of the exterior sunshades and somehow interior sunshades are appropriate for controlling solar gain. Shading devices have high influence on the decline of energy use in the buildings.

The other essential factor is providing proper natural ventilation in the residential buildings in hot-humid climates. The level of satisfaction of residences in rooms and living rooms that have cross ventilation is higher than single-sided ventilation no matter windows are in which direction. Most of the residences are interest to open windows during night. They operate air conditioner during noon in hot days in bedrooms. Some investigation discussed that cooling effect of night ventilation is larger than those of the other ventilation strategies during the day and night in hot-humid regions.

In the design of windows, air leakage and condensation should be controlled and it is essential in design of windows in residential buildings especially in cold days. In this study, most of the residences are not satisfied with these issues in single glazed windows and just they are satisfied in one apartment building with double glazed windows. This issue is essential for residences during cold days so, this issue should be considered in window selection.

The other important issue is opening type that has influence on providing amount of natural ventilation in residential buildings. Most of the buildings have double casement opening type that is one of the appropriate opening types for Famagusta, North Cyprus. Residences do not have any idea about opening type or maybe it is not as important as it is for users. Further information that is summary of results in appendix M, N, O, and P.

It is important to consider these issues in order to have proper daylight in cold days such as locating most of windows on south side so that daylight can be gained in cold days; use vertical windows, have the ratio of window area to floor area in between 15 - 20%, place windows to have enough daylight during cold days, use double glazed windows, and apply shading devices in south, east and west side of the residential buildings.

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In order to have enough natural ventilation, windows should be located on two sides of the rooms so that natural enough ventilation (cross ventilation) can be achieved during hot days. It is proper to locate windows on southwest and west side, control air leakage and condensation in window design, and opening type should be awing or double casement for the allowance of more air.

In the following chapter, results of Chapter 3 will be explained to clarify the importance of window design for residences' satisfaction in the selected residential buildings – Table 8. Further information is in appendix H.

	Table 8: Summary of findings
	Orientation user satisfaction for living room (e.g. southwest, southeast and
DAYLIGHTING	northeast in winter time) in buildings with double glazed windows is more than
	buildings with single glazed windows and they are not satisfied with northwest
	windows. User satisfaction for bedroom: southwest and southeast
	Ratio of windows area to floor area for living rooms are 1/10,
	1/13, 1/15, 1/20, and 1/26 and for bedrooms are 1/5, 1/8, and 1/10. However,
	residences satisfaction level is neutral.
	Placement for living room and bedrooms: Users' satisfaction is neutral. Living
	room and bedrooms: southeast in winter
	Shading devices or sun breaker (type, material, color) are
	important in the design of windows in Famagusta in hot-humid climate and
	especially in summer. Exterior shading devices and overhangs in south side.
	Greenery in west side
NATURAL VENTILATION	Ventilation the level of satisfaction of residences in bedrooms and living
	rooms that have cross ventilation is higher than single-sided ventilation no
	matter windows are in which direction.
	Orientation southwest in summer for living room and for
	bedroom southwest and southeast. For living room northwest and southeast are
	not satisfied. Users are not satisfied with windows of bedrooms on southeast.
	Control of air leakage just in double glaze windows and residences are more
	satisfied.
	Windows opening types in all of the buildings is casement and residences do
	not have any opinion. The best choice is awing type and second one is double
Z	casement.

Table 8: Summary of findings

Chapter 4

CONCLUSION AND FURTHER STUDY

This part includes an evaluation of the case study and gives out recommendations for the further study. Due to the restrictions related to the desire of the constructors to have maximum amount of flats in a minimum area, it is hard to end up with designs that satisfy the requirements of hot-humid climate. However, it may be possible to overcome these difficulties by the introduction of some standards that affect the design, selection and construction of windows. The study on the selected residential buildings in Famagusta most clearly proves that there is a lack of standards relating to window design in Northern Cyprus.

However, as an essential component of the building, window has two main functions like providing daylighting and ventilation in buildings as well as supplying a visual connection between inside and outside of the residential buildings. In this study, daylighting and ventilation issues and their constituents have been considered in the evaluation of windows in hot-humid climate. In terms of daylighting, orientation, window glazing, size of windows, placement and ratio of windows area to floor area, and shading devices have been looked at in more detail in order to understand the role of these issues in providing proper daylight and in the ventilation part, natural ventilation type, orientation, opening type and dehumidification strategies have been scrutinized in order to understand how windows satisfy the residences. As far as the daylight issue is considered, several factors should be considered in the design of windows such as orientation, shading devices, placement, size and ratio of windows area to floor area, and window glazing. In the design of windows, the first effective factor for gaining suitable daylight is designing a building with proper orientation so that suitable solar radiation can be collected both in winter and summer. Most of the residences are not satisfied with windows orientation in south east side of their units in winter time due to lack of enough daylight in winter so, it is essential to design windows properly in this side in order to increase the level of residence satisfaction.

In Famagusta, windows with largest spans should be located on southeast and southwest side of buildings in order to gain enough daylight. In northwest, windows should be minimized.

Most of the residences are not satisfied with horizontal windows. Therefore, window size should be enlarged as well as including vertical openings for gaining more daylight during winter especially in living rooms because users spend most of their time in living rooms. In most of bedrooms and living rooms ratio of window area to floor area is less than 15 - 20% and in bed rooms 20%. It is advisable to have the ratio of window area to floor area in between 15 to 20% in bedrooms and living rooms, however, it has been discovered that the case is different in the selected residential buildings.

According to the questionnaires, around 49% of the residences are satisfied with the size of the windows in their flats especially with room sizes of 12m². However, 15% of the residences wish to have larger windows than the existing ones located in the

living rooms due to daylight and natural ventilation issues. Therefore, it is not only important to design the size of windows thinking daylight issues, but also consider the depth of space in the building so that there is enough opening to gain daylight in cold days. However, wide openings can also have an effect on the increase of heat loss and gain.

The other important aspect is the kind of window glazing used in selected residential buildings, so, it is preferable to use double, triple-glazed and other new types of materials in order to control solar radiation in summer in Famagusta, North Cyprus. In general, level of residence satisfaction with double glazed windows is a slightly higher than single glazed windows. Thermal insulation is an important issue to be considered in the selection of window material, because heat loss can occur through the windows when indoor temperature is more than outdoor temperature. Therefore, U-Value of windows (e.g. both sash and frame) should be selected properly in order to control the heat loss through windows. Therefore, apartment buildings and its components should be designed appropriately considering the environmental characteristics of the residential buildings that have been mentioned above.

Furthermore, in order to control sunlight penetration, shading devices and sun breakers should be integrated. According to the questionnaires carried out with the users, most of the residences are not satisfied with the shutters of their flat windows. In order to maximize the level of users' satisfaction, overhangs are suggested on the southern side of residential buildings in order to control the sun in summer and early fall. In west, east and north side of the building, moveable or stable sun shades can be integrated. The other function in design of windows in hot-humid climate is providing appropriate natural ventilation during hot days in hot-humid climate in residential buildings. Some factors should be realized in design of windows to have appropriate natural ventilation such as cooling techniques, orientation, window opening type and control of humidity.

Most of the living rooms and bedrooms do not have cross ventilation and this creates problem for providing suitable air circulation in the building in order to remove heat and humidity. Therefore, air circulation has an important especially in residential buildings and it is important to provide cross ventilation in most of the flats in order to increase level of residences' satisfaction and decline electricity usage.

Residences are more satisfied if windows are located on southwest and west sides of their living room and bed rooms. According to Famagusta climate, wind direction is from southwest and west in summer. Therefore, most of windows should be located on mentioned sides. The other important issue is natural ventilation in design of windows in residential buildings.

Components of windows like glass and their proper installation are also important for designers. Types of openings are effective for providing proper daylight and natural ventilation in the apartment buildings. Almost all of the window opening types in selected residential buildings have double casement opening. The level of residence satisfaction is neutral. According to criteria and collected data the best possible choices can be awing, casement, sliding and casement type (Vertical one) as they help reduce heat loss and gain through the windows in residential buildings in Famagusta, North Cyprus. One of the problems in Famagusta is the humidity where

providing suitable indoor temperature during the year is difficult for residents in apartment buildings. Opening types of windows sometimes have an essential role in improving the function of windows in hot and cold days in Famagusta.

In cases where windows are double glazed residences are satisfied with the control of air leakage and condensation. Therefore, it is essential to consider these issues in window design. The other essential matter is to choose airtight windows as well as other components (e.g. moisture transport strip between glazing or proper insulation) to control condensation in humid climates.

For removing humidity, it is essential to provide cross ventilation in the residential buildings. As mentioned in most of the cases in bedroom and living room, this issue is very much underestimated. Therefore, residences are usually obliged to use air conditioning units in summer time. Therefore, it is important to provide cross ventilation in the residential buildings in order to increase residence satisfaction in hot-humid climates.

In this study, daylighting and natural ventilation issues were examined in selected residential buildings in Famagusta to understand the level of residence satisfaction. In further study, material of windows can be examined so that the role of material in controlling of daylight and decreasing of energy use in apartment buildings can be understood. This will help recommend new types of material which are both flexible under various environmental conditions and inexpensive to apply.

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APPENDICES

Appendix A: Questionnaire Relating to Windows' Functional Features



EASTERN MEDITERRANEAN UNIVERSITY (DOĞU AKDENİZ ÜNİVERSİTESİ)

SUBJECT: An Evaluation of Residence Satisfaction on Window Design of Mass Housing in Hot-Humid Climates: The Case of Famagusta, North Cyprus

QUESTIONAIRE

SOOLMAZ ABDALI HAJIABADI 125371

Data collection

Questionnaire for user satisfaction:

The aim of this questionnaire has been to identify the effect of openings on people's life in every unit of apartment.

Neutral

Satisfied

A. Daylighting

1

1. Are you satisfied with shading devices of you unit?

Construction Companies	Dissatisfied
Uzun	
Noyanlar	
Dovec	

2. Are you satisfied with windows orientation in bedrooms with single glazed in summer and winter time?

Window	s Orientation	Dissatisfied	Neutral	Satisfied
	Southwest			
	Northwest			
	Northeast			
Summer	Southeast			
	Southwest			
	Northwest			
	Northeast			
	Southeast			
	Southwest			
	Northwest			
	Northeast			
Winter	Southeast			
	Southwest			
	Northwest			
	Northeast			
	Southeast			

Why?....

Window	s Orientation	Dissatisfied	Neutral	Satisfied
	Southwest			
	Northwest			
	Northeast			
Summer	Southeast			
	Southwest			
	Northwest			
	Northeast			
	Southeast			
	Southwest			
	Northwest			
	Northeast			
Winter	Southeast			
	Southwest			
	Northwest			
	Northeast			
	Southeast			

3. Are you satisfied with windows orientation in bedrooms with double glazed windows in summer and winter time?

Why?....

4. Are you satisfied with windows orientation in living rooms with single glazed in summer and

.

2 winter time?

Window	s Orientation	Dissatisfied	Neutral	Satisfied
	Southwest			
	Northwest			
	Northeast			
Summer	Southeast			
	Southwest			
	Northwest			
	Northeast			
	Southeast			
	Southwest			
	Northwest			
	Northeast			
Winter	Southeast			
	Southwest			
	Northwest			
	Northeast			
	Southeast			

Why?....

Window	s Orientation	Dissatisfied	Neutral	Satisfied
	Southwest			
	Northwest			
	Northeast			
Summer	Southeast			
	Southwest			
	Northwest			
	Northeast			
	Southeast			
	Southwest			
	Northwest			
	Northeast			
Winter	Southeast			
	Southwest			
	Northwest			
	Northeast			
	Southeast			

5. Are you satisfied with windows orientation in living rooms with double glazed windows in summer and winter time?

3

Why?....

6. Are you satisfied with the size of windows?

Yes	
No	
Not important	
Wish to have larger than current one size	
Wish to have smaller than the current one size	

7. Are you satisfied with ratio of windows area to floor area in bedrooms in winter and summer time?

.....

Ratio of	Windows A	Area to Floor Area	Dissatisfied	Neutral	Satisfied
	Second	115			
	Second Floor	118			
Summar	FIOOI	1110			
Summer	Third	115			
	Floor	118			
	FIOOI	1110			
	Second	115			
	Floor	118			
Winter	FIOOI	1110			
winter	Third Floor	115			
		118			
	FIOOI	1110			

Why?....

Ratio of	Windows A	Area to Floor Area	Dissatisfied	Neutral	Satisfied
		1110			
	Second	1113			
	Second Floor	1115			
	FIOOI	1120			
Summer		1126			
Summer		1110			
	Third	1113			
	Floor	1115			
	FIOOI	1120			
		1126			
		1110			
	Second	1113			
	Floor	1115			
	FIOOI	1120			
Winter		1126			
w milei		1110			
	Third	1113			
	Floor	1115			
	11001	1120			
		1126			

8. Are you satisfied with ratio of windows to floor area in living rooms in winter and summer time?

Why?.....

4

9. Are you satisfied with placement of windows in bedrooms with single glazed in summer time?

Dissatisfied	
Neutral	
Satisfied	

Which place? Which floor? Why?.....

.....

10. Are you satisfied with placement of windows in bedrooms with double glazed windows in summer time?

Dissatisfied	
Neutral	
Satisfied	

Which place? Which floor? Why?.....

.....

11. Are you satisfied with placement of windows in bedrooms with single glaze windows in winter time?

Dissatisfied	
Neutral	
Satisfied	

Which place? Which floor? Why?.....

12. Are you satisfied with placement of windows in bedrooms with double glazed windows in winter time?

Dissatisfied	
Neutral	
Satisfied	

Which place? Which floor? Why?.....

13. Are you satisfied with placement of windows in living rooms with single glazed windows in

S	ummer time?	
	Dissatisfied	
	Neutral	
	Satisfied	

Which place? Which floor? Why?.....

14. Are you satisfied with placement of windows in living rooms with double glazed windows in summer time?

unnut	time.	

F

Dissatisfied	
Neutral	
Satisfied	

5

Which place? Which floor? Why?.....

15. Are you satisfied with placement of windows in living rooms with single glazed windows in winter time?

Dissatisfied	
Neutral	
Satisfied	

Which place? Which floor? Why?

16. Are you satisfied with placement of windows in living rooms with double glazed windows in winter time?

.....

Dissatisfied	
Neutral	
Satisfied	

Which place? Which floor? Why?.....

17. Are you satisfied with placement of their windows?

Yes	
No	

B. NATURAL VENTILATION

18. Are you satisfied with natural ventilation of windows in bedrooms in summer time?

	Dissatisfied		
	Neutral		
	Satisfied		
W	nich place? Which	floor? Why?	

.....

19. Are you satisfied with natural ventilation of windows in living rooms in summer time?

Dissatisfied	
Neutral	
Satisfied	

Which place? Which floor? Why?.....

20. Do you have air tight from your windows?

Yes	
No	

21. Are you satisfied with windows opening type in bedrooms in summer time?

Dissatisfied	
Neutral	
Satisfied	

6

Which place? Which floor? Why?.....

22. Are you satisfied with windows opening type in bedrooms in winter time?

Dissatisfied	
Neutral	
Satisfied	

Which place? Which floor? Why?.....

23. Are you satisfied with windows opening type in living rooms in summer time?

Dissatisfied	
Neutral	
Satisfied	

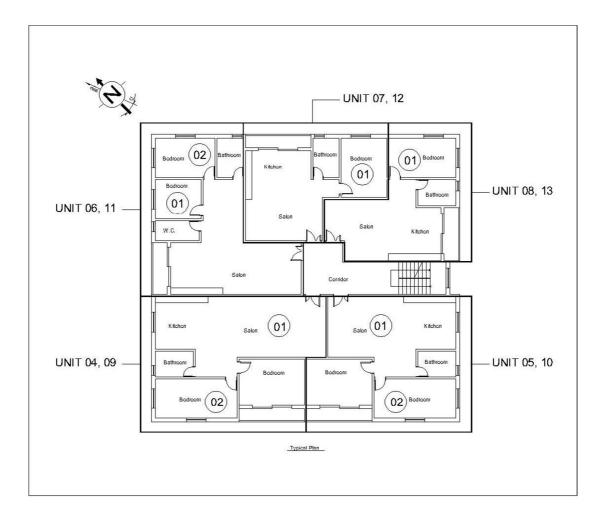
Which place? Which floor? Why?

24. Are you satisfied with windows opening type in living rooms in winter time?

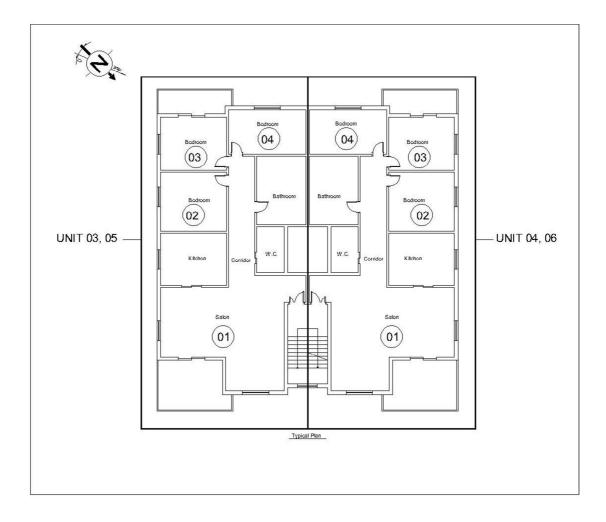
Dissatisfied	
Neutral	
Satisfied	

Which place? Which floor? Why?.....

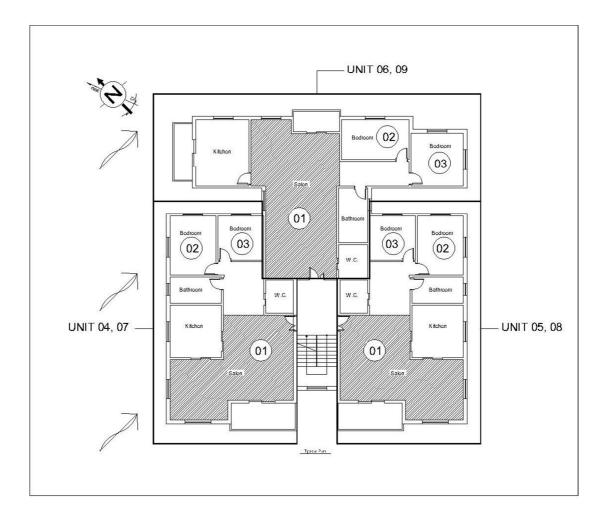
Appendix B: M. Oltan Apt., Schematic Plan (Uzun)



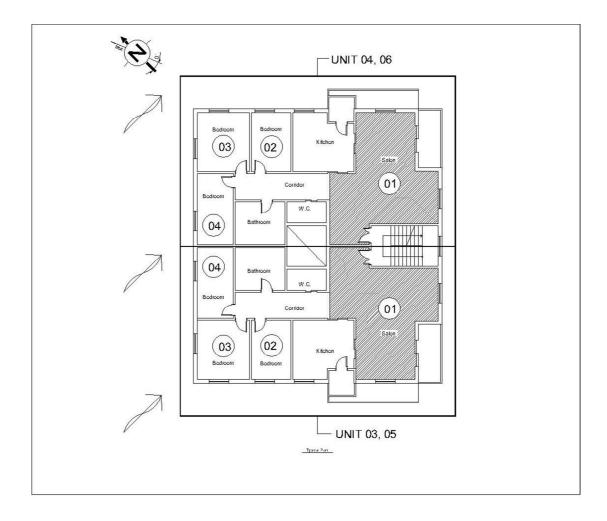
Appendix C: Emine Apartment, Schematic Plan (Uzun)

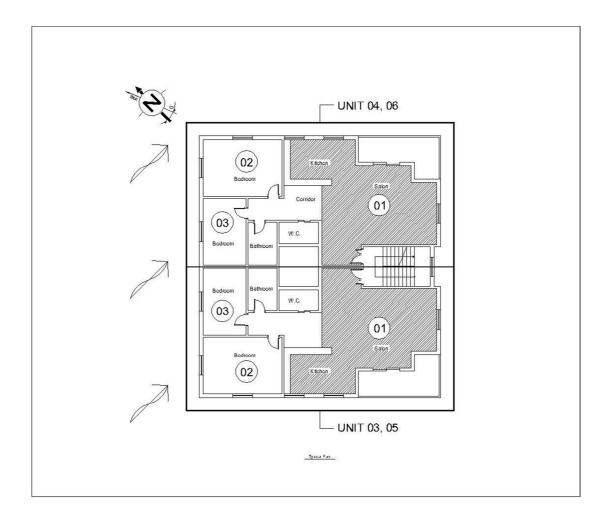


Appendix D: Arken 14 Apartment, Schematic Plan (NOYANLAR)

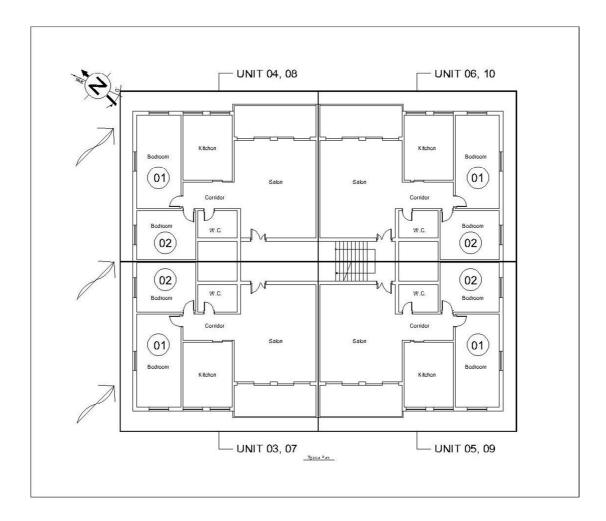


Appendix E: Arken 12 Apartment, Schematic Plan (NOYANLAR)





Appendix G: Celebi Apartment, Schematic Plan (DOVEC)



Daylighting				
 Are you s devices? 	atisfied with shading			
Uzun		61%	39%	-
Noyanlar		50%	50%	-
Dovec		46%	54%	-
orientation in	satisfied with windows bedrooms with single mer and winter time?	Dissatisfied	Neutral	Satisfied
	Southwest		4%	
	Northwest	4%	8%	
	Northeast		26%	
~	Southeast		6%	
Summer	Southwest		4%	
	Northwest	2%	8%	
	Northeast		26%	
	Southeast	2%	6%	
	Southwest		4%	
	Northwest	6%	2%	
	Northeast	1%	26%	
	Southeast	1%	4%	1
Winter	Southwest		4%	
	Northwest	6%	4%	
	Northeast	4%	22%	
	Southeast		6%	2
orientation in	atisfied with windows bedrooms with double ws in summer and winter	Dissatisfied	Neutral	Satisfied
	Southwest		13%	
	Northwest	4%	9%	
	Northeast		12%	
Summer	Southeast		14%	
Summer	Southwest		11%	3
	Northwest	2%	8%	
	Northeast		10%	
	Southeast	2%	12%	
	Southwest		12%	2
	Northwest	3%	2%	
Winter	Northeast	1%	9%	
	Southeast	1%	14%	4
w nitei	Southwest		14%	
	Northwest	4%	4%	
	Northeast	2%	10%	_

orientation in	satisfied with windows living rooms with single mer and winter time?	Dissatisfied	Neutral	Satisfied
	Southwest		12%	
	Northwest	8%	4%	
	Northeast		5%	
Summer	Southeast	8%	13%	
Summer	Southwest	2%	8%	
	Northwest	8%	8%	
	Northeast		4%	
	Southeast	12%	4%	4%
	Southwest	5%	5%	4%
	Northwest	10%	3%	
	Northeast	6%	4%	
Winter	Southeast		5%	6%
	Southwest	2%	7%	5%
	Northwest	11%	3%	
	Northeast 1997	4%	5%	
	Southeast		7%	8%
and winter ti	1 windows in summer ne? Southwest		5%	9%
	Northwest	2%	4%	7%
	Northeast	1%	5%	
	Southeast	13%	6%	
Summer	Southwest	2%	5%	7%
	Northwest	3%	3%	6%
	Northeast	2%	4%	
	Southeast	3%	4%	9%
	Southwest	3%	6%	5%
	Northwest	3%	4%	6%
	Northeast	4%	6%	
Winter	Southeast		4%	7%
winter	Southwest	2%	7%	5%
	Northwest	4%	5%	2%
	Northeast	4%	5%	
	Southeast	2%	7%	9%
6. Are you: windows?	satisfied with the size of			
Yes		49%		
No		36%		
Not important		-		
Wish to have lar	ger than current one size	15%		
	aller than the current			

Appendix H: Questionnaires results

windo	ws area to fl	ied with ratio of oor area in r and summer time?	Dissatisfied	Neutral	Satisfied
	Second	1/5		10%	4%
	Floor	1/8		24%	
Summer	11001	1/ 10		7%	
Summer	701 · 1	1/5		18%	3%
	Third Floor	1/8		13%	
	11001	11/10		21%	
		1/5		10%	
	Second Floor	1/8		25%	
Winter	FIOOI	1 <i>l</i> 10		16%	
Winter		115		9%	
	Third Floor	1/8		22%	
	Pioor	1110		18%	
	ter and sumr		Dissatisfied	Neutral	Satisfied
	1	1/ 10		17%	
		1/13		17%	
	Second	1/ 15		8%	
	Floor	1/20		8%	
1		1/26		8%	
Summer		1/10		17%	
		1/13		17%	
	Third	1/ 15		8%	
	Floor	1/20		8%	
		1/26		8%	
		1/ 10		17%	
		1/13		17%	
	Second	1/15		8%	
	Floor	1/20		8%	
		1/26		8%	
	1				
Winter		1/10		17%	
Winter				17% 17%	
Winter	Third	1/ 10			
Winter	Third Floor	1/10 1/13		17%	

of wind		ied with placement rooms with single ime?	Dissatisfied	Neutral	Satis fied
Suzedi	li sunnier (-		40/	
		Uz/04/02/NW		4%	
		Uz/04/02/SW	4%		
		Uz/04/02/NW -			
		NOY/04/02/NW-		12%	
		DOV/03/02/NW			
		Uz/04/02/NE-			
		NOY/04/02/NE-	4%	8%	
		DOV/03/02/NE			
		Uz/08/01/NE-			
		NOY/05/02/NE-		12%	
		DOV/04/02/NE			
	Second	Uz/08/01/SE-	004	40/	
	Floor	NOY/05/02/SE-	8%	4%	
		DOV/04/02/SE	10/		
		Uz/05/02/SW	4%		
		Uz/05/02/SE	4%		
		Uz/06/01/NW		4%	
		Uz/07/01/NE-			
		NOY/04/03/NE-			
		NOY/05/03/NE-			
		NOY/06/02/NE-		29%	
		NOY/06/03/NE-			
		DOV/03/03/NE-			
Summer		DOV/04/03/NE			
		Uz/09/02/NW		4%	
		Uz/09/02/SW	4%		
		Uz/11/02/NW-			
		NOY/07/02/NW-		12%	
		DOV/05/02/NW			
		Uz/11/02/NE-			
		NOY/07/02/NE-		12%	
		DOV/05/02/NE			
		Uz/13/01/NE-			
		NOY/08/02/NE-	4%	8%	
		DOV/06/02/NE			
	Third	Uz/13/01/SE-			
	Floor	NOY/08/02/SE-	4%	8%	
		DOV/06/02/SE			
		Uz/10/02/SW		4%	
		Uz/10/02/SE	4%		
		Uz/06/01/NW		4%	
		Uz/07/01/NE-			
		NOY/04/03/NE-			
		NOY/05/03/NE-			
		NOY/06/02/NE-		29%	
		NOY/06/03/NE-			
		DOV/03/03/NE-			
		DOV/04/03/NE			

10.		satisfied with			
		ows in bedrooms	Dissatisfied	Neutral	Satisfied
		l windows in			
summe	r time?	DOI//02/01/01/01		40/	
		DOV/03/01/NW	4-1	4%	
		DOV/03/01/SW	4%		-
		NOY/03/03/NW-		8%	
		DOV/04/01/NW			
		NOY/03/03/NE-		8%	
		DOV/04/01/NE			
		NOY/04/03/NE- DOV/06/01/NE		8%	
		NOY/04/03/SE-			
		DOV/06/01/SE		8%	
		DOV/05/01/SE		3%	
		DOV/05/01/SE		3%	
	Second	UZ/04/02/NW-		370	
	Floor	UZ/04/02/NW- UZ/04/03/NW-			
		NOY/03/02/NW-		19%	
		DOV/03/02/NW-		1970	
		DOV/04/02/NW			
		NOY/03/04/NE-			
		NOY/04/04/NE-		11%	
		DOV/06/02/NE			
		UZ/03/02/SE-			
		UZ/03/03/SE-	11%	5%	
	NOY/04/02/SE-	1170	.370		
		DOV/05/02/SE			
		Uz/03/04/SW -		8%	
ummer		Uz/04/04/SW			
		DOV/07/01/NW		4%	
		DOV/07/01/SW		4%	
		NOY/05/03/NW-		8%	
		DOV/08/01/NW		070	
		NOY/05/03/NE-		8%	
		DOV/08/01/NE		0/0	
		NOY/06/03/NE-		8%	
		DOV/10/01/NE			
		NOY/06/03/SE-		4%	
		DOV/10/01/SE		201	
		DOV/09/01/SW		3%	
	Third	DOV/09/01/SE		3%	
	Floor	UZ/06/02/NW-			
	1	UZ/06/03/NW-		20	
		NOY/05/02/NW-		20%	
		DOV/07/02/NW-			
	DOV/08/02/NW NOY/05/04/NE-				
	NOY/05/04/NE- NOY/06/04/NE-		11%		
	DOV/10/02/NE		11%		
		UZ/05/02/SE-			
		UZ/05/03/SE-			
		NOY/06/02/SE-	4%	15%	
		DOV/09/02/SE			
		Uz/05/04/SW -		_	
	1	Uz/06/04/SW		8%	

11					
11.		satisfied with			
		ows in bedrooms indows in winter	Dissatisfied	Neutral	Satis fied
time?	gie glaze w	indows in winter			
time?	I				
		Uz/04/02/NW		1%	
		Uz/04/02/SW			1%
		Uz/04/02/NW-			
		NOY/04/02/NW-	2%	1%	
		DOV/03/02/NW			
		Uz/04/02/NE-			
		NOY/04/02/NE-		2%	1%
		DOV/03/02/NE			
		Uz/08/01/NE-			
		NOY/05/02/NE-		3%	
		DOV/04/02/NE			
	Second	Uz/08/01/SE-			
	Floor	NOY/05/02/SE-		1%	2%
		DOV/04/02/SE			
		Uz/05/02/SW			1%
		Uz/05/02/SE		1%	
		Uz/06/01/NW	1%		
		Uz/07/01/NE-			
		NOY/04/03/NE-			
		NOY/05/03/NE-			
		NOY/06/022/NE-	3%	4%	
		NOY/06/03/NE-			
		DOV/03/03/NE-			
Winter		DOV/04/03/NE			
to inter		Uz/09/02/NW		1%	
		Uz/09/02/SW			1%
		Uz/11/02/NW-			
		NOY/07/02/NW-	1%	2%	
		DOV/05/02/NW			
		Uz/11/02/NE-			
		NOY/07/02/NE-		3%	
		DOV/05/02/NE			
		Uz/13/01/NE-			
		NOY/08/02/NE-		2%	1%
		DOV/06/02/NE			
	Third	Uz/13/01/SE-			
	Floor	NOY/08/02/SE-		2%	1%
		DOV/06/02/SE			
		Uz/10/02/SW		1%	
		Uz/10/02/SE		1%	
		Uz/06/01/NW	1%		
		Uz/07/01/NE-			
		NOY/04/03/NE-			
		NOY/05/03/NE-			
		NOY/06/022/NE-	3%	4%	
		NOY/06/03/NE-			
		DOV/03/03/NE-			
		DOV/04/03/NE			

	ment of wind	a satisfied with ows in bedrooms I windows in winter	Dissatisfied	Neutral	Satisfied
		DOV/03/01/NW		4%	
		DOV/03/01/SW		4%	
		NOY/03/03/NW- DOV/04/01/NW	8%		
		NOY/03/03/NE-	8%		
		DOV/04/01/NE NOY/04/03/NE-	8%		
		DOV/06/01/NE NOY/04/03/SE-	8%		
		DOV/06/01/SE		20/	
		DOV/05/01/SW		3% 4%	
	Second	DOV/05/01/SE		4%	
	Floor	UZ/04/02/NW- UZ/04/03/NW-			
		02/04/05/NW- NOY/03/02/NW-	19%		
		DOV/03/02/NW-	1970		
		DOV/04/02/NW			
		NOY/03/04/NE-			
		NOY/04/04/NE- DOV/06/02/NE	3%	8%	
		UZ/03/02/SE-			
		UZ/03/03/SE-	3%	12%	
		NOY/04/02/SE-			
		DOV/05/02/SE			
		Uz/03/04/SW- Uz/04/04/SW	8%		
		DOV/07/01/NW		4%	
Winter		DOV/07/01/SW		4%	
		NOY/05/03/NW-		470	
		DOV/08/01/NW	8%		
		NOY/05/03/NE- DOV/08/01/NE	8%		
		NOY/06/03/NE- DOV/10/01/NE	8%		
		NOY/06/03/SE- DOV/10/01/SE	8%		
		DOV/09/01/SW		3%	
	Third	DOV/09/01/SE		4%	
	Floor	UZ/06/02/NW-			
		UZ/06/03/NW-			
		NOY/05/02/NW-	19%		
		DOV/07/02/NW-			
		DOV/08/02/NW			
		NOY/05/04/NE- NOY/06/04/NE-	11%		
		DOV/10/02/NE	ļ		
		UZ/05/02/SE-			
		UZ/05/03/SE- NOY/06/02/SE-	3%	12%	
		DOV/09/02/SE-			
		Uz/05/04/SW-			
		Uz/06/04/SW	8%		

13.	Are you	satisfied with			
placement of windows in living rooms			Dissatisfied	Neutral	Satis fied
	ngle glazed	windows in summer	Dissatisticu	iveutiai	Satisfied
time?	Т				
		Uz/04/01/NW		1%	
		Uz/05/01/SE		1%	
		NOY/06/01/NE		1%	
	Second	NOY/05/01/SW- DOV/04/01/SW	2%		
	Floor	Uz/05/01/SE- DOV/04/01/SE	2%		
		NOY/04/01/NW-			
		DOV/03/01/NW	2%		
		NOY/04/01/SW-	201		
Summer		DOV/03/01/SW	2%		
Summer		Uz/09/01/NW		1%	
		Uz/10/01/SE		1%	
		NOY/09/01/NE		1%	
	Third	NOY/05/01/SW- DOV/04/01/SW	2%		
	Floor	Uz/05/01/SE-	2%		
		DOV/04/01/SE NOY/04/01/NW-	2%		
		DOV/03/01/NW	270		
		NOY/04/01/SW- DOV/03/01/SW	2%		
14.	Are you	satisfied with			
-	ouble glazed	ows in living rooms windows in	Dissatisfied	Neutral	Satis fied
summe		UZ/03/01/NE		16%	
		UZ/03/01/SE	10%		
		UZ/04/01/NE		12%	
	Second	UZ/04/01/NW	10%		
	Floor	NOY/03/01/NW		16%	
		NOY/03/01/SW		13%	
		NOY/03/01/SW		14%	
		NOY/03/01/SE	9%	11/0	
Winter		UZ/05/01/NE	270	13%	
		UZ/05/01/NE	12%	1370	
		UZ/06/01/NE	1270	14%	
	Third	UZ/06/01/NE		14%	
	Floor	NOY/05/01/NW		12%	
	1001	NOY/05/01/SW		10%	
		NOY/06/01/SW		10%	
			100/	11%	
		NOY/06/01/SE	12%		

15.	Are you	1 satisfied with			
		ows in living rooms			
		windows in winter	Dissatisfied	Neutral	Satis fied
time?	0.0.0				
		Uz/04/01/NW	5%		
		Uz/05/01/SE	4%		
		NOY/06/01/NE		5%	
		NOY/05/01/SW-	5%	4%	
	Second	DOV/04/01/SW	5%	4%	
	Floor	Uz/05/01/SE-		9%	
		DOV/04/01/SE		270	
		NOY/04/01/NW-	4%	5%	
		DOV/03/01/NW NOY/04/01/SW-			
		DOV/03/01/SW	5%	4%	
Winter		Uz/09/01/NW	5%		
		Uz/10/01/SE	570	4%	
		NOY/09/01/NE		5%	
		NOY/05/01/SW-			
	Third	DOV/04/01/SW	5%	4%	
	Floor	Uz/05/01/SE-		00/	
	1.001	DOV/04/01/SE		9%	
		NOY/04/01/NW-	4%	5%	
		DOV/03/01/NW	470	570	
		NOY/04/01/SW-	4%	5%	
16		DOV/03/01/SW			
16.		satisfied with ows in living rooms			
		windows in winter	Dissatisfied	Neutral	Satis fied
time?					
		UZ/03/01/NE		16%	
		UZ/03/01/SE		10%	
		UZ/04/01/NE		12%	
	Second	UZ/04/01/NW	10%	12/0	
	Floor	NOY/03/01/NW	10/0	16%	
		NOY/03/01/SW	13%	10/0	
		NOY/03/01/SW	13%		
			14%	00/	
Winter		NOY/03/01/SE		9%	
		UZ/05/01/NE		13%	
		UZ/05/01/SE		12%	
		UZ/06/01/NE		14%	
	Third	UZ/06/01/NW	12%		
	Floor	NOY/05/01/NW		16%	
		NOY/05/01/SW	10%		
		NOY/06/01/SW	12%		
		NOY/06/01/SE		11%	
17. placeme	Are you ent of their	satisfied with windows?	Yes	No	
			59%	41%	
k		1			

17. placement		satisfied with indows?	Yes	No	
			59%	41%	
18.	Are you	satisfied with			
natural ver bedrooms	ntilation o	f windows in	Dissatisfied	Neutral	Satisfied
		Uz/04/02/NW-			
		DOV/03/01/NW +			(0)
		Uz/04/02/SW-			6%
		DOV/03/01/SW			
		Uz/06/02/NW-			
		NOY/04/02/NW-			
		DOV/03/02/NW			
		NOY/03/03/NW-			
		DOV/04/01/NW+			14%
		Uz/0/02/NE-			11/0
		NOY/04/02/NE-			
		DOV/03/02/NE-			
		NOY/03/03/NE-			
		DOV/04/01/NE			
		Uz/08/01/NE-			
		NOY/05/02/NE-			
		DOV/04/02/NE-			
		NOY/04/03/NE-			
		DOV/06/01/NE +		1%	2%
		Uz/08/01/SE-			
		NOY/05/02/SE-			
		DOV/04/02/SE- NOY/04/03/SE-			
		DOV/06/01/SE Uz/05/02/SW-			
	econd oor	DOV/05/01/SW +			
гі	oor	Uz/05/02/SE-			6%
		DOV/05/01/SE			
		Uz/06/01/NW	9%		
			970		
		Uz/07/01/NE- NOY/04/03/NE-			
		NOY/05/03/NE-			
		NOY/06/02/NE-			
		NOY/06/03/NE-			
		DOV/03/03/NE-	26%	3%	
		DOV/03/03/NE-			
		NOY/03/04/NE-			
		NOY/04/04/NE-			
		DOV/06/02/NE			
		UZ/04/02/NW-			
		UZ/04/03/NW-			
		NOY/03/02/NW-	12%	3%	
		DOV/03/02/NW-	,-		
		DOV/04/02/NW			
		UZ/03/02/SE-			
		UZ/03/03/SE-	100/		
		NOY/04/02/SE-	12%		
		DOV/05/02/SE			

Vinter	Uz/03/04/SW-	6%	
inter	Uz/04/04/SW	070	
	Uz/09/02/NW-		
	DOV/07/01/NW +		60/
	Uz/09/02/SW-		6%
	DOV/07/01/SW		
	Uz/11/02/NW-		
	NOY/07/02/NW-		
	DOV/05/02/NW-		
	NOY/05/03/NW-		
	DOV/08/01/NW +		
	Uz/11/02/NE-		13%
	NOY/07/02/NE-		
	DOV/05/02/NE-		
	NOY/05/03/NE-		
	DOV/08/01/NE		
	Uz/13/01/NE-		
	NOY/08/02/NE-		
	DOV/06/02/NE-		
	NOY/06/03/NE-		
	DOV/10/01/NE+		
	Uz/13/01/SE-		14%
	NOY/08/02/SE-		
	DOV/06/02/SE-		
	NOY/06/03/SE-		
Third	DOV/10/01/SE		
Floor	Uz/10/02/SW-		
	DOV/09/01/SW +		00/
	Uz/10/02/SE-		9%
	DOV/09/01/SE		
	Uz/11/01/NW-		
	UZ/06/02/NW-		
	UZ/06/03/NW-	1	
	NOY/05/02/NW-	17%	
	DOV/07/02/NW-		
	DOV/08/02/NW		
	Uz/12/01/NE-		
	NOY/07/03/NE-		
	NOY/08/03/NE-		
	NOY/09/02/NE-		
	NOY/09/03/NE-		
	DOV/05/03/NE-	23%	
	DOV/06/03/NE-		
	NOY/05/04/NE-		
	NOY/06/04/NE-		
	DOV/10/02/NE		
	UZ/05/02/SE-		
	UZ/05/03/SE-		
	NOY/06/02/SE-	12%	
	DOV/09/02/SE		
	Uz/05/04/SW-		
		6%	

19. Are you satisfied with natural ventilation of windows in living voms in summer time? Dissatisfied Neutral Satisfied V2/04/01/NW 9% V2/04/01/NE 9% V2/04/01/NE 9% 9% V2/04/01/NE 0 10% 9% V2/04/01/NE 0 10% 9% V2/03/01/NE + 10% 18% 18% NOY05/01/SE 00/04/01/SE 18% 18% NOY04/01/SE 00/03/01/SE 27% NOY04/01/NW + NOY04/01/SE 27% NOY04/01/SE 10% 27% Summer V2/09/01/NW 9% 27% NOY04/01/SE 10% 27% Summer V2/09/01/NW 9% 212%						
Uz05/01/SE 9%	natural	ventilation o	of windows in	Dissatisfied	Neutral	Satisfied
Summer NOY/06/01/NE 10% UZ/04/01/NE+UZ /04/01/NW 9% UZ/03/01/NE + 18% NOY/05/01/SW- DOV/04/01/SW- DOV/04/01/SE- DOV/04/01/SE- NOY/03/01/SE- DOV/04/01/SE- NOY/03/01/SW + 18% NOY/05/01/SW- DOV/04/01/SE- NOY/03/01/SW + 18% NOY/04/01/NW - DOV/03/01/SW + 27% NOY/04/01/NW + NOY/03/01/SW + 27% NOY/04/01/SE- NOY/03/01/SW + 12% VI/10/01/SE 10% UZ/05/01/NW + NOY/03/01/SE 12% VI/10/01/SE 10% UZ/05/01/NE + UZ/05/01/NE + UZ/05/01/NE + UZ/06/01/NW + 12% NOY/06/01/SE- NO			Uz/04/01/NW	9%		
Second Floor UZ/04/01/NE+UZ /04/01/NW 18% NOY/03/01/SE 27% NOY/03/01/SW 27% VU/10/01/SE 10% UZ/05/01/NE 9% UZ/05/01/NE 12% NOY/07/01/SE 12% NOY/06/01/SE 30% NOY/06/01/SE 30% NOY/06/01/SE 18% NOY/06/01/SW 18% NOY/06/01/SW NOY/06/01/SW NOY/06/01/SW NOY/06/01/SW NOY/06/			Uz/05/01/SE	9%		
Second 04/01/NW 9% UZ/03/01/NE + UZ/03/01/SE 18% NOY/05/01/SE 18% Poor NOY/05/01/SE NOY/05/01/SE 18% NOY/05/01/SE 18% NOY/05/01/SE 18% NOY/05/01/SE 18% NOY/05/01/SE 27% NOY/03/01/SE 27% NOY/03/01/SE 27% NOY/03/01/SW 9% NOY/03/01/SW 27% NOY/03/01/SW 27% NOY/03/01/SW 27% DOV/03/01/SW 27% NOY/03/01/SW 27% DOV/03/01/SW 27% DOV/03/01/SW 27% DOV/03/01/SE 10% UZ/05/01/NW + 9% UZ/06/01/NE + 12% DOV/06/01/SE 30% DOV/06/01/SE 30% NOY/06/01/SE 30% NOY/06/01/SW + NOY/06/01/SW + NOY/06/01/SW + 18% NOY/06/01/SW + NOY/06/01/SW + NO			NOY/06/01/NE		10%	
Second Floor 104/01/NW 18% VZ/03/01/NE + UZ/03/01/SE 18% NOY/05/01/SE- DOV/04/01/SE- DOV/04/01/SE- NOY/03/01/SE 18% NOY/05/01/SE- DOV/04/01/SE- NOY/03/01/SW + NOY/03/01/SW + NOY/03/01/SW + NOY/03/01/SW + NOY/03/01/SW + NOY/03/01/SW + NOY/03/01/SE 18% Summer UZ/05/01/NW + NOY/03/01/SE 27% Summer UZ/05/01/NW + NOY/03/01/SE 10% Third Floor NOY/03/01/SE + UZ/05/01/NE + UZ/05/01/NE + UZ/06/01/NE + UZ/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/05/01/SW + NOY/06/01/SE - DOV/05/01/SW + NOY/06/01/SE - DOV/05/01/SW + NOY/06/01/SW - DOV/05/01/SW + NOY/05/01/SW			UZ/04/01/NE+UZ			0%
Second Floor UZ/03/01/SE NOY/05/01/SW- NOY/05/01/SW- NOY/03/01/SE DOV/04/01/SE- DOV/04/01/SE- DOV/04/01/SE- DOV/03/01/NW - NOY/03/01/NW - NOY/03/01/SW - NOY/03/01/SW - DOV/03/01/SW - DOV/03/01/SE 18% Summer UZ/09/01/NW - NOY/03/01/SE 27% MOY/05/01/SE- DOV/04/01/SW - NOY/03/01/SW - NOY/03/01/SW - NOY/03/01/SW - NOY/03/01/SE 12% Summer UZ/09/01/NW - NOY/04/01/SE 12% MOY/09/01/SE 10% 12% NOY/09/01/SE 00% 30% NOY/06/01/SW + Floor NOY/07/01/SW - NOY/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SW - NOY/06/01/SW - NOY/06/01/SW - DOV/05/01/NW + NOY/06/01/SW - DOV/05/01/NW + NOY/06/01/SW - DOV/05/01/SW - DOV/05/01/SW - NOY/05/01/SW - DOV/05/01/SW - DOV						270
Second Floor NOY0501/SW- DOV(0401/SE- DOV(0401/SE- DOV(0401/SE- DOV(0401/SE- DOV(0401/SE- NOY(0301/SW- DOV(0301/SW- DOV(0301/SW- DOV(0301/SW- DOV(0301/SW- DOV(0301/SW- DOV(0301/SW- DOV(0301/SE 18% Summer U20901/NW V2/1001/SE 27% MOY0501/SW- DOV(0301/SW- NOY(0301/SW- DOV(0301/SW- NOY(0301/SW- NOY(0301/SE 9% 27% Summer U20901/NW V2/1001/SE 9% 27% MOY0601/SE- V2/06/01/NE+ U2/06/01/NE+ U2/06/01/SE- DOV(06/01/SE- NOY(06/01/SE- NOY0601/SE- NOY0601/SE- NOY0601/SE- NOY0601/SE- NOY0601/SE- NOY0601/SW- NOY060/SW- NOY0601/SW- NOY06						18%
Second Floor DOV/04/01/SW- NOY/03/01/SE- NOY/03/01/SE- NOY/03/01/SE- NOY/03/01/SE- NOY/03/01/SW- DOV/03/01/SW- NOY/03/01/SW- DOV/03/01/SW- DOV/03/01/SW- NOY/03/01/SW- DOV/03/01/SE 18% Summer 20/00/00000000000000000000000000000000						
Second Floor NOY0301/SW + NOY06/01/SE- DOV/04/01/SE- DOV/04/01/SW- DOV/03/01/NW - DOV/03/01/NW + NOY03/01/SW - NOY03/01/SW - NOY03/01/SW - NOY03/01/SW - NOY03/01/SE 18% Summer UZ/09/01/NW - NOY03/01/SW - NOY03/01/SW - NOY03/01/SE 27% MOY06/01/SE - DOV/03/01/SW - NOY06/01/SE 10% 12% UZ/05/01/NE + UZ/05/01/NE + UZ/06/01/NW - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/05/01/NW - NOY/08/01/SW - DOV/05/01/SW - DOV						
Floor NOY05/01/SE- DOV/04/01/SE- NOY03/01/SE- NOY03/01/NW - NOY03/01/NW - NOY03/01/NW - NOY03/01/NW - NOY03/01/SW - DOV/03/01/SW - DOV/03/01/SE 18% Summer Uz/09/01/NW - NOY09/01/SE 27% MOY09/01/SE 10% 27% VUZ/05/01/SE 10% 27% NOY09/01/NW 9% 27% Summer Uz/09/01/NW 9% 27% NOY09/01/SE 10% 27% NOY09/01/SE 10% 27% NOY09/01/SE 10% 27% NOY06/01/SE + UZ/06/01/NW + Eloor 10% 27% NOY06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/06/01/SE - DOV/05/01/NW + NOY06/01/SW - DOV/05/01/NW + NOY06/01/SW - DOV/05/01/SW - DOV/05/01/SW - DOV/05/01/SW - NOY/05/01/SW - DOV/05/01/SW - NOY/05/01/SW - 30% 20 Do you have air tight from your windows? Yes No						
Summer DOV 04/01/SE- NOY/03/01/SE NOY/03/01/SW DOV/03/01/NW + NOY/03/01/NW + NOY/03/01/NW + NOY/03/01/SW DOV/03/01/SW DOV/03/01/SW UZ/05/01/NE + UZ/05/01/NE + UZ/05/01/NE + UZ/05/01/NE + UZ/05/01/NE + UZ/05/01/SE DOV/06/01/SE NOY/06/01/SE NOY/06/01/SE NOY/06/01/SE NOY/06/01/SE NOY/06/01/SE NOY/06/01/SE NOY/06/01/SE NOY/06/01/SE NOY/06/01/SE NOY/06/01/SE NOY/06/01/SE NOY/06/01/SE NOY/06/01/SE NOY/06/01/SE 12% 20 Do you have air tight from your windows? Yes No		Floor				18%
NOY/03/01/SE Image: Control of the sector of t						
Summer DOV/03/01/NW - NOY/03/01/SW - DOV/03/01/SW - NOY/03/01/SW - NOY/03/01/SW - 27% Summer UZ/09/01/NW 9%						
Summer NOY(03/01/NW + NOY(04/01/SW- DOV(03/01/SW) NOY(03/01/SW) 27% Summer U2/09/01/NW NOY(03/01/SE 9% 0 U2/10/01/SE 10% 0 U2/05/01/NE + U2/05/01/NE + U2/05/01/NE + U2/06/01/NE + U2/06/01/NW 9% 0 NOY(07/01/SE DOV(06/01/SE + DOV(06/01/SE + DOV(06/01/SE + DOV(06/01/SE + DOV(06/01/SE + DOV(06/01/SE + DOV(06/01/SE + DOV(05/01/NW + NOY(06/01/SE + DOV(05/01/NW + NOY(05/01/SW + NOY(05/01/SW + NOY(05/01/SW + DOV(05/01/SW + NOY(05/01/SW + DOV(05/01/SW + DOV(05/01/SW + DOV(05/01/SW + NOY(05/01/SW + DOV(05/01/SW + DO			NOY/04/01/NW-			
Summer Image: Summer view of the second						
Summer UZ 09/01/NW 9%			NOY/03/01/NW +			270/
Summer NOY/03/01/SW 9% Summer Uz/09/01/NW 9% Uz/10/01/SE 10% NOY/09/01/NE 9% Uz/10/01/SE 10%			NOY/04/01/SW-			27%
Summer Uz/09/01/NW 996 Image: Constraint of the symbolic of the symb						
20. Do you have air tight from your windows? Yes No 20. Do you have air tight from your windows? Yes No			NOY/03/01/SW			
NOY/09/01/NE 9% UZ/05/01/NE + UZ/05/01/NE + 12% UZ/05/01/NE + UZ/05/01/NE + 12% UZ/06/01/NE + D2% 12% NOY/07/01/SW- D2% 30% DOV/06/01/SW- D0%/06/01/SW- 30% NOY/06/01/SE- NOY/06/01/SE- 30% DOV/06/01/SE- NOY/06/01/SE- 18% NOY/06/01/SW- DOV/05/01/SW- 18% NOY/05/01/SW- NOY/05/01/SW- 18% NOY/05/01/SW- NOY/05/01/SW- 18% 20. Do you have air tight from your windows? Yes No	Summer		Uz/09/01/NW	9%		
UZ/05/01/NE + UZ/05/01/SE 12% UZ/06/01/SE 12% UZ/06/01/NW + UZ/06/01/SW + DOV/06/01/SW + NOY/06/01/SE 12% NOY/06/01/SE - DOV/06/01/SE 30% NOY/06/01/SE - NOY/06/01/SE 12% NOY/06/01/SE - DOV/06/01/SE 12% NOY/06/01/SE - NOY/06/01/SE 12% NOY/06/01/SE - DOV/05/01/SE 13% NOY/06/01/SE - NOY/06/01/SW - NOY/05/01/SW - NOY/05/01/SW - NOY/05/01/SW - NOY/05/01/SW - NOY/05/01/SW - 18% 20. Do you have air tight from your windows? Yes No			Uz/10/01/SE	10%		
UZ/05/01/SE 12% UZ/06/01/NE + 12% UZ/06/01/NE + 12% UZ/06/01/NE + 12% NOY/07/01/SW - DOV/06/01/SW + Ploor NOY/07/01/SE - DOV/06/01/SE - 30% NOY/06/01/SE - 30% NOY/06/01/SE - 30% NOY/06/01/SE - 18% NOY/05/01/NW + 18% NOY/05/01/SW - 18% DOV/05/01/SW - NOY/05/01/SW - NOY/05/01/SW - NOY/05/01/SW - NOY/05/01/SW - NOY/05/01/SW - DOV/05/01/SW - NOY/05/01/SW - NOY/05/01/SW - No			NOY/09/01/NE	9%		
UZ.05/01/SE 12% UZ/06/01/NE + 12% UZ/06/01/NW 12% NOY/07/01/SW- DOV/06/01/SW- DOV/06/01/SE- 30% DOV/06/01/SE- 30% NOY/06/01/SE- 12% NOY/06/01/SE- 18% NOY/05/01/SW- 18% 20. Do you have air tight from your windows? Yes			UZ/05/01/NE+			1204
UZ/06/01/NW 12% NOY/07/01/SW- DOV/06/01/SW- NOY/06/01/SE- DOV/06/01/SE- DOV/06/01/SE- NOY/06/01/SE- NOY/06/01/SE- NOY/06/01/SW- DOV/05/01/NW + NOY/08/01/SW- DOV/05/01/SW- DOV/05/01/SW- NOY/05/01/SW 30% 20. Do you have air tight from your windows? Yes No						1270
NOY/07/01/SW- DOV/06/01/SW- Floor NOY/06/01/SW- NOY/06/01/SE- DOV/06/01/SE- NOY/06/01/SE- NOY/06/01/SE- NOY/06/01/SW- DOV/05/01/NW + NOY/05/01/NW + NOY/05/01/SW- DOV/05/01/SW- DOV/05/01/SW- NOY/05/01/SW 30% 20. Do you have air tight from your windows? Yes No						12%
Third Floor DOV/06/01/SW- NOY/06/01/SE- DOV/06/01/SE- DOV/06/01/SE- NOY/06/01/SE- NOY/06/01/SE- NOY/06/01/SW- DOV/05/01/NW + NOY/05/01/SW- DOV/05/01/SW- DOV/05/01/SW- NOY/05/01/SW- 30% 20. Do you have air tight from your windows? Yes No						
Third Floor NOY/06/01/SW + NOY/07/01/SE- DOV/06/01/SE- DOV/06/01/SE- NOY/06/01/SE- 30% NOY/06/01/SE- DOV/05/01/SW - DOV/05/01/SW - DOV/05/01/SW - DOV/05/01/SW - DOV/05/01/SW - 18% 20. Do you have air tight from your windows? Yes						
Floor NOY/07/01/SE- DOV/06/01/SE- NOY/06/01/SE 30% NOY/06/01/SE NOY/06/01/SE 18% NOY/06/01/SW - DOV/05/01/NW + NOY/06/01/SW - DOV/05/01/SW - DOV/05/01/SW 18% 20. Do you have air tight from your windows? Yes No		Third				
DOV/06/01/SE- NOY/06/01/SE NOY/06/01/SE NOY/06/01/SE NOY/06/01/SE NOY/06/01/SE NOY/06/01/SW- DOV/05/01/SW- DOV/05/01/SW- DOV/05/01/SW- NOY/05/01/SW 18% 20. Do you have air tight from your windows? Yes No		Floor				30%
NOY/06/01/SE Image: Constraint of the second s						
NOY/08/01/NW- DOV/05/01/NW- NOY/05/01/NW + NOY/08/01/SW- DOV/05/01/SW 18% 20. Do you have air tight from your windows? Yes						
DOV/05/01/NW- NOY/05/01/NW + NOY/08/01/SW- DOV/05/01/SW 18% 20. Do you have air tight from your windows? Yes						
NOY/05/01/NW + NOY/08/01/SW- DOV/05/01/SW- NOY/05/01/SW 18% 20. Do you have air tight from your windows? Yes						
NOY/08/01/SW- DOV/05/01/SW- NOY/05/01/SW 18% 20. Do you have air tight from your windows? Yes						
DOV/05/01/SW- NOY/05/01/SW 20. Do you have air tight from your windows? Yes No						18%
20. Do you have air tight from your windows? Yes No						
your windows? Yes No			NOY/05/01/SW			
your windows? Yes No	20	L.	l			
			nave air tight from	Yes	No	
33% 6/%	yourwi	100 ws :		2201	(70)	
				53%	6/%	

21. window summer	s opening	satisfied with type in bedrooms in	Dissatisfied	Neutral	Satisfied
		Uz/04/02/NW		4%	
		Uz/04/02/SW		4%	
		Uz/04/02/NW-			
		NOY/04/02/NW-		13%	
		DOV/03/02/NW			
		Uz/04/02/NE-			
		NOY/04/02/NE-		13%	
		DOV/03/02/NE			
		Uz/08/01/NE-			
		NOY/05/02/NE-		12%	
		DOV/04/02/NE			
	Second	Uz/08/01/SE-		1.00/	
	Floor	NOY/05/02/SE- DOV/04/02/SE		12%	
		Uz/05/02/SW		4%	
		Uz/05/02/SE	-	4%	
		Uz/06/01/NW		4%	
		Uz/07/01/NE-			
		NOY/04/03/NE- NOY/05/03/NE-			
		NOY/06/02/NE-		30%	
		NOY/06/03/NE-		50%	
		DOV/03/03/NE-			
~		DOV/04/03/NE			
Summer		Uz/09/02/NW		4%	
		Uz/09/02/SW		4%	
		Uz/11/02/NW-			
		NOY/07/02/NW-		12%	
		DOV/05/02/NW			
		Uz/11/02/NE-			
		NOY/07/02/NE-		12%	
		DOV/05/02/NE			
		Uz/13/01/NE-			
		NOY/08/02/NE-		13%	
	Third	DOV/06/02/NE Uz/13/01/SE-			
	Third Floor	UZ/15/01/SE- NOY/08/02/SE-		13%	
	11001	DOV/06/02/SE		1570	
		Uz/10/02/SW		4%	
		Uz/10/02/SE		4%	
		Uz/06/01/NW		470 5%	
	1	Uz/12/01/NW-		3%	
	1	Uz/12/01/NE- NOY/07/03/NE-			
	1	NOY/08/03/NE-			
		NOY/09/02/NE-		29%	
		NOY/09/03/NE-		2770	
		DOV/05/03/NE-			
	1	DOV/06/03/NE			

22. window winter t	s opening	satisfied with type in bedrooms in	Dissatisfied	Neutral	Satis fied
		Uz/04/02/NW		4%	
		Uz/04/02/SW		4%	
		Uz/04/02/NW-			
		NOY/04/02/NW-		13%	
		DOV/03/02/NW			
		Uz/04/02/NE-			
		NOY/04/02/NE-		13%	
		DOV/03/02/NE			
		Uz/08/01/NE-			
		NOY/05/02/NE-		12%	
	C	DOV/04/02/NE Uz/08/01/SE-			
	Second Floor	NOY/05/02/SE-		12%	
	FIOOT	DOV/04/02/SE		1270	
		Uz/05/02/SW		4%	
		Uz/05/02/SE		4%	
				4%	
		Uz/06/01/NW Uz/07/01/NE-		4%	
		02/01/01/NE- NOY/04/03/NE-			
		NOY/05/03/NE-			
		NOY/06/02/NE-		30%	
		NOY/06/03/NE-		5070	
		DOV/03/03/NE-			
		DOV/04/03/NE			
inter		Uz/09/02/NW		4%	
		Uz/09/02/SW		4%	
		Uz/11/02/NW-			
		NOY/07/02/NW-		12%	
		DOV/05/02/NW			
		Uz/11/02/NE-			
		NOY/07/02/NE-		12%	
		DOV/05/02/NE			
		Uz/13/01/NE-			
	1	NOY/08/02/NE-		13%	
		DOV/06/02/NE			
	Third	Uz/13/01/SE-		120/	
	Floor	NOY/08/02/SE- DOV/06/02/SE		13%	
		Uz/10/02/SE		4%	
		Uz/10/02/SE		4%	
		Uz/06/01/NW		5%	
		Uz/12/01/NE-			
	1	NOY/07/03/NE-			
	1	NOY/08/03/NE-		2000	
	1	NOY/09/02/NE-		29%	
	1	NOY/09/03/NE-			
	1	DOV/05/03/NE- DOV/06/03/NE			

23.	Are you	satisfied with			
window	vs opening t	ype in living rooms	Dissatisfied	Neutral	Satis fied
in sum	ner time?				
		Uz/04/01/NW		5%	
		Uz/05/01/SE		4%	
		NOY/06/01/NE		4%	
		NOY/05/01/SW-		.,.	
	Second	DOV/04/01/SW		9%	
	Floor	Uz/05/01/SE-			
	. 1001	DOV/04/01/SE		9%	
		NOY/04/01/NW-		10%	
		DOV/03/01/NW		1070	
		NOY/04/01/SW-		9%	
Summer		DOV/03/01/SW			
		Uz/09/01/NW		5%	
		Uz/10/01/SE		4%	
	1	NOY/09/01/NE		5%	
		NOY/07/01/SW-		10%	
	Third	DOV/06/01/SW			
	Floor	NOY/07/01/SE- DOV/06/01/SE		9%	
		NOY/08/01/NW-			
		DOV/05/01/NW		9%	
		NOY/08/01/SW-			
		DOV/05/01/SW		6%	
24.	Are you	satisfied with			
windov	-	ype in living rooms	Dissatisfied	Neutral	Satis fied
in winte	er time?				
		Uz/04/01/NW		5%	
		Uz/05/01/SE		4%	
		NOY/06/01/NE		4%	
		NOY/05/01/SW-			
	Second	DOV/04/01/SW		9%	
	Floor	Uz/05/01/SE-		00/	
	. 1001	DOV/04/01/SE		9%	
		NOY/04/01/NW-		10%	
		DOV/03/01/NW		10/0	
		NOY/04/01/SW-		9%	
Winter		DOV/03/01/SW			
		Uz/09/01/NW		5%	
	1	Uz/10/01/SE		4%	
		NOY/09/01/NE		5%	
		NOY/07/01/SW-		10%	
	Third	DOV/06/01/SW			
	Floor	NOY/07/01/SE- DOV/06/01/SE		9%	
		NOY/08/01/NW-			
		DOV/05/01/NW		9%	
	1	NOY/08/01/SW-			
		DOV/05/01/SW		6%	

25. Are vo	a satisfied with			
different direction	of the single glaze ince in hot and cold	Dissatisfied	Neutral	Satisfied
3003013.	- F			
	Southwest			32%
Hot days	Northwest			21%
	Northeast			29%
	Southeast			18%
	Southwest			25%
Cold days	Northwest			23%
Cold days	Northeast			19%
	Southeast			33%
different direction	a satisfied with of the double glaze Ince in hot and cold	Dissatisfied	Neutral	Satisfied
	Southwest			25%
**	Northwest			22%
Hot days	Northeast			24%
	Southeast			29%
	Southwest			17%
a	Northwest			22%
Cold days	Northeast			14%
	Southeast			47%
	a satisfied with wws performance in ons?	Yes	No	
	January	33%		
	February	33%		
	March	33%		
	April	55%		
	May	55%		
	June	55%		
	July	55%		
	Agust	55%		
	September	55%		
	October	33%		
	November	33%		
	December	33%		

	you satisfied with indows performance in easons?	Yes	No	
	January	42%		
	February	42%		
	March	42%		
	April	64%		
	May	64%		
	June	64%		
	July	64%		
	Agust	64%		
	September	64%		
	October	42%		
	November	42%		
	December	42%		
29. Are	your windows	Yes	NO	
Single glaze		50%		
Double glaze		50%		
Triple glazed				
Other				

Appendix I: Explanation of horizontal axis of chart 10, 12, 22, 23

Number	Places
1	Uz/04/02/NW
2	Uz/04/02/SW
3	Uz/04/02/NW-NOY/04/02/NW-DOV/03/02/NW
4	Uz/04/02/NE-NOY/04/02/NE-DOV/03/02/NE
5	Uz/08/01/NE-NOY/05/02/NE-DOV/04/02/NE
6	Uz/08/01/SE-NOY/05/02/SE-DOV/04/02/SE
7	Uz/05/02/SW
8	Uz/05/02/SE
9	Uz/06/01/NW
10	Uz/07/01/NE-NOY/04/03/NE-NOY/05/03/NE-NOY/06/02/NE-
10	NOY/06/03/NE-DOV/03/03/NE-DOV/04/03/NE
11	Uz/09/02/NW
12	Uz/09/02/SW
13	Uz/11/02/NW-NOY/07/02/NW-DOV/05/02/NW
14	Uz/11/02/NE-NOY/07/02/NE-DOV/05/02/NE
15	Uz/13/01/NE-NOY/08/02/NE-DOV/06/02/NE
16	Uz/13/01/SE-NOY/08/02/SE-DOV/06/02/SE
17	Uz/10/02/SW
18	Uz/10/02/SE
19	Uz/06/01/NW
20	Uz/07/01/NE-NOY/04/03/NE-NOY/05/03/NE-NOY/06/022/NE-
	NOY/06/03/NE-DOV/03/03/NE-DOV/04/03/NE
	Uz (Uzun construction Company), NOY (Noyanlar Construction
	d DOV (Dovec Construction Company)
	Uz/04/02/NW: Uzun Co./ Unit number is 04/ Bedroom number is 02/
Northwest (wi	ndow orientation)

Appendix J: Explanation of horizontal axis of Chart 11, 13

Number	Places
1	DOV/03/01/NW
2	DOV/03/01/SW
3	NOY/03/03/NW-DOV/04/01/NW
4	NOY/03/03/NE-DOV/04/01/NE
5	NOY/04/03/NE-DOV/06/01/NE
6	NOY/04/03/SE-DOV/06/01/SE
7	DOV/05/01/SW
8	DOV/05/01/SE
9	UZ/04/02/NW- UZ/04/03/NW-NOY/03/02/NW-DOV/03/02/NW-
9	DOV/04/02/NW
10	NOY/03/04/NE-NOY/04/04/NE-DOV/06/02/NE
11	UZ/03/02/SE-UZ/03/03/SE-NOY/04/02/SE-DOV/05/02/SE
12	Uz/03/04/SW-Uz/04/04/SW
13	DOV/07/01/NW
14	DOV/07/01/SW
15	NOY/05/03/NW-DOV/08/01/NW
16	NOY/05/03/NE-DOV/08/01/NE
17	NOY/06/03/NE-DOV/10/01/NE
18	NOY/06/03/SE-DOV/10/01/SE
19	DOV/09/01/SW
20	DOV/09/01/SE
21	UZ/06/02/NW- UZ/06/03/NW-NOY/05/02/NW-DOV/07/02/NW-
21	DOV/08/02/NW
22	NOY/05/04/NE-NOY/06/04/NE-DOV/10/02/NE
23	UZ/05/02/SE-UZ/05/03/SE-NOY/06/02/SE-DOV/09/02/SE
24	Uz/05/04/SW-Uz/06/04/SW
	Uz (Uzun construction Company), NOY (Noyanlar Construction
	nd DOV (Dovec Construction Company)
DOV/03/01/N	W: Dovec Co./ Unit number is 03/ Bedroom number is 01/ Northwest
(window orier	ntation)

Appendix K: Explanation of horizontal axis of Chart 19

Number	Places
1	Uz/04/02/NW-DOV/03/01/NW + Uz/04/02/SW-DOV/03/01/SW
	Uz/06/02/NW-NOY/04/02/NW-DOV/03/02/NW
2	NOY/03/03/NW-DOV/04/01/NW+ Uz/0/02/NE-NOY/04/02/NE-
	DOV/03/02/NE-NOY/03/03/NE-DOV/04/01/NE
	Uz/08/01/NE-NOY/05/02/NE-DOV/04/02/NE-NOY/04/03/NE-
3	DOV/06/01/NE + Uz/08/01/SE-NOY/05/02/SE-DOV/04/02/SE-
	NOY/04/03/SE-DOV/06/01/SE
4	Uz/05/02/SW-DOV/05/01/SW + Uz/05/02/SE-DOV/05/01/SE
5	Uz/06/01/NW
	Uz/07/01/NE-NOY/04/03/NE-NOY/05/03/NE-NOY/06/02/NE-
6	NOY/06/03/NE-DOV/03/03/NE-DOV/04/03/NE-NOY/03/04/NE-
	NOY/04/04/NE-DOV/06/02/NE
7	UZ/04/02/NW- UZ/04/03/NW-NOY/03/02/NW-DOV/03/02/NW-
7	DOV/04/02/NW
8	UZ/03/02/SE-UZ/03/03/SE-NOY/04/02/SE-DOV/05/02/SE
9	Uz/03/04/SW-Uz/04/04/SW
10	Uz/09/02/NW-DOV/07/01/NW + Uz/09/02/SW-DOV/07/01/SW
	Uz/11/02/NW-NOY/07/02/NW-DOV/05/02/NW-
11	NOY/05/03/NW-DOV/08/01/NW + Uz/11/02/NE-
	NOY/07/02/NE-DOV/05/02/NE-NOY/05/03/NE-DOV/08/01/NE
	Uz/13/01/NE-NOY/08/02/NE-DOV/06/02/NE-NOY/06/03/NE-
12	DOV/10/01/NE + Uz/13/01/SE-NOY/08/02/SE-DOV/06/02/SE
	NOY/06/03/SE-DOV/10/01/SE
13	Uz/10/02/SW-DOV/09/01/SW + Uz/10/02/SE-DOV/09/01/SE
1.4	Uz/11/01/NW-UZ/06/02/NW- UZ/06/03/NW-NOY/05/02/NW-
14	DOV/07/02/NW-DOV/08/02/NW
	Uz/12/01/NE-NOY/07/03/NE-NOY/08/03/NE-NOY/09/02/NE-
15	NOY/09/03/NE-DOV/05/03/NE-DOV/06/03/NE-NOY/05/04/NE-
	NOY/06/04/NE-DOV/10/02/NE
16	UZ/05/02/SE-UZ/05/03/SE-NOY/06/02/SE-DOV/09/02/SE
17	Uz/05/04/SW-Uz/06/04/SW
Explanation :	Uz (Uzun construction Company), NOY (Noyanlar Construction
	d DOV (Dovec Construction Company)
	V: Uzun Co./ Unit number is 04/ Bedroom number is 02/ Northwes
(window ories	ntation)

Appendix L: Explanation of horizontal axis of Chart 20

Number	Places
1	Uz/04/01/NW
2	Uz/05/01/SE
3	NOY/06/01/NE
4	UZ/04/01/NE+UZ/04/01/NW
5	UZ/03/01/NE+UZ/03/01/SE
6	NOY/05/01/SW-DOV/04/01/SW-NOY/03/01/SW + NOY/05/01/SE-
0	DOV/04/01/SE-NOY/03/01/SE
7	NOY/04/01/NW-DOV/03/01/NW-NOY/03/01/NW +
/	NOY/04/01/SW-DOV/03/01/SW-NOY/03/01/SW
8	Uz/09/01/NW
9	Uz/10/01/SE
10	NOY/09/01/NE
11	UZ/05/01/NE+UZ/05/01/SE
12	UZ/06/01/NE+UZ/06/01/NW
13	NOY/07/01/SW-DOV/06/01/SW-NOY/06/01/SW + NOY/07/01/SE-
15	DOV/06/01/SE-NOY/06/01/SE
14	NOY/08/01/NW-DOV/05/01/NW-NOY/05/01/NW +
14	NOY/08/01/SW-DOV/05/01/SW-NOY/05/01/SW
	Uz (Uzun construction Company), NOY (Noyanlar Construction
	d DOV (Dovec Construction Company)
	Uz/04/01/NW: Uzun Co./ Unit number is 04/ Bedroom number is 01/
Northwest (w	indow orientation)

Appendix M: Summary of windows functional features (daylighting) in living room and bed room

Li	iving rooi	n																		
Co.	Apartment build		Floor	s	eason		Windov	vs Orie	ntation		Ratio of wir	ndows area to Flo	or area		Placer	nent		Sha	ding l	Devices
			Second	Sı	ımmer	SW	NW	N	ΙE	SE	1/26	1/20		SW	V NW	NE	SE	N	0	YES
	M.Oltan Apt.		Third	V	Vinter	SW	NW	N	ΙE	SE	1/26	1/20		SW	/ NW	NE	SE	N	0	YES
	(single-glazed	b [Second	Sı	ummer	SW	NW	N	ΙE	SE	1/26	1/20		SW	/ NW	NE	SE	N	0	YES
E			Third	v	Vinter	SW	NW	N	ΙE	SE	1/26	1/20		SW	/ NW	NE	SE	N	0	YES
Uzun			Second		ummer	_	NW	NE	NE	SE		1/13		SW		NE	SE	Ν		YES
	Emine Apt.		Third		Vinter	sw	NW	NE	NE	SE		1/13		sw		NE	SE	N	_	YES
	(double-glaze	d)				_								-						
			Second		ummer		NW	NE	NE	SE		1/13		SW		NE	SE		O	YES
			Third	V	Vinter	SW	NW	NE	NE	SE		1/13		SW	V NW	NE	SE	Ν	0	YES
		L	Second	Sı	ummer	: SW	NW	Ν	Æ	SE	1/13	1/15		SW	' NW	NE	SE	Ν	O	YES
	Arken 14		Third	V	Vinter	SW	NW	N	Æ	SE	1/13	1/15		SW	NW N	NE	SE	N	ю	YES
1	(single-glazed	יר	Second	Sı	ummer	: SW	NW	N	Æ	SE	1/13	1/15		SW	/ NW	NE	SE	N	O	YES
ula			Third	v	Vinter	sw	NW	Ν	IE	SE	1/13			SW	NW	NE	SE	N	io I	YES
Noyanlar			Second		ummer		NW		Æ	SE		1/13		SW		NE	SE		0	YES
2 Z	Arken 12		Third		Vinter	SW	NW		IE IE	SE	1/13		SW		NE	SE		0	YES	
	(double-glaze	d)																	_	
			Second		ummer		NW		IE IE	SE		1/13 1/13		SW		NE	SE	-	0	YES
		_	Third	V	Vinter	SW	NW	N	ΙE	SE				SW		NE	SE	N	0	YES
	NL 10	L	Second	Sı	ımmer	: SW	NW	N	Æ	SE		1/10		SW	NW	NE	SE	N	0	YES
	No. 18		Third	V	Vinter	SW	NW	N	ΙE	SE		1/10		SW	NW	NE	SE	Ν	0	YES
	(single-glazed	י ר	Second	Sı	ummer	: SW	NW	N	ΙE	SE		1/10		SW	/ NW	NE	SE	N	O	YES
ec			Third	V	Vinter	SW	NW	N	ΙE	SE		1/10		SW	NW	NE	SE	N	0	YES
Dovec			Second		ummer	SW	NW		Æ	SE	-	-		SW		NE	SE		0	YES
	Celebi Apt.		Third		Vinter	SW	NW	-	IE IE	SE	-			SW	-	NE	SE	-	0	YES
	(double-glaze	d)				-		-						-				-		
			Second	_	ummer	_	NW	-	IΕ	SE	-	-		SW	-	NE	SE	-	0	YES
			Third	V	Vinter	SW	NW	N	ΙE	SE	-	-		SW	NW	NE	SE	N	0	YES
B	ed room																			
Co.	Apartment building	Floo	or Sea	son		Win	dows Or	ientation			Ratio of window	vs area to Floor area			Placement			Sh	ading I	Devices
		Seco	nd Sun	nmer	SW	NW		NE	SE	i.	1/5	1/8	SW	NW	NE	SI	E	NO	Y	ΈS
	M.Oltan Apt.	Thir	d Wi	nter	SW	NW		NE	SE	3	1/5	1/8	SW	NW	NE	SI	E	NO	Y	ΈS
	(single-glazed)	Secon	nd Sun	nmer	SW	NW N		NE	SE	:	1/5	1/8	SW	NW	NE	SI	E	NO	Y	ΈS
Uzun		Thir	d Wi	nter	SW	NW N		NE	SE		1/5	1/8	SW	NW	NE	SI		NO		'ES
5		Seco		nmer	SW	NW		NE	SI			1/10	SW	NW	NE		_	NO		ΈS
	Emine Apt.	Thir		nter	SW	NW	_	NE	SE			1/10	SW	NW	NE	SE	_	NO		ΈS
	(double-glazed)	Secon		nmer	SW	NW		NE	SE			1/10 1/10	SW SW	NW NW	NE		_	NO		'ES
		Thir		nter mer	SW SW	NW NW		NE NE	SE	_	1/5	1/10	SW	NW	NE NE	SE	_	NO NO		'ES 'ES
	Arken 14	Thir	_	nter	SW	NW	NE	_	SE		1/5	1/8	SW	NW	NE	SI	_	NO		ES
	(single-glazed)	Seco	_	mer	SW	NW		NE	SE		1/5	1/8	SW	NW	NE	SI		NO		'ES
Noyanlar		Thir		nter	SW	NW		NE	SE		1/5	1/8	SW	NW	NE NE	SI		NO		ΈS
oyal		Seco		nmer	SW	NW		NE	SE		1/5	1/8	SW	NW	NE			NO	YES	YES
Ž	Arken 12	Thir	d Wi	nter	SW	NW		NE	SE	6	1/5	1/8	SW	NW	NE	SE	SE	NO	٢	ΈS
	(double-glazed)	Seco	nd Sun	nmer	SW	NW		NE	SE		1/5	1/8	SW	NW	NE	S	E	NO	Y	'ES
		Thir	d Wi	nter	SW	NW		NE	SE	5	1/5	1/8	SW	NW	NE	SI	E	NO	Y	'ES
		Seco	nd Sun	nmer	SW	NW		NE	SE)	1/5	1/8	SW	NW	NE		_	NO	Y	ΈS
	No. 18	Thir	d Wi	nter	SW	NW		NE	SE		1/5	1/8	SW	NW	NE			NO		ΈS
	(single-glazed)	Seco		nmer	SW	NW		NE	SE		1/5	1/8	SW	NW	NE	SI		NO		TES
Dovec		Thir	_	nter	SW	NW		NE	SE	_	1/5	1/8	SW	NW	NE	SI	_	NO		ΈS
Ă		Secon		nmer	SW	NW	_	NE	SE	_	1/5	1/8	SW	NW	NE	SI	_	NO		TES
	Celebi Apt.	Thir		nter	SW	NW		NE	SE	_	1/5	1/8	SW	NW	NE	SI	_	NO		TES
	(double-glazed)	Secon		nmer	SW	NW		NE	SE		1/5	1/8	SW	NW	NE	SI	_	NO		ES
		Thir	d Wi	nter	SW	NW		NE	SE	SE	1/5	1/8	SW	NW	NE	SI	E I	NO	Y	ΈS

Appendix N: Summary of windows functional features (ventilation) in living room and bed room

Со.	IVINg room	Floor	Season	Ventil	lation		Vindows	Oriert	ation		Control of the Air	lester	ge and Condensation	Windows Opening T
C0.	Apartment building							_		OF		пеака	-	Windows Opening Type
		Second	Summer	SS	CV	SW	NV NV		NE	SE	NO		YES	DCO
	M.Oltan Apt. (single-glazed)	Third	Winter Summer	- SS	- CV	SW SW	NV		NE NE	SE SE	NO NO		YES YES	DCO DCO
-	(single-glazed)	Second Third	Winter		-	SW	NV		NE	SE	NO		YES	DCO
Uzun		Second	Summer	SS	- CV	SW	NV		NE		NO		YES	DCO
	Ender Ant	Third	Winter		-	SW	NV		NE	SE SE	NO		YES	DCO
	Emine Apt. (double-glazed)	Second	Summer	SS	CV	SW	NV		NE	SE	NO	_	YES	DCO
	(acucie giuzeu)	Third	Winter	-	-	SW	NV			SE		NO YES		DCO
		Second	Summer	SS	CV	SW	NW		NE	SE	NO		YES	DCO
	Arken 14	Third	Winter	-	-	SW	NW		NE	SE	NO		YES	DCO
	(single-glazed)	Second	Summer	SS	CV	SW	NW		NE	SE	NO		YES	DCO
Noyanlar	(ongre guilter)	Third	Winter		-	sw	NW		NE	SE	NO		YES	DCO
yar		Second	Summer	SS	CV	SW SV			NE	SE	NO		YES	DCO
Ž	Asless 12	Third	Winter	-	-	SW	NW	_	NE	SE	NO	_	YES	DCO
	Arken 12 (double-glazed)	Second	Summer	SS	CV	SW	NW	_	NE	SE	NO		YES	DCO
	ganzan)	Third	Winter	-	-	SW	NW	_	NE	SE	NO		YES	DCO
		Second	Summer	SS	CV	SW	NW		NE	SE	NO	-	YES	DCO
	N. 19	Third	Winter	-		SW	NW	_	NE	SE	NO		YES	DCO
	No. 18 (single-glazed)	Second	Summer	SS	CV	SW	NW		NE	SE	NO		YES	DCO
S		Third	Winter		-	SW	NW	_	NE	SE	NO		YES	DCO
Dovec		Second	Summer	SS	- CV	SW	NW	_	NE	SE	NO		YES	DCO
Ω	0.1.1. 4.4	Third	Winter	-	-	SW	NW	-	NE	SE	NO		YES	DCO
	Celebi Apt. (double-glazed)	Second	Summer	SS	CV	SW	NW	_	NE	SE	NO	_	YES	DCO
	(aduote giuzeu)			55	0.4		-	-		5L	NO	_		
		Inird	Winter	- 1	-	SW	NW	7	NE	SE	NO		YES	DCO
R	ed room	Third	Winter	-	-	SW	NW	7	NE	SE	NO		YES	DCO
	ed room			-										
В с.	ed room	Floor	Winter Season		ntilation	ı V	Vindows	Orient	ation		Control of the Air le	eakage	e and Condensation	Windows Opening Type
						sw	Vindows	Orient	ation SE			eakage		
	Apartment building M.Oltan Apt.	Floor	Season Summer Winter	SS	ntilation CV -	SW	Vindows NW NW	Orient NE NE	ation SE SE		Control of the Air le NO NO	eakage	e and Condensation YES YES	Windows Opening Type: DCO DCO
Co.	Apartment building	Floor Second	Season Summer	SS	ntilation CV	sw	Vindows	Orient	ation SE		Control of the Air le	eakage	e and Condensation YES	Windows Opening Types
Co.	Apartment building M.Oltan Apt.	Floor Second Third	Season Summer Winter	SS	ntilation CV -	SW	Vindows NW NW	Orient NE NE	ation SE SE		Control of the Air le NO NO	eakage	e and Condensation YES YES	Windows Opening Type: DCO DCO
	Apartment building M.Oltan Apt.	Floor Second Third Second	Season Summer Winter Summer	: SS - : SS -	ntilation CV - CV	sw sw sw	Vindows NW NW NW	Orient NE NE NE	ation SE SE SE		Control of the Air le NO NO NO	eakage	e and Condensation YES YES YES	Windows Opening Type: DCO DCO DCO
Co.	Apartment building M.Oltan Apt.	Floor Second Third Second Third	Season Summer Winter Summer Winter	: SS - : SS -	ntilation CV - CV	SW SW SW SW	Vindows NW NW NW	Orient NE NE NE NE	ation SE SE SE SE		Control of the Air le NO NO NO NO	eakage	e and Condensation YES YES YES YES	Windows Opening Type: DCO DCO DCO DCO DCO
Co.	Apartment building M.Oltan Apt. (single-glazed)	Floor Second Third Second Third Second	Season Summer Winter Summer Winter Summer	: SS - : SS - : SS - : SS	ntilation CV - CV - CV -	sw sw sw sw sw sw	Vindows NW NW NW NW NW	Orient NE NE NE NE NE	ation SE SE SE SE SE		Control of the Air le NO NO NO NO NO	eakage	e and Condensation YES YES YES YES YES	Windows Opening Type: DCO DCO DCO DCO DCO DCO
Co.	Apartment building M.Oltan Apt. (single-glazed) Emine Apt.	Floor Second Third Second Third Second Third	Season Summer Winter Summer Winter Summer Winter	: SS - : SS - : SS - : SS	atilation CV - CV - CV -	SW SW SW SW SW SW SW SW	Vindows NW NW NW NW NW NW NW	Orient NE NE NE NE NE	ation SE SE SE SE SE		Control of the Air le NO NO NO NO NO NO	eakage	e and Condensation YES YES YES YES YES YES	Windows Opening Type: DCO DCO DCO DCO DCO DCO DCO DCO
Co.	Apartment building M.Oltan Apt. (single-glazed) Emine Apt.	Floor Second Third Second Third Second Third Second	Season Summer Winter Summer Winter Winter Summer	: SS - : SS - : SS - : SS - : SS	Atilation CV CV CV CV CV CV CV	sW SW SW SW SW SW SW SW	Vindows NW NW NW NW NW NW NW NW	Orient NE NE NE NE NE NE NE	ation SE SE SE SE SE SE SE		Control of the Air le NO NO NO NO NO NO NO	eakage	e and Condensation YES YES YES YES YES YES YES YES	Windows Opening Type: DCO DCO DCO DCO DCO DCO DCO DCO DCO
Co.	Apartment building M.Oltan Apt. (single-glazed) Emine Apt.	Floor Second Third Second Third Second Third Second Third	Season Summer Winter Summer Winter Summer Summer Winter Summer Winter Winter	: SS - : SS - : SS - : SS - : SS	atilation CV CV CV CV CV CV CV CV CV CV	sw sw sw sw sw sw sw sw sw sw sw sw	Vindows NW NW NW NW NW NW NW NW NW	Orient NE NE NE NE NE NE NE	ation SE SE SE SE SE SE SE SE		Control of the Air le NO NO NO NO NO NO NO NO NO	eakage	e and Condensation YES YES YES YES YES YES YES YES YES	Windows Opening Type: DCO DCO DCO DCO DCO DCO DCO DCO DCO DCO
Co.	Apartment building M.Oltan Apt. (single-glazed) Emine Apt. (double-glazed)	Floor Second Third Second Third Second Third Second Third Second	Season Summer Winter Winter Summer Summer Summer Winter Summer	: SS - : SS : SS - : SS - : SS - : SS -	ntilation CV - CV - CV - CV - CV - CV	Image: signal with signal	Vindows NW NW NW NW NW NW NW NW NW NW	Orient NE NE NE NE NE NE NE NE	ation SE SE SE SE SE SE SE SE SE SE SE		Control of the Air le NO NO NO NO NO NO NO NO NO NO NO NO	eakage	e and Condensation YES YES YES YES YES YES YES YES YES	Windows Opening Type: DCO DCO DCO DCO DCO DCO DCO DCO DCO DCO
Co.	Apartment building M.Oltan Apt. (single-glazed) Emine Apt. (double-glazed) Arken 14	Floor Second Third Second Third Second Third Second Third Second Third	Season Summer Winter Winter Winter Summer Winter Summer Winter Summer Winter Summer Winter Summer Winter Winter Winter	: SS - : SS : SS - : SS - : SS - : SS -	ntilation CV - CV - CV - CV - CV - CV - CV	swi swi swi swi swi swi swi swi swi swi	Vindows NW NW NW NW NW NW NW NW NW NW NW	Orient NE NE NE NE NE NE NE NE NE	ation SE SE SE SE SE SE SE SE SE SE SE SE		Control of the Air le NO NO NO NO NO NO NO NO NO NO NO NO NO	eakage	e and Condensation YES YES YES YES YES YES YES YES YES YES	Windows Opening Type: DCO DCO DCO DCO DCO DCO DCO DCO DCO DCO
yanlar Uzun 9	Apartment building M.Oltan Apt. (single-glazed) Emine Apt. (double-glazed) Arken 14	Floor Second Third Second Third Second Third Second Third Second Third Second	Season Summer Winter Summer Winter Summer Summer Summer Winter Summer Summer	 SS SS SS SS SS SS SS SS SS SS SS 	CV CV	SW SW SW SW SW SW SW SW SW SW SW SW SW SW SW SW SW SW SW SW	Vindows NW NW NW NW NW NW NW NW NW NW NW NW NW	Orient NE NE NE NE NE NE NE NE NE	ation SE SE SE SE SE SE SE SE SE SE		Control of the Air lee NO NO NO NO NO NO NO NO NO NO NO NO NO	eakage	e and Condensation YES YES YES YES YES YES YES YES YES YES	Windows Opening Type: DCO DCO DCO DCO DCO DCO DCO DCO DCO DCO
Co.	Apartment building M.Oltan Apt. (single-glazed) Emine Apt. (double-glazed) Arken 14 (single-glazed)	Floor Second Third Second Third Second Third Second Third Second Third	Season Summer Winter Winter Winter Winter Winter	 SS SS SS SS SS SS SS SS SS SS SS 	Image: Constraint of the constraint of the	SW SW SW SW SW SW SW SW SW SW SW SW SW SW SW SW SW SW SW SW	Vindows NW NW NW NW NW NW NW NW NW NW NW NW NW	Orienter NE NE NE NE NE NE NE NE NE NE NE	ation SE SE SE SE SE SE SE SE SE SE SE SE SE		Control of the Air lee NO NO NO NO NO NO NO NO NO NO NO NO NO		e and Condensation YES YES YES YES YES YES YES YES YES YES	Windows Opening Type: DCO
yanlar Uzun 9	Apartment building M.Oltan Apt. (single-glazed) Emine Apt. (double-glazed) Arken 14	Floor Second Third Second Third Second Third Second Third Second Third Second Third Second	Season Summer Su	SS SS	CV CV	SW SW	Vindows NW NW NW NW NW NW NW NW NW NW	Orient NE NE NE NE NE NE NE NE NE NE	ation SE SE SE SE SE SE SE SE SE SE SE SE SE		Control of the Air lee NO NO NO NO NO NO NO NO NO NO NO NO NO	eakage	e and Condensation YES YES YES YES YES YES YES YES YES YES	Windows Opening Type: DCO
yanlar Uzun 9	Apartment building M.Oltan Apt. (single-glazed) Emine Apt. (double-glazed) Arken 14 (single-glazed) Arken 14 Arken 12	Floor Second Third Second Third Second Third Second Third Second Third Second Third	Season Summer Summer Winter Winter Winter Winter Summer Winter Summer Winter Summer Winter Summer Winter Winter Summer Winter Summer Winter Summer Winter Winter Winter Winter Winter Winter	SS SS	Image: Constraint of the constraint of the	SW SW	Vindows NW NW NW NW NW NW NW NW NW NW NW NW NW	NCINCUINC INCINCUINCINCUINCINCUINCINCUINCINCUINCINCUINCINCUINCINCUINCU	ation SE SE SE SE SE SE SE SE SE SE SE SE SE		Control of the Air lee NO NO NO NO NO NO NO NO NO NO NO NO NO		e and Condensation YES YES YES YES YES YES YES YES YES YES	Windows Opening Types DCO
yanlar Uzun 9	Apartment building M.Oltan Apt. (single-glazed) Emine Apt. (double-glazed) Arken 14 (single-glazed) Arken 14 Arken 12	Floor Second Third Second Third Second Third Second Third Second Third Second Third Second Third	Season Summer Summer Summer Winter Winter Winter Winter Summer Summer Summer Summer Summer	SS SS	Image: state of the s	SW SW	Vindows NW NW NW NW NW NW NW NW NW NW NW NW	Orient NE NE NE NE NE NE NE NE NE NE NE NE NE	ation SE SE SE SE SE SE SE SE SE SE SE SE SE		Control of the Air lee NO NO NO NO NO NO NO NO NO NO NO NO NO		e and Condensation YES YES YES YES YES YES YES YES YES YES	Windows Opening Types DCO
yanlar Uzun 9	Apartment building M.Oltan Apt. (single-glazed) Emine Apt. (double-glazed) Arken 14 (single-glazed) Arken 12 (double-glazed)	Floor Second Third Second Third Second Third Second Third Second Third Second Third Second Third Second Third Second	Season Summer Summer Summer Winter Summer Summer Summer Summer	SS SS	Image: state of the s	SW SW	Vindows NW NW NW NW NW NW NW NW NW NW NW NW NW	Orient NE NE NE NE NE NE NE NE NE NE NE NE NE	ation SE SE SE SE SE SE SE SE SE SE SE SE SE		Control of the Air lee NO NO NO NO NO NO NO NO NO NO NO NO NO	eakage	e and Condensation YES YES YES YES YES YES YES YES YES YES	Windows Opening Types DCO
yanlar Uzun 9	Apartment building M.Oltan Apt. (single-glazed) Emine Apt. (double-glazed) Arken 14 (single-glazed) Arken 12 (double-glazed) No. 18	Floor Second Third Second Third Second Third Second Third Second Third Second Third Second Third Second Third	Season Summer Summer Summer Summer Winter Winter Winter	- SS - SS	Image: state	SW SW	Vindows NW NW NW NW NW NW NW NW NW NW NW NW NW	NE NE <td>ation SE SE SE SE SE SE SE SE SE SE SE SE SE</td> <td></td> <td>Control of the Air lee NO NO NO NO NO NO NO NO NO NO NO NO NO</td> <td>eakage</td> <td>e and Condensation YES YES YES YES YES YES YES YES</td> <td>Windows Opening Types DCO DCO </td>	ation SE SE SE SE SE SE SE SE SE SE SE SE SE		Control of the Air lee NO NO NO NO NO NO NO NO NO NO NO NO NO	eakage	e and Condensation YES YES YES YES YES YES YES YES	Windows Opening Types DCO
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Noyanlar Uzun	Apartment building M.Oltan Apt. (single-glazed) Emine Apt. (double-glazed) Arken 14 (single-glazed) Arken 12 (double-glazed) No. 18	Floor Second Third Second Third Second Third Second Third Second Third Second Third Second Third Second Third Second Third	Season Summer Summer Summer Summer Winter Winter Winter Winter Winter Summer Winter Summer Winter Winter Winter Summer Winter Winter Winter Winter Winter Winter	- SS - SS	Image: Constraint of the constraint of the	SW SW	Vindows Vindow	Oreations of the sector of the	ation SE SE SE SE SE SE SE SE SE SE SE SE SE		Control of the Air let NO NO NO NO NO NO NO NO NO NO NO NO NO	eakage	e and Condensation YES YES YES YES YES YES YES YES	Windows Opening Types DCO DCO </td
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Noyanlar Uzun	Apartment building M.Oltan Apt. (single-glazed) Emine Apt. (double-glazed) Arken 14 (single-glazed) Arken 12 (double-glazed) No. 18	Floor Second Third Second Third Second Third Second Third Second Third Second Third Second Third Second Third Second Third	Season Summer Summer Summer Summer Winter Winter Winter Winter Winter Summer Winter Winter	- SS - SS	Image: Constraint of the constraint of the	SW SW	Vindows Vindow	Oreations of the sector of the	ation SE SE SE SE SE SE SE SE SE SE SE SE SE		Control of the Air let NO NO NO NO NO NO NO NO NO NO NO NO NO		e and Condensation YES YES YES YES YES YES YES YES	Windows Opening Types DCO DCO </td