(MASTER THESIS)

PERFORMANCE EVALUATION OF RESIDENTIAL KITCHENS: SUSTAINABLE AND USER FRIENDLY DESIGNS

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Bornova – İZMİR
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YASAR UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

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This study titled “Performance Evaluation of Residential Kitchens: Sustainable and User Friendly Design” and presented as Master Thesis by Burçin HANCI has been evaluated in compliance with the relevant provisions of Y.U Graduate Education and Training Regulation and Y.U Institute of Science Education and Training Direction and jury members written below have decided for the defense of this thesis and it has been declared by consensus of votes that the candidate has succeeded in thesis defense examination dated 24.02.2012.

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Rapporteur Member: Prof.Dr.Tayfun Taner 

Member **:** Assist.Prof.Dr. Malike Özsoy 

TEXT OF OATH

I hereby certify with honor that this MSc thesis titled "**PERFORMANCE EVALUATION OF RESIDENTIAL KITCHENS: SUSTAINABLE AND USER FRIENDLY DESIGN"** was written by me, without aid that would not comply with scientific ethics and academic traditions, that the bibliography I have used is that indicated in this thesis and that appropriate reference has been given whenever necessary.

24 / 02 / 2012

Burçin HANCI

T.C.

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INSTITUTE OF SCIENCES MASTER'S WITH THESIS JURY EXAMINATION REPORT

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Thesis Title: PERFORMANCE EVALUATION OF RESIDENTIAL KITCHENS: SUSTAINABLE AND USER FRIENDLY DESIGNS

Having evaluated the answers of the candidate to questions about field of the study and questions from departments representing thesis basis after ..120.. minute thesis defense based on the personal study of the candidate, the jury decides with

☒ SUCCESSFUL (S) ☒ CONSENSUS

1 ☐ INCOMPLETE (I)

2 ☐ FAILED (F) ☐ MAJORITY OF VOTES

3 ☐ Since the jury couldn't gather, the examination hasn't been done.

4 ☐ The student hasn't participated in the examination.

☒ Successful (S)	☒ Successful (S)	☒ Successful (S)
☐ Incomplete (I)	☐ Incomplete (I)	☐ Incomplete (I)
☐ Failed (F)	☐ Failed (F)	☐ Failed (F)
Member : Assist.Prof.Dr. Gülnur Ballice	**Member :** Prof.Dr. Tayfun Taner	**Member :** Assist.Prof.Dr. Malike Özsoy
Signature :	**Signature :**	**Signature :**

1 *In this case the student is given 3 months' time.*

2 *This case will be dismissed from the student.*

3 *In this case set a new date for the exam.*

4 *In this case Institute Board of Directors discussed if student have an excuse certificate. Student will be dismissed, if the board does not accept excuses. Student has a valid excuse Board of Directors gives a new exam date.*

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KONUT MUTFAKLARININ PERFORMANS DEĞERLENDİRMESİ: SÜRDÜRÜLEBİLİR VE KULLANICI DOSTU MUTFAK TASARIMI İÇİN ÖNERİLER SUNULMASI

HANCI, Burçin

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Bu araştırmada kullanıcı açısından konutlardaki mutfak performansı değerlendirilmiş, ortaya çıkan sonuçların sürdürülebilirlikle uygunluğuna bakılmış ve sürdürülebilir mutfak önerileri sunulmuştur. Araştırmanın amacı kullanıcılar açısından, mutfak performansını değerlendirmek ve en uygun sürdürülebilir mutfak önerileri sunmaktır. Bu amaçla araştırmada, kullanıcılara göre mutfağın yeri ve tipi, mutfak planı, mobilyaları, ergonomisi nasıl olmalıdır?, kullanıcılar mutfak mobilyalarında ne tür malzeme tercih ederler?, aydınlatma nasıldır ve sürdürülebilirliğe uygun mudur?, kullanıcılar havalandırmadan, atık kontrolünden ve araç gereçlerden memnun mudur? ve mutfaklarının eksiklikleri nelerdir? sorularına cevap aranmıştır.

Araştırmaya farklı sosyo-ekonomik düzeylerden 40 mutfak kullanıcısı katılmıştır. Bunların 20'si apartman dairesinde, 20'si müstakil evde yaşamaktadır. Araştırmada kapsam geçerliliği için uzman kanısı alınan 42 sorudan oluşan anket kullanıcılara uygulanmıştır. Veriler SPSS 16.0 programı kullanılarak girilmiştir. Verilerin analizinde frekans ve ortalama hesaplamalarına başvurulmuştur. Ankette yer alan açık uçlu sorular için çetele tutularak ortalama hesaplaması yapılmıştır.

Bulgulara göre, kullanıcılar G tipi ve Ada tipinde, 5-10 m^2 arası mutfaklar, 80-85 cm yüksekliğinde, 200-300 cm uzunluğunda, 3-4 cm kalınlığında tezgah, 35-40 cm., 40-45 cm derinliğinde dolap, buzdolabı-ocak, buzdolabı-lavabo

arasında 50-100 cm mesafe, ocak-lavabo arasında 0-50 cm mesafe, yer döşeme malzemesinde seramik, dolap malzemesinde lake boya, tezgah malzemesinde ise mermer tercih etmektedir.

Bu bulgular, sürdürülebilirlik açısından uygun bulunmuştur. Sadece lake boya kullanılması durumunda, toksik olmayan ve bio boyalı ürünler kullanılmalıdır. Kullanıcılar tarafından aydınlatmada doğal ışık ve floresanlar, havalandırmada bio filtreli aspiratörler ve rahatlık açısından çöp öğütücüler tercih edilmektedir. Çöp öğütücüler, sürdürülebilirlik açısından uygun değildir. Kullanıcıların gördükleri eksiklikler; yetersiz dolap kapasitesi, çöp öğütücü olmaması, mutfakların küçük olması ve yüksek enerji verimliliği olmayan makinelere sahip olmak olarak belirtilmiştir.

Anahtar Kelimeler: Mutfak, mutfak performans değerlendirmesi, sürdürülebilirlik, sürdürülebilir mutfak.

ABSTRACT

PERFORMANCE EVALUATION OF RESIDENTIAL KITCHENS: SUSTAINABLE AND USER FRIENDLY DESIGN

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In this study, performance of kitchen was evaluated by users, the results were compared with sustainability and given sustainable kitchen design suggestions. Aim of the study is to evaluate kitchen performance according to user's views and to present most suitable kitchen design in terms sustainability. With this aim, how location, type, kitchen layout, furnitures, ergonomics should be, what kind of material and lighting are preferred by users are evaluated. Then, whether they are appropriate to sustainability or not and whether users are satisfied with ventilation, waste control and appliances were investigated. What kitchen's deficiency are according to users were answered.

40 kitchen users which are from different socio-economic status, attended to the survey. 20 of the participants live in detached houses and the rest live in flats. Firstly, a questionnaire was prepared by the researcher and was given to expert's analysis for content validity. Then it was applied to participants. Questionnaire includes 42 items, some of which are open-ended. Obtained data was entered to the SPSS 16.0 programme. While analyzing data, frequency and mean techniques were used.The researcher kept tally for open-ended questions.

According to findings, users prefer G and island shaped kitchen having, 5-10 square meters, 80-85 cm counter height, 200-300 cm counter lenght, 3-4 cm thickness of counter, 35-40 or 40-45 cm cabinetry depth. Refrigerator-cooker, refrigerator-sink distance should be 50-100 cm and sink-cooker distance should be

0-50 cm. Users are satisfied with painted-lacquer cupboard and marble counters. Findings are mostly suitable for sustainability, except the use of painted lacquer. If it is used, it must contain bio-paint and be non-toxic. Fluorescents, bio-filtered fans, natural lighting, garbage disposal are also preferred by the users. Defiency of the kitchens are: the inadequecy of cupboard capacity, non-existence of garbage disposal, small size of kitchens and high energy efficient appliances.

Keywords: Kitchen, kitchen performance evaluation, sustainability, sustainable kitchen.

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I dedicate this thesis to my parents who unremittingly supported me during my years of education. They made this work possible.

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1. INTRODUCTION

Today kitchens are not only cooking places but also the part of our lives and they are in deal with life quality. In modern life, people spend much more time in kitchens, kitchens should support desired family interaction and participation. This support can be provided with nice, clean and smart designs. All details should be considered in the project sketches and designs should be user friendly.

One of our living spaces, kitchen is the heart of the house, the center of consumption, the hub of daily life. It is the place where family and friends gather to eat, drink, and chat, share their joy, or solve problems. According to Nystrom, it is life center which is used by all family members (Nyström, 1994). So, while planning a kitchen, priorities of users must be assessed; individual needs of users, cooking frequency, the activities which take place in it, the budget, the layout, the location of kitchen, the current offer of products, ergonomics, natural light, storage requirements, appliances and type of kitchen (Spechtenhauser, 2006; Conran, 2010). This study tries to answer those questions while evaluating performance of kitchens and giving sustainable kitchen design suggestions. Kitchens must be meet the users' needs and also be environmentally friendly in using natural materials.

Kitchens which are the skeletons of houses physically and socially. They have an efficient role while reducing environmental problems such as pollution. Water usage, material choice, energy saving, waste control methods are required for decreasing environmental pollution. In pollution, building technologies are effective, but design can offer possible solutions to dilemmas (Papanek, 1982). Ecology and design have considerable relationships. Papanek defines that there is an interaction between ecology and design (1982). Williamson et al. believe that sustainability is part of this interaction (Willamson et.al., 2003). Sustainability is a concept which was founded in 1987 by the World Commission on Environment and Development report. "Our Common Future" provided an early authoritative definition of what constitutes sustainable development. Sustainability means

“meeting the needs of the present without compromising the ability of future generations to meet their own needs” (Hammond, 2004).

While planning our living spaces, designers need to think about how they design products that are sustainable and do not damage nature. In this study sustainability is examined because the construction industry can damage the environment. Mora said that, it is responsible for 7% of global CO2 emissions (Mora, 2007) and houses are also responsible for energy consumption; for example in Turkey houses consume 45% all of electricity and “in the U.S., buildings use one third of the total energy, two-thirds of the electricity, one-eighth of the water, and transform land that provides valuable ecological services” (Howard, 2005). Most of residential energy consumption takes place in kitchens. The necessary reduction in carbon dioxide emission and climate change can be achieved by known technology (Cliff, 2007). Resources are limited and some will be gone if these numbers continue. Therefore, it is crucial for society to change its habits. Sustainable design is about changing the construction industry’s building techniques and material usage to become more environmentally friendly. Sustainable design also involves the introduction of nonpolluting materials with “lower operating energy requirements and higher durability and recyclability (Loftness et al., 2007). Product life cycle assessment, product design for disassembly or the use of recycled materials are important and can make a contribution (Frei, 1998).

In this research, kitchens are analyzed, because "kitchens consume more than five times the energy per square foot as any other part of a building” (Lawn, 2011). Kitchens are also thirsty; water is heated and also wasted there. In sustainable kitchen, there are four key principles; to maintain/restore biodiversity; minimize pollution of soil, air and water; minimize the consumption of resources (particularly non-renewable resources); and maximize the health, safety and comfort of building users (Mackay, 2010).

According to Sharwin et al., what we need now is a new type of kitchen, a new focus for our daily life that is not intended for surface show, but stands for

personal health and ecology (Sherwin et.al., 1998). When we focused on personal health, the most important qualities have been efficiency and cleanliness since the early 20th century, but today, they are part of a bigger design concept: sustainability (Laskey, 2009).

For healthy and user friendly kitchens, sustainability is the key concept. Bragança and Mateus confirm that supporting sustainable kitchen design is important. Systematic, holistic and practical approaches must be properly implemented (Bragança, 2011).

Moreover, adapting a kitchen to meet users' needs does not have to be expensive or time consuming. There are many affordable ways to make the kitchen easier to use. The aim of this study is to evaluate kitchen performance in terms of users' views and making suggestions on sustainable kitchen design in order to provide safety, health and hygiene, comfort, energy efficiency and waste control criteria, describing designers the means of creating ideal kitchens and aesthetics and functionality concepts.

1.1. Aim of the Study and Research Questions

The main objective of this research is to evaluate kitchen performance according to users' views and to give most suitable kitchen design in terms of sustainability and meeting user needs. It is thought that performance evaluation can contribute to designers in designing a kitchen and pay attention to sustainability. People can realize the importance of natural problems and remember to avoid unnecessary energy consumption. This research aims to contribute to sustainability and sustainable kitchen design. With this aim, data obtained from literature review and questionnaire is gathered. Firstly, kitchen performance results are given and then advices for sustainable kitchen are presented. The problems listed below are investigated to find user friendly sustainable kitchen criteria.

1. How should the kitchen location and type be according to users?

2. How should the kitchen layout and furniture measures be for user satisfaction?

3. How is the ergonomics evaluation of users?

4. What kind of materials do users prefer on kitchen furniture and is it suitable for sustainability?

5. What are the views of users about lighting and is it suitable for sustainability?

6. Are users pleased with their kitchen ventilation and is it appropriate for sustainability?

7. How should waste control be in sustainable kitchens?

8. How should appliances be in sustainable kitchens?

9. What is the deficiency of their kitchens according to users?

1.2. Limitation

This study was limited with 40 users who live in İzmir and with their views. Firstly, users' views on their kitchen were taken. Then, advices for sustainability were given in terms of energy efficiency, user comfort, safety and hygiene according to literature review. Other subjects about sustainability were emitted from research.

1.3. Significance of the Study

This study focuses on user friendly kitchens and sustainable kitchen designs Results of the study provide information about user's needs. This study is important due to two reasons. First one is environmental reasons and pollution. The second one is a kitchen's place in our daily life. Using findings of the study,

which were obtained from “different families, who come from different socio-economical status, are important for giving opinion, while designing kitchens” (Işık, 1992) and it can contribute avoiding energy consumption. Moreover, efforts on sustainability have focused mainly on reducing negative environmental impacts of human activities. Among the main impacts are those resulting from the amount of use of non-renewable energy the world consumes. Creating kitchens which use less energy, recycled materials can contribute minimizing demolition and waste by making buildings (Holowka, 2007).

In addition to this, kitchens’ functions have been changed and most of people’s activities are getting place in the kitchen. Consequently, they have to meet needs of users to make them happy and relaxed in their homes. With this research, performances of kitchen were evaluated and sustainable kitchen suggestions were given to designers. Designers may learn the needs of kitchen users and design kitchens which answer the user’s needs and are environment friendly. Some criteria may be used such as energy efficiency, waste control, safety and cleanliness and contribute to avoid damage nature.

2. FORMER STUDIES

In this chapter, the studies which were done in Turkey and other countries related with performance evaluation of kitchen design are given.

Yıldırım (1999) analyzes the design criteria and functional use relationships in the kitchens of the families at different socio economical levels as well as their fidelity with regard to the equipment elements. In this context, 20 house kitchens which were fit for the purpose were selected in Isparta. Equipment elements of these kitchens were designed by means of Arcon architectural design programme taking into consideration the functionality of the cupboards, and their three dimension pictures were also illustrated. In an effort to measure the demands and satisfaction level of the users, a survey was conducted among the users of the selected kitchens, and the obtained data were evaluated, and solutions for making the spaces more efficient were proposed. There are some fitting problems. Flexible tabs must be used in sinks front of windows.

According to Gelegen (2009), the wall cupboard height, bench height, bench length and kitchen illuminance are not suitable for the ergonomy of customers in kitchen in houses which have been built in recent five years in Ankara. However, customers are satisfied about the kitchens in general. The most dissatisfied point is the lack of storage area. Customers declared that the main points of dissatisfaction are inadequate local illuminance, usage of balcony, applications that can cause accidents in the kitchen. In the investigated kitchens, the functional designs which are in accordance to the technology are very rare. The suitability of the ergonomics of the kitchens to the customers is a very important point which can not be ignored. So, the results of the researches in this field, the proposals about the kitchen designs must be improved and continuous work must be done to follow the changes.

Yeşilkavak (2007) has been researched kitchens of 4 apartments in the common type architectural plan in Eryaman 7th stage in Ankara that is thought to be addressing to middle socio-economic status. A detailed questionnaire has been

done to dwelling users for their evaluating their kitchens. Consequently, it is found out that users find the kitchens in the common type made by TOKİ generally adequate and evaluate the quality of space perception positively. On the other hand, it is seen that most of the users complain about the deficiency of storing units in kitchen space. Another striking result is that the users utilizing their kitchens as uninteresting / ordinary places.

Altıparmak (2006) has been aimed to develop a data bank to design suitable kitchen furniture for our people's anthropometry. Considering that women mostly work in kitchen, a data bank was developed from 27 body sizes, 12 of which were standing up sizes, were taken from 906 women in normal working posture. According to result of this study, the height of the counter is proposed to be 95 cm and the width of counter is to be between 65 and 75 cm.

Küçük (2009) has been researched what kind of materials users who have different socio-demographic characteristics use for the fixed cabinet surfaces in the kitchen; according to which characteristics they choose these materials; what kind of complaints and preferences arise as a result of these choices; and which aesthetic criteria play a role in the choices. Women prefer easy clean, heat resistant and materials which aren't affected by physical and chemical matters counters.

Yıldırım et al. (2007) have been aimed to this research determines at what stage the daily needs of the occupants accommodating in apartments has been answered and the complaints if there exist. For that aim, kitchens having the same interior organization were used as the stimuli in four apartments recently built for the middle income status in a district called Eryaman 7 in Ankara. According to the research, though the occupants were satisfied the use of the kitchens functionally, they only complain the insufficient use of storages of the dwelling built by Mass Housing Administration. Another striking result was the users' perceptual evaluation on their kitchens as they mostly found the space uninteresting and ordinary.

Yıldırım, Çağatay and Özkan (2009) have been aimed to detect the middle and upper socio-economic status (SES) families have the satisfaction of the kitchen and complaints of the state of the ventilation systems. For this purpose, the houses' kitchens of the different SES families, settled in different regions of Ankara in Keçiören (middle SES) and Çukurambar (upper SES) were chosen. The opinions of the users to the ventilation systems of kitchens at the apartment housing in two regions were identified by a questionnaire. As a result, differences between purpose and frequency of use, exhaust fan type situated kitchens of users have the middle and upper SES was determined. As a result, differences between purpose and frequency of use, exhaust fan type situated kitchens of users have the middle and upper SES was determined. Accordingly, the ventilation system in the kitchens more frequently uses by the upper SES in comparison with the middle SES was determined.

Yıldırım, Şimşek, Akalın and Kahraman (2008), have been aimed to determine the difficulties that the users might be experiencing with dimensional standards of interior housing equipments in connection with the technological devices such as built-in cooker, oven, computer, television, etc. For that aim, the prepared research questionnaire was conducted on 128 residents of high socio-economic status (SES) who live in Çiğdem Street which is one of the suburbs in the south of Ankara. According to the statistical analysis, it was concluded that the majority of the residents were unhappy due to the mismatch between the interior housing equipments and the technological devices. The unhappiness was mainly due to the project/design errors along with scaling and production faults, and the inadequate use of technology by the producers.

According to İlçe and Usta (2003), the way of life of the persons having different social-cultural structures and different economical situations has appeared to be the most revised on the internal home designing in accordance with changing of their considered circumstances. In this study, the effects of the social-cultural behavior of the persons on designing of the kitchen furniture, it was aimed to be determined. For this purpose, the kitchen furniture was investigated in detail by doing a total of 200 face-to-face questionnaires that of

each was randomly selected in both Ankara and Tokat. As a result, to make the less traffic and suitable work at the kitchens, it may be suggested to design that 360 cm for the circular of the work angle, 120 cm for the distance between the sink and the cooker, 120 cm for the distance between the sink and the fridge, 120 cm for the distance between the fridge and the cooker. Also, it may be suggested that indoor design has to be properly fitted for the kitchens on the first stage of the home design. Furthermore, the kitchens in Tokat has to be designed including with the sitting facilities at least comfort in the sitting room, whereas in Ankara the area of the workbench has to be enlarged according to the needs.

According to Yıldırım and Hacıbaloğlu (2000), houses are the most important place in the daily life in which kitchen is the most intensive space for the living necessities and actions. However, despite the huge importance of kitchen, it is the fact that kitchen spaces and furniture have not been designed scientifically. In Ankara, 105 Kitchen samples are selected among the different socio economic status (SES) of families, such as lower, middle and upper of the SES. Kitchen of houses has been selected according to its characteristics, relations, equipment elements and peculiarities with other spaces. In the research, the satisfactions and wishes of user are also investigated. In this study, data has been collected through detailed questionnaire, and surveys related with space and equipment elements have been determined. In conclusion, kitchen should be near living place, adequate cupboard for storage, big enough to cook, preparation, eating and washing, have sitting place and T.V unit. Most of the users need closed kitchens.

Baran’s (2011) study focuses on ecological design between the building and both its physical (topography, and climate) and structural environment (building form, spatial organization, material, landscape and planting, and technical infrastructure). Housing as a new concept within this environment attracts much attention. However, housing was previously considered to have good interactions with the ecosystem. Houses were built around water resources using local materials and energy sources. Even the wastes were evaluated and recycled (Yaren, 1990). Ecology based technologies like energy usage and conservation of

natural resources, are closely related to architectural design (Karaman, 1995). These architectural designs are essential for a sustainable life as well as environmental design.

Mackay (2010) has been aimed of this research is to understand the broad issues and dynamics of kitchen re-modelling with respect to principles of sustainable design. Firstly, this paper considers the position of kitchen modelling with respect to a framework for environmental sustainability. Secondly, current theoretical explanations for kitchen renewal are presented. Four key drivers of kitchen re-modelling are investigated and discussed with respect to issues of sustainability; perceived improved functionality, self-expression and identity through design, changing social patterns and the pressure of advertising promoted by the kitchen industry. In conclusion, key sustainability issues are identified and possible sustainable outcomes are proposed.

2.1. History of Kitchen

After the discovery of fire in early periods of humanity, kitchens formed the focal point of dwellings as the most important element of the whole house. The fire in the stove of each group remained steadily burning. It was merely the symbol of the family life's living group. It was fulfilling requirements such as cooking food, heating, lighting and protection from wild animals. However that fire lost its sanctity in later times, with developments in the source of fire and related to achieving it at any desired time. It has not lost its meaning and important power within the house and remained always to be the "heart" of the house (Ağat, 1983; Ünügür, 1997).

The kitchen, which is defined as the wet area of the house where food is prepared, cooked, eaten and stored, exhibits interesting development stages within the historical perspective (Ünügür, 1997). To a large extent, the history of kitchens has been mainly linked to the development of heat sources (Giedion, 1994). People, who were benefiting from the fire that was burning in the middle of the volume in single-space homes, have been designed as the first kitchens in

housing installations with growing number of spaces by customizing the volume where the fire is located (Ünügür,1997).

While in ancient Greece, the kitchen was not being a separate division outside their rich residences and used as a space for meeting and sitting, it became one of the divisions next to the great hall during the Roman period. In the Mesopotamian culture the kitchen was structured under the ground and its ventilation and light exposure was provided with the help of a window that was opened in the ceiling (Ünügür, 1997).

Regarding the Turks, the stove became the "touchstone" of the Traditional Turkish House, as food was cooked on the stove, heating was provided through the stove, it became a meeting point of household people, daily fatigue was appeased at the stove and it gained a holy personality. Keeping the stove constantly burning was regarded as the family living forever. (Hacıbaloğlu, 1987).

Before the end of industrialization, the kitchens and living rooms have not been analyzed in a single place in all rural and urban public housing (Ağat, 1983). After the industrial revolution of the 18th century spreading from England to all of Europe and the entire world, the stove continued to be active in the life of man (Sözer,1990). Although industrial revolution has brought unhealthy living conditions to major cities of Europe, these unhealthy conditions were corrected by the measures taken over time and with applications and solutions being discovered. In large cities, electricity, water and gas installations have been brought up the house. One of the reasons is that the need to burn a stove or an oven for cooking was no more required and the kitchen was heated in order not to burn a second stove in another space. Therefore, living in the kitchen was abandoned. The second reason is that gas leakage that will occur due the use of gas would lead to a danger of death or fire. Thus, as the former living room became the space of everyday life, kitchens achieved the status of a small service division. Reduction in the size of the kitchen has provided benefits in the reduction of the residence area and therefore in the cost of housing (Eser, 1952).

Besides that today's living conditions make it very difficult to find and pay an assistive, women being engaged in more education and the participation of more women in business life has discarded the kitchen to be a place in which the housewife is working everyday for hours. In order to prevent that the housewife is separated from the family life during the time she is working in the kitchen, kitchen designs should be performed in accordance with this situation. With these designs, the visual and spatial relationship of the kitchen with living spaces is developed in today's housing (Ağat, 1991). As the kitchen discarded to be a place in which the woman is dominant and as it turned to be a space to be used by all family members, it shows a conceptual formation with an appropriate size, area and arrangements enabling a few people to work together and by becoming a model and social space.

2.1.1. Kitchen Space in Today's Housing

The kitchen is a division in the housing where food is prepared, cooked, stored and preserved, served and optionally eaten. Today's kitchens are integrated with other spaces being embedded with life in addition to its dining and preparation activities. Thus, activities performed in the kitchen include varieties (Sayel, 1993).

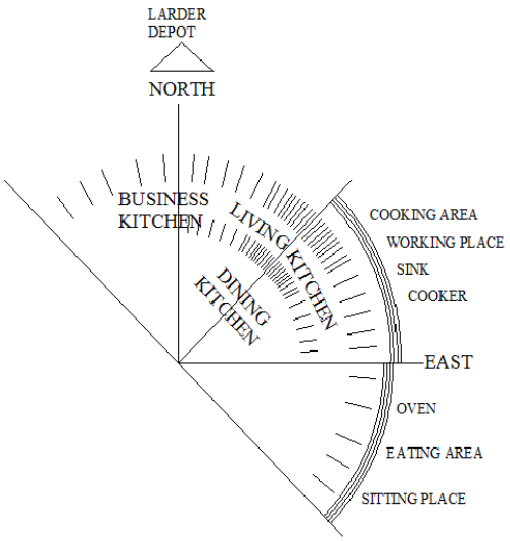
The kitchen is a space starting from the receipt of all materials required for eating continuing up to the activity for eating, a space which can hold all processes of washing-preparation-cooking-transferring-storing and dining, being also used for different functions depending on the structure, size, socio-economic status and cultural features of the family by which it is used (Ulular, 2006). The kitchen being one of the spaces in which time is mostly spent, can be considered as inside a cabinet of in the state of an open bench depending on the area of life or within a separate volume (Özerdim, 1991).

2.2. The Orientation of the Kitchen

The location and direction of the kitchen is of great importance in the correct design and direction of housing. As the kitchen is a space where activities of washing, preparation and cooking of food is performed and where food is stored either prepared or non-prepared, it is objectionable that the kitchen space is located in directions with much sun light in order to prevent the deterioration of food (Agat, 1991). The northern direction can be recommended for a working kitchen, the north-east direction exposed to morning sun as a dining kitchen in which dining is also performed, the east direction can be recommended as an open kitchen in which sitting is also performed. The directions to mostly avoid for a kitchen are the western and south-west directions.

If a covered balcony or terrace or a large cornice is built to cut heat or to provide shade, the kitchen may also be placed towards these directions. If these elements are not available, a large external facade and large openings should be avoided (Arcan ve Evci, 1992). In the case that the kitchen is facing a sunny direction, there is need for well-functioning natural ventilation. In figure 1, kitchen types and related direction are given (Agat, 1983).

Figure 2.1. Kitchen types and related orientation (Agat, 1983).



2.3. The Relationship of the Kitchens with other House spaces and its surrounding

The kitchen is the most important study area when compared to other spaces. As a result of carried out studies, it can be said that the activities performed in the kitchen fill the half of the daily workforce of the housewife (Agat, 1983). Based on this, the relationship of the kitchen in housing with other areas and its surrounding is gaining importance.

Movements of kitchen users in the housing, their activities and with which spaces in the housing they require to be in relation were scientifically studied and a rating was performed in accordance with the data being obtained. The most important link is the link with the dining table. It is necessary to provide convenience in carrying equipment such as food, plates, cups, etc and to avoid long and winding roads. It will be of benefit to shorten routes and simplify connections by taking the physical exhaustion of users into consideration. Even if the kitchen is required to be separated from the other spaces of the housing due to noise, odor, etc reasons, it should have a visual and auditory link with family living spaces.

Based on designing the kitchen as a life and communication center, "the idea to make the kitchen more livable by combining it with other spaces" that served for this purpose was presented for the first time in 1927 at the Weissenhof Siedlung fair held in Stuttgart with the design of Jacobus Pieter Oud, a Dutch architect. In the kitchen of Johannes, a sliding window, providing connection with other rooms of the flat was also enabling food service as well as the establishment of communication. With this innovation, the kitchen embarked for the first time to be an isolated area (Yazıcıoğlu, 2010).

According to the result of the evaluation study carried out by Hildebrand Frey and his colleagues in Switzerland, the kitchen and the dining space is listed in 4 categories; as the service window cannot provide a complete visual connection, as a first it is desired that the kitchen and dining area is adjacent and

in direct connection. After the direct link of the activity area, if the distance to the nearest edge of dining table from the kitchen entry is not more than 3 meters and if a service window is available, a connection provided with a corridor takes the second order. A connection with a corridor being the same with the second order but which does not have a service window takes the third order. Finally, the connection conditions in which the connection from the corridor is more than 3 meters or in which the connection is provided through passing from a different space.

After the kitchen – dining table connection, the connection of the kitchen – children's room is important. In his researches Meyer Ehlers has observed that a go and come event at an daily average of 8-9 times between the kitchen and children's room was experienced particularly in families having children in small ages and at school-age, and has therefore pointed out the importance of the connection between these two spaces (Agat, 1983).

In the 1920s, according to American architect Frank Lloyd Wright, the kitchen is the center of family life. With his open plan idea, being a determinant feature of his "organic architecture" approach, switch between the kitchen and living areas has started to be provided both formally and with material integrity. In the 1980s, designer Otl Aicherin, has brought an innovative approach for the company Bulthaup by "accepting the approach that "the kitchen will be the center of home life in the future" as a reference point and has laid one of the foundations of today's kitchen design (Yazıcıoğlu, 2010).

In addition to being in direct connection with areas such as storage and cellars, the kitchen also should be associated with open areas and the garden available in detached and single-storey houses (Arcan and Evci, 1992). The kitchen and housing entry connection should be convenient and short-distanced in terms of carrying supplies straight to the kitchen without handling them to much within the housing (Yıldırım, 1999). Waste and garbage that accumulates in the kitchen should not be passed through any living space when they are carried to the place where they are collected and this place should not have a distance more than

6 meters to the kitchen. The connection between the kitchen and with open spaces such as balconies and terraces should be provided directly (Baytın, 1980). They should not be planned next to or in succession with wet spaces such as the bathroom and WC. In this way, installation is eased and cost of housing is reduced (İlçe, 2001).

2.4. Analysis of Study Areas Located in Residential Kitchens and Design of Work Triangle

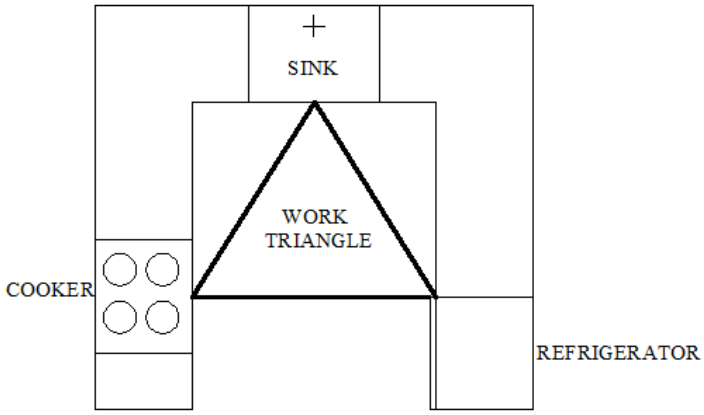
In addition to main activities such as storing, preparing, washing, cooking and serving of purchased food as well as cleaning and storing tools and materials, side activities such as TV watching, dining and laundering may also take place in the kitchen space.

The side activities carried out in the kitchen may vary according to the structure, socio-economic status, size, cultural characteristics, habits and behavior types of the family and according to the size of the housing. As the equipment necessary to perform the activities in the kitchen are focused on specific centers, the right planning and organization of such centers allow yielding the best efficiency from the kitchen space.

Until averagely 50 years ago housing kitchens were built as an empty space having a tap, sink, extractor fans and a cooker hood. According to possibilities, users have equipped this space with stove, cabinet, shelves etc. equipment. These elements were randomly placed without considering their relationship with each other. In such furnished kitchens users have become exhausted and have spend time by performing more effort with unnecessary comes and goes. As rationalizing studies in industry produced successful results, it has been thought that housing kitchens are also a workplace and that arrangements made according to rational working principles herein would be of benefit. Researches, first in Switzerland and England and later in Western Germany were carried on this issue and it was determined that a kitchen planned according to a rational work order saved time and was less exhausting for its user (Ağat, 1983).

The work surface, storage area and equipment are the basic elements at workplaces. The concept of a work center was introduced by bringing these elements together. Work centers providing savings in the kitchen in terms of time and economy and give the user the opportunity to work in a more practical and ergonomic environment. Work centers are planned around the most commonly used three major kitchen equipment, the kitchen sink, cooker and the refrigerator. These equipment elements need to form the corners of a triangle in order to ensure savings to its user in terms of time and economy and for a good workflow. This triangle being formed is referred as the work triangle.

Figure 2.2. Work triangle (Gönen et.al., 1990).



The shape and surrounding of this triangle is important in order to ensure the usefulness of the kitchen (Gönen et.al., 1990). It has been determined that each side of the triangle should be minimum 120cm and maximum 270cm. According to Yazıcıoğlu (2010) and İkbal (1987), the surrounding of the work triangle should not exceed 7m in small kitchens and 8m in large kitchens (Goldbeck, 1989).

It is determined that the distance between the three major equipment elements, forming the kitchen work triangle, should be as 120-180cm between sink-cooker, 120-210cm between sink-refrigerator and 120-270cm between the refrigerator-cooker (Kalınkara, 1990 ve Peet et.al., 1979).

While determining the locations of main activity spaces (work centers), daylight, the relationship of the kitchen with other spaces of the house and with outside as well as its ventilation should be considered. Side activity spaces such as dining, watching TV etc., should be located in a state that will not interfere with the work triangle and pass through this circulation line.

Main activity areas (work centers) are given below:

Preparation Area

Cooking Area

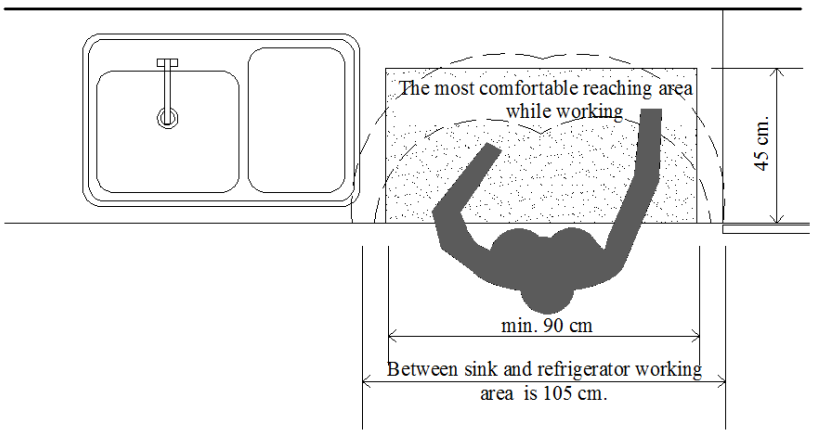
Service Area

Washing Area

2.4.1. Preparation Area

The main element required for the preparation area is the counter. Planning the preparation counter with a sink on one side and the cooker on the other side is ideal. In this way, it is also possible to benefit from the preparation counter in dishwashing and cooking activities. The material of the preparation counter should be in the type of dirt-hosting free, easy to clean and in monolithic structure. Joints, combinations and finishes that will cause dirt to accumulate on the counter should be avoided. Storing frequently used small household appliances and tools such as pots, spoon and forks around this counter in spaces to be reached with the arm would be ideal in terms of the organization of the kitchen. The preparation counter should be well-lit.

Figure 2.3. Counter in spaces to be reached with the arm (Yazıcıoğlu,2010).



When planning the work surface provision of the optimum work height is an important factor. In a study on kitchen activities in 1850 by the U.S. Department of Agriculture, it was indicated that the height of the counter should be adjustable to the user's body size while preparing food and the distance in standing position between the elbow and the counter was appropriated to be 10-15cm. Accordingly, the ideal counter height should be averagely 85-90cm and the counter depth should be between 60-65cm. When determining the net size related to the depth of the counter, the arm length of the user, accessing easily the farthest point of the counter, should be taking into account (Yazıcıoğlu, 2010).

For processes that can be made more comfortably by sitting, a stage generated unit, opening table equipment may be used.

2.4.2. Cooking Area

The most commonly used device when performing cooking is the cooker. As the cooking event will follow the preparation process, the cooker may be placed to the right of the preparation counter.

When determining the location of the cooking unit is should never be at the end of the counter. If it is required to be located near to the counter end a space of at least 23 cm from the edge should be left. The distance of the cooker to a module, cabinet or wall located over the counter should be less than 30cm. This

spacing is required to allow comfortable movement of both arms. The cooker should be certainly not close to an opening window. If such a case is unavoidable, care should be taken that the current window is made of sash or sliding type and of non-flammable materials. 4-division stoves, the lower part being the cooker, are the most popular cooking units. These products may be used as solo or built-in.

An extractor fan or hood should be placed on the cooker. Locating a cabinet over the cooker is not suitable due to the water vapor emerging from food. The distance of the extractor fan and the hood with the counter should be at least 65cm in case that the cooker is of gassy type and minimum 60cm if it is of electrical type. In the event that the surface of the ventilation system is manufactured from flammable material, this distance should be increased minimum to 75cm (Yazıcıoğlu, 2010).

In recent years, island type kitchen applications in the middle of the kitchen have started by taking the cooker from the wall. The aim is to reduce the circulation between the cooking center and other centers. Such applications allow more people to cook food as the possibility to use the cooker from both sides is arising. Thus, the kitchen turns into a living area.

The water vapor that is emerging during cooking and the absorption of smell as well as the circulation of heated air is resolved through the hood placed over the cooker. The hood, by means of embedded lighting elements, provides at the same time illumination for the cooker.

The built-in cooker may be placed to the lower or upper device cabinet. It is more ergonomic to place the cooker inside the upper cabinet as it will allow accession without causing movement such as bending or kneeling. If the stove is to be placed under the counter it should be located under the cooker or close to the cooker without blocking movements and should be adjusted maximum 3cm from the wall.

2.4.3. Service Area

The service area should be side by side or near to the cooking center. The second counter created for long term food preparations may also be used as a preparation area for service. If the kitchen is small and placing a second counter is not possible, the counter between the sink and the cooker will is also capable to fulfill this function (Sayel, 1993 ve Yıldırım, 1999).

There are relations with the refrigerator during food preparation as well as setting and clearing the table. For this reason, the refrigerator in the kitchen should be within easy reach. It should not be placed behind the kitchen door for opening and closing the door of the refrigerator easily.

2.4.4. Washing Area

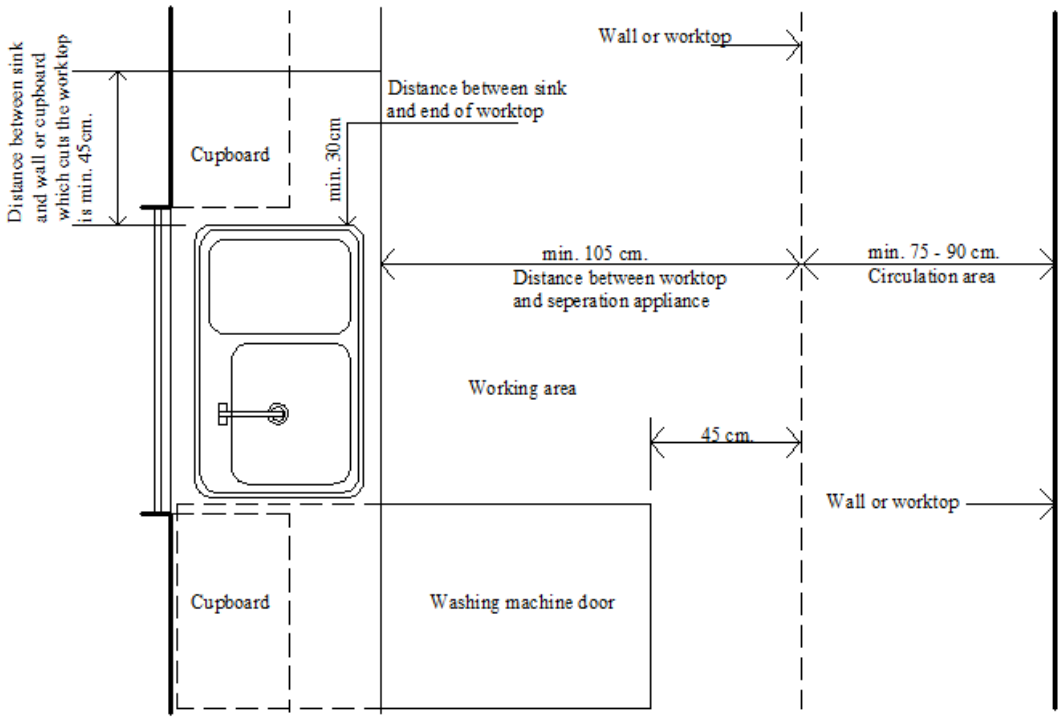
The basic area where the washing process is carried out is the sink. The sink should be always easily accessible, in an area where activities related to washing can be comfortable performed. At the same time, as many functions at the wash area are performed depending on the preparation area, there should be a direct relation between the preparation area and the sink. Placing the dishwasher under or near to the sink will provide ease of use.

Placing a module or unite that is cutting the counter, immediately next to the sink on the counter will make use harder. However, in the event that a unit cutting the counter such as a refrigerator or cabinet needs to be placed, the distance left between the sink and this unit should be minimum 45cm. If there will be a cabinet on the upper part of the sink, it should be designed shorter than other cabinets to avoid hitting the head. If shelves are to be place over the sink, the depth of those should not exceed 20cm (Polat, 2005).

In order to allow convenient filling and emptying of the dishwasher, which is the most basic component of the wash area, the distance between the counter and a divider structure element should be minimum 105 cm as seen in Figure 2.4.

If behind the user of the dishwasher a circulation area is considered, this range should be increase to 180-195cm (Polat, 2005).

Figure 2.4. Measurements of washing area (Yazıcıoğlu, 2010).



2.5. Types of Kitchen

2.5.1. Types of Kitchen according to their use

2.5.1.1. Closed kitchen (Business kitchen)

Closed type kitchens are kitchens where only kitchen works such as food preparation, cooking, washing and storage is performed. As other activities are not carried out in such type kitchens, their being small is deemed suitable in terms of ease of use (Arcan and Evci, 1992).

As the working kitchen requires a small area it is particularly applied in public housing. There are applications reduced to 3.5 – 4 $m^{2.}$ The ideal size for a business kitchen is 5 or 6 m2. Several issues are arising in case that they are built

in smaller sizes. The smaller these kitchens, the better they need to be ventilated (Bozbaş, 1990).

2.5.1.2. Semi-open kitchen (Dining)

This is a kitchen type created by the addition of a dining area to closed working kitchens (Baytin, 1980). The excess of hours spent by all family members outside the housing due to today's structure of society and working conditions repulses the family members to be together. As the activity of dining is also included in such type kitchens and as they reduce negativities that cause loss of time and energy such as excessive work and excessive circulation requiring services which arise during setting the dining table, such type kitchens become one of the most positive solutions for working families. Dining in these kitchens is performed with the least energy loss. The dining kitchen needs to be larger than the working kitchen. There is need of an area of minimum 8-10 m^2 for such a kitchen (Sayel, 1993).

2.5.1.3. Open kitchen (Living kitchen)

In open kitchens, the living space of the family and the kitchen are taken in a state to ensure space integrity. The living and dining activities are open kitchens are approached in first degree. In-kitchen activities are taken as second degree as the main space is divided to dining and living areas (Agat, 1991). In open kitchens, there is either no distinction between living and dining spaces or equipment such as a dining counter, small half-cabinets may be used as small separation materials (Tüzün, 2001).

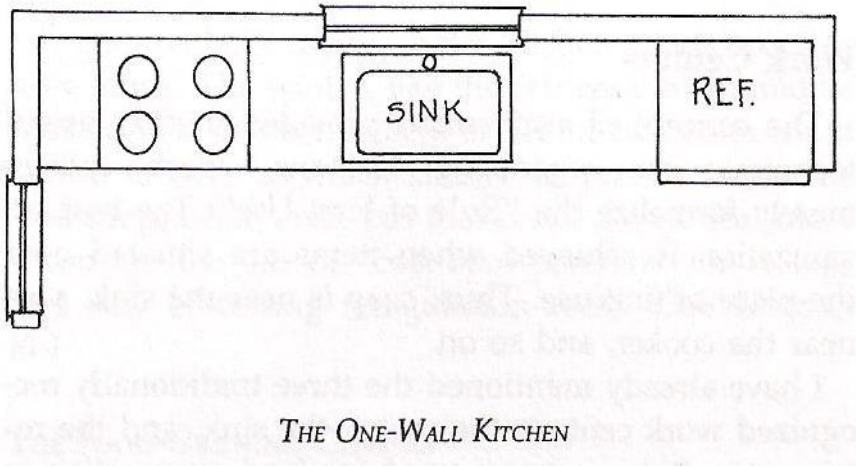
As more than one activity takes place in living kitchens, the space needs to be large. This largeness should not decline to less than 15 square meters (Sayel, 1993).

2.5.2. Types of Kitchen according to the shaping of their working surfaces

2.5.2.1. I type

I form kitchen, is a kitchen type in which all working centers are placed side by side lined at the edge of a wall. Generally in small housings, I form kitchens are preferred due to the narrowness of the space's width. Applying the "work triangle" concept in single wall type kitchens is not possible. A linear movement from one activity area to the other is in question. According to Yazıcıoğlu (2010), a counter distance of minimum 60cm should be left between cooking, washing, preparation and service areas in such type kitchens in terms of convenient use.

Figure 2.5. I type kitchen (Goldbeck, 1989).



In I type kitchen, an area in a length of 350cm is sufficient to line all working centers. It is a more suitable arrangement type for narrow rectangular kitchens (Demirel, 1997). As the sides of the single-sided counter and inter-counter circulation are more than 110-130cm, the width of the kitchen can be reduced to 240cm (Arcan and Evci, 1992).

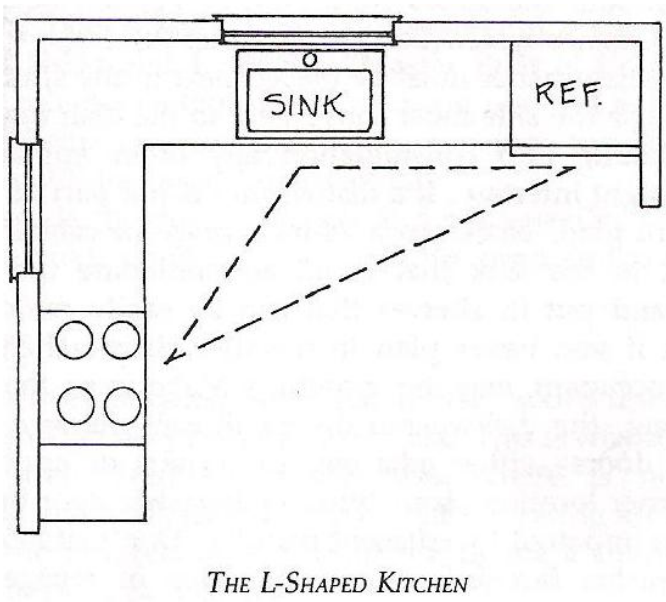
As all working areas are located on a single line in such type kitchens, working becomes practical and time is saved. In I type kitchen, the natural light

received from the side facade will not be adequate the longer the counter will be. Over-counter cabinets are placed all along the upper part of the counter.

2.5.2.2. L type

It is built by lining working places in a state of forming L at two wall sides being perpendicular to each other. The work triangle forms by itself in L type kitchens. As the counter corner is not useful in preparation works, usually the dropper is placed into the corner. In this case, 2 preparation counters start from the left side of the dropper.

Figure 2.6. L type kitchen (Goldbeck, 1989).



As being the case in other kitchens, the cooking area in L type kitchens should be in the middle of the space as the refrigerator should be near to the door and to the end of the cabinets. In this way, both a danger that may result from the cooking area will be protected and supplies being provided will allow to be placed comfortably. In addition, the refrigerator which is constantly opened and closed will not hinder the works performed in other working areas.

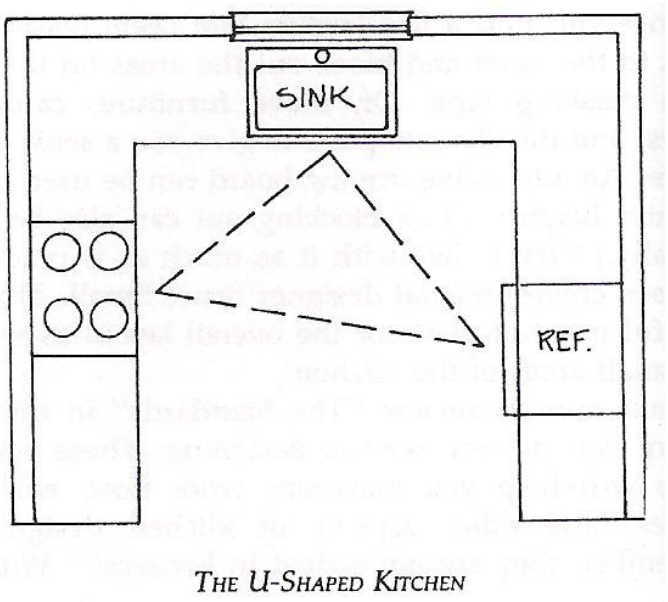
The corner in the L kitchen at the under-counter cabinet requires special solution. The lower cabinet to be used on the corner can be made more effective

by cellar systems in different types. These most easily accessible and functional among these systems are those that can fully, three-quarterly and semi-circularly rotate or those which completely come out when the cover is opened (Anonim, 2009).

2.5.2.3. U type

These types of kitchens are the most efficient arrangements in terms of movement and working relationships as they can be arranged along three walls of the working line without interruption and as they enable a large working area (Balikhani, 2005).

Figure 2.7. U type kitchen (Goldbeck, 1989).



U type kitchens are usually used in large-type housing where the distance between two parallel counters is minimum 157cm (Baytin, 1980). The volume of the working place and cabinet is greater in U type kitchens. As it is the case in L type kitchens, U type kitchens cabinet corners also require special solutions of rotary shelf mechanisms. Although that all working areas may be located at different counters, the sink and the cooker may be located on the same counter as the other counter may be used as a service preparation counter. In this way, the

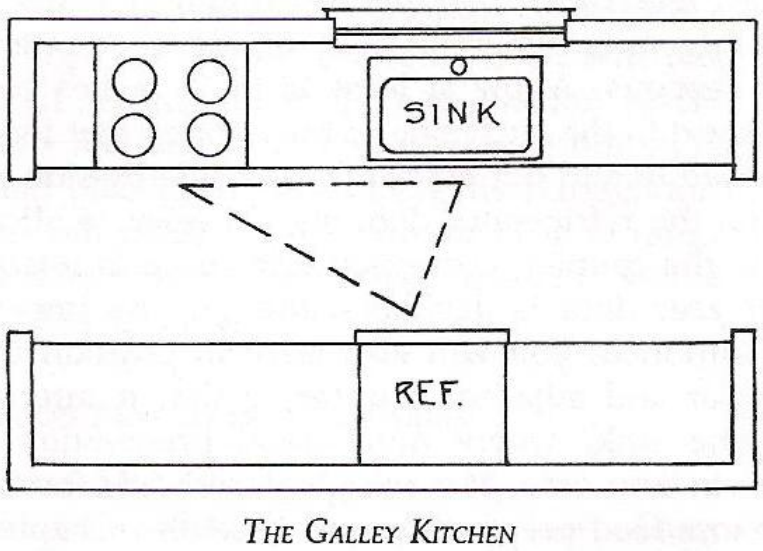
circulation line between the basic working places and the sink becomes a straight or a triangle.

Dark corners may cause a problem in U type kitchens. In the event that these corners are not adequately illuminated even at daylight, then light colors should be preferred on surfaces. In this way, light will provide more reflection and will make the space more lighted and spacious as it is (Yazıcıoğlu, 2010).

2.5.2.4. Corridor type (Galley Type)

It is constituted by working counters forming two lines in parallel to each other. They are usually preferred when it is necessary to give an exit to the balcony or to the garden from the kitchen. A door is not used in such type kitchens as the counter division and cabinets left behind the door are blocking the door when it is opened. For this reason, using a sliding door in U type kitchens will make a better solution.

Figure 2.8. Corridor type kitchen (Goldbeck, 1989).



An efficient activity triangle can be easily created in corridor type kitchens. The distance between the two lines forming the activity triangle should be not less than 120cm and not more than 270cm and regarding the two counters placed on

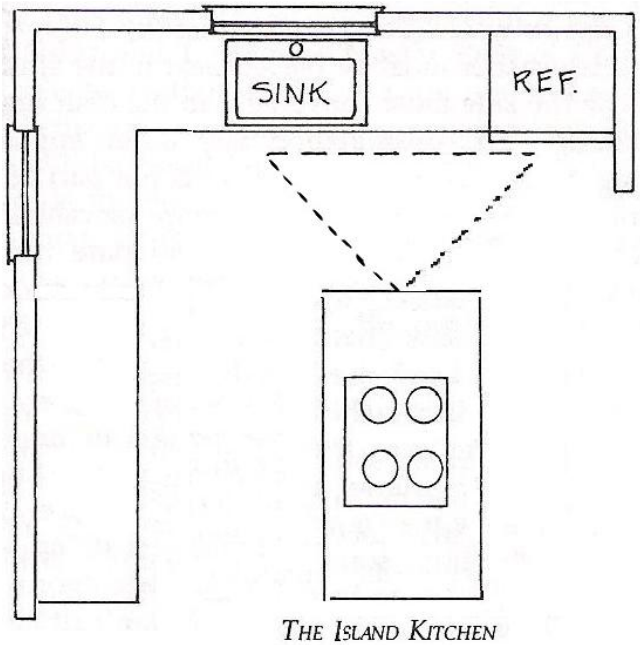
opposing walls, a distance of minimum 120cm should be left by considering also the moments when drawers are opened. They are more tiresome compared to single line kitchens due to the existence of back turn movements (Yazıcıoğlu, 2010).

2.5.2.5. Island type

This is the kitchen type in which one or a few activity areas are resolved in the middle of the kitchen being suitable for large areas. The main purpose of the island-type kitchen is to create more working space.

These types of kitchen easily provide a movement area at which two people can easily work. Circulation areas in a width of minimum 120cm should be created around the island for comfortable movement (Yazıcıoğlu, 2010).

Figure 2.9. Island type kitchen.

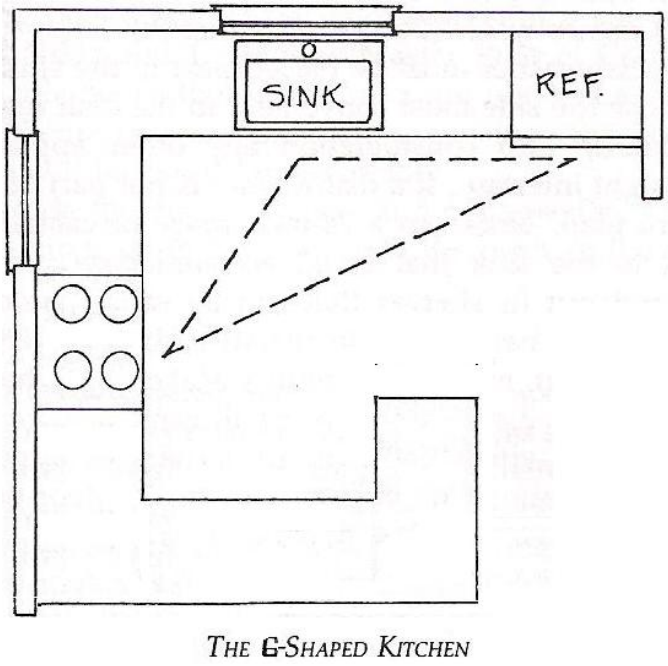


2.5.2.6. G type

It is formed by separating a part of the kitchen counter from the wall and extending it to the mid-section area. Such type kitchens are usually built with the

aim to increase the working space and to resolve the dining function on a portion of the counter. As it is the case in island type kitchens, in G type kitchens more space is needed compared to other types. According to Sayel (1993), the G kitchen type is a dining kitchen where a space more than 10m2 is needed. As a third counter arm will extend between opposing two counter lines, the width needs to be much.

Figure 2.10. G type kitchen.



2.6. Accepted Sizes in Residential Kitchen Design According to Ergonomics and Anthropometric Sizes of Users

People are in mutual interaction with their surroundings. They create artificial environments appropriate to their activities in order to better perform their activities. Architecture aims to design and create this artificial environment. In whichever environment, the human performs some activities in accordance with its characteristic and its requirements and uses internal equipment elements, tools and machines in order to realize such activities (Baytın, 1980).

Ergonomics defined as the inter-science that examines the relationship between human, machine and the environments and which applies the originating results to the advanced information stock of the sciences of anatomy, physiology and psychology is formed from the Greek words “ergo” (work) and “nomi” (science) (Toka, 1978). Even if looked from this sense, the reason of the involvement of housing kitchen in ergonomics literature will be easily understood (Ünügür, 1997).

Ergonomics is of great importance in organizing working environments. Man’s physical and mental activity depends on the location of the work being performed, on the appropriate arrangement of equipment and tools used in performing the work as well as on the fulfillment of physical environment conditions. For this reason, attention should be paid to some points (Baytin, 1980).

• The working plane height should be adjusted to the size of people and according to the location of the work to be performed.
• There should be spaces allowing movement convenience for the head, arms, hands, legs and feet during working.
• Equipment elements used around the working area should have system integrity to enable function, flexibility and easy replacement as well as to ensure different arrangements.
• Equipment elements need to be compatible with the anthropometric size of the user (Baytin, 1980).

A compatible system between the individual and the equipment elements it is using is needed in order that the study is enabled to be effective. Anthropometric sizes related to human body give the necessary information for the development of this system. Anthropometric data can be used in determining the size and shape of equipment elements used by people and in determining the workspace of people. The dimensional measurements of the user need to be known in order to allow the user to work in a comfortable manner in terms of physiological and psychological aspects in the activity areas of the kitchen by

spending less time and energy (Gönen, 1990). Anthropometry is divided into two separate fields:

1. Static anthropometry; is concerned with the physical properties of the human body and the measurement of its sizes.

2. Dynamic anthropometry is concerned with the dynamic dimensions of human when performing a process (Sözer, 1990).

Drawing a person's workspace would be possible through dynamic anthropometry. Primarily, static dimensions should be obtained in planning the workspace as dynamic measurements should be collected subsequently (Gönen, 1989). According to Mc Cullough and his colleagues measurements in standing and sitting position are as given in Table 2 (Yılmaz, 1988).

Table 2.1. Body measurements of women in standing and sitting position (Yılmaz, 1988).

Body measurements of women in sitting position	Height (cm)
Height from the sitting point	83.5
Eye height	72
Shoulder height	54
Elbow height (from the sitting point)	22.5
Height from the floor up to the knee	38
Height from the floor up to the upper part of the hip bone	52
Body measurements of women in standing position	Height (cm)
Figure height	160
Eye height	149
Shoulder height	130
Elbow height	99
Palm height	74
Thump tip height	66.5

2.6.1. Cupboards and their measurements

Upper cabinets are a furniture group formed by the complete group or a few of cupboards, which are usually mounted onto the wall in a state to be over the counter, with or without cover, a corner cupboard and a ventilation cabinet.

Cupboards are in a height of approximately 125-150cm from ground, having a depth of 30-35cm and in a height of 40-95cm (Yıldırım, 1999).

2.6.2. Cabinets and their measurements

Kitchen cabinets and the counter that will be take place on an important part of the wall and base area are an important issue in the spatial placement of kitchens. Kitchen cabinets are furniture for preserving kitchen equipment and foodstuffs.

Cabinets are a furniture group formed by the complete group or a few of a corner lower cabinet, lower division cabinet, sitting on the ground, tube and under-sink cabinet, drawer cabinet and wire basket and so on. Cabinets are legged or based cabinets in a height of approximately 80-90cm between the floor and the counter, in a depth of 50-65cm which of their width is varying depending on the characteristics of the kitchen (Yıldırım, 1999).

2.6.3. Pantry cupboards and their measurements

Pantry cupboards are single or double-cover rack furniture, which are usually located on sides or on the corner and which of their height is at the upper level of the cupboard. Pantry cupboards need to be in a height of 195-245cm and in a depth of 50-60cm (Yıldırım, 1999).

2.6.4. Counters and their properties

Counters over which food preparation is performed are mounted over cabinets. If work counters are to be located between equipment elements such as the cooker, refrigerator or sink, their height is designed approximately as 85-90cm and their depth as 60-65cm in order to make them have the same size with such elements (Yıldırım, 1999).

3. SUSTAINABILITY AND SUSTAINABLE KITCHENS

Sustainability was found out in 1987 the World Commission on Environment and Development report (Brudlandt Report), Our Common Future which provided an early authoritative definition of what constitutes sustainable development. Brundtland Report; the outcome of 4 years of study and debate by the World Commission on Environment and Development is led by the former Prime Minister of Norway, Gro Harlem Brundtland. *Sustainability* was introduced as a term in the context of human life style, consumption and the exploitation of natural resources. Calculation of today's Western consumption distributed over future generations will demand the resources from four planets. Because of the asymmetry of resource use and resource recovery, the term sustainability introduces a new dimension to the term environmental impact, namely the need and demand to decrease consumption in the industrialized world and to distribute resources equally between nations and generations today and in the future. Principally, total consumption and output of emissions must not exceed the natural reproduction of resources and the cleansing capacity of nature.

The Brundtland definition of sustainability (1987) is literally: "Sustainable Development is to ensure that humanity meets the needs of the present without compromising the ability of future generations to meet their own needs." The director of the International Society for Industrial Ecology, John Ehrenfeld, has the following definition of sustainability (2003), which he used in his study of the use of metaphors in industrial ecology: "Sustainability is the possibility that human and other life will flourish on Earth forever… Flourish means not only survival, but also the realization of whatever we humans declare makes our life meaningful: justice, freedom, dignity…" It is difficult, if not impossible, to measure the degree of sustainability in a society or business. However, some nascent attempts have to this point included indicators of economic, environmental and social performance. Known as "the triple bottom line ", a few companies have presented sustainability reports based on a selection of measurable indicators within each of these dimension.

Sustainability can be defined as strong and weak. *"Weak" sustainability* is defined by Hueseman and others (2003) as a strategy which includes to some extent the use of non-renewable resources, such as metals, minerals and fossil resources. This should be thought of in a cautious way through loop-closing and limited extraction. "Weak sustainability" may be a realistic approach towards sustainable development, but will also demand substitutes for the nonrenewable resources in a long-term perspective. In terms of energy, renewable sources must also become the dominating alternative in a long-term perspective (Wigum, 2004).

"Strong" sustainability is a strategy without compromise. This is a clear approach towards renewable materials and solar-based energy sources. While it might be the type of strategy that does not wait for society and individuals to "wake up" and understand that a change in thinking is necessary to survive, it is rather dominated by a top-down management process including radical solutions and system change. "Strong" sustainability might also be based on a precautionary evaluation of the signals from nature, as James Lovelock points out in a newspaper article (May 2004) on climate changes and available sources for clean energy. Lovelock sees no other option than to introduce nuclear power sources today, replacing all coal and other fossil-fuel based systems, to slow down the accelerating process of climate changes caused by the emission of climate gases (such as CO2). The way Lovelock understands the global situation, we do not have the option of experimenting for 50 years, which is the time it might take to design and develop sustainable solar-based energy transformers.

The objectives of sustainability concept are: providing adequate shelter, improving management of urban settlements, promoting sustainable land-use planning and management, providing environmentally sound infrastructure facilities, promoting energy-efficient technology, alternative and renewable energy sources and sustainable transport systems, enabling disaster-prone countries to plan for and recover from natural disasters, promoting sustainable construction industry activities, and finally human resource development (Collins, 2010). Sustainability sometimes used ESD, E means Ecological, Economic and

Environmental; S means Sustainable and D sometimes Development, sometimes Design. Sustainability of all three environmental, socio-cultural and economic systems called triple bottom line (World Commission on Environment and Development). Sustainable development simply aims to make forms of national and global development less environmentally damaging (Fry, 2009). Some examples of them; Building Research Establishment Assessment Method (BREAM) was established in the U.K. in 1990, LEED System, (Leadership in Energy and Environmental Design)in U.S.A in 2000, Sustainable Building Tool (SBTool), developed through the collaborative work of representatives from 20 countries (Lawn, 2011). Australia's Green Star green building rating system was launched in 2003 and has certified 148 projects through April 2009. Green building rating systems such as LEED, BREAM and Green Star attempt to be comprehensive by addressing as many sustainability concerns as can be readily quantified such as energy use, air quality, urban sprawl. In fact, their success is in large measure due to this fact of quantification of the components of an issue whose complexity defies simple description and resolution (Ozolins, 2010).

Sustainability affects material choice, materials life duration, lighting preferences, ventilation, heating systems, waste control, health of users, safety and hygiene. These terms are discussed below in terms of sustainability.

3.1. Lighting in Sustainable Kitchens

Light can be natural and artificial and openings. A combination of bright task lighting correctly angled and positioned over counters and appliances, and warm ambient or background lighting is preferable. Lights should be carefully positioned so that you are not working in your own shadow (Conran, 2010). Local lighting should be done for preparation, cooking, washing areas under the cupboards besides ceiling lambs (Faulkner, 1979). Light must come from left top of front top (Neufert, 1998).

Figure 3.1. Wrong lamb position (Gönen 1988 citied in Gelegen, 2009).

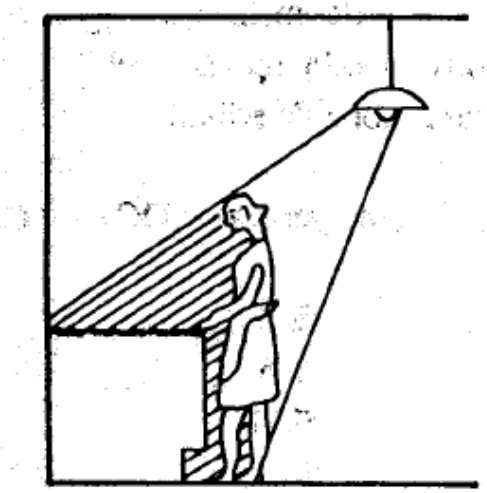


Figure 3.2. Right lamb position (Gönen 1988 citied in Gelegen, 2009).

In sustainable kitchens, first preference can be natural light. Taking more light, kitchen windows' height and direction are considered. Removing a wall allowed more natural light in, is as possible (Hardwick, 2010). Bulb choice is a second important issue. To cut down on energy bill, you can opt for energy efficient compact fluorescents. These come in a wide range of shapes and can be fitted into every conceivable kind of light fixture. Although they are more expensive than tungsten bulbs, fluorescents consume only a fifth of the energy and last 15 times longer. Another alternative is low-energy halogen lights, which provide fresh, clean light. LEDs, or light emitting diodes, offer a whole spectrum of colors and are being used increasingly in domestic fittings. LEDs not only reduce power consumption but also reduce heat gain significantly, lowering the air-conditioning load. Also, purchasing bulbs with the lowest wattage feels comfortable with to save cost.

If you eat in the kitchen, put the task lighting on a dimmer switch, so that you can lower light levels when you are sitting at the table (Conran, 2010). If the kitchen has the luxury of designing, design it to allow the largest amount of natural light into the room to cut down on the need for bright lights. Light fittings can be designed so that only approved low-energy components will fit, as is the case with the Eaton MEM BC3 range of light bulbs and lamp-holders (Lockton et

all., 2008). Using T-8 lamps reduce wattage requirements and heat gain without reducing illumination levels if you cut the flow rate 30 percent (Berning, 2009).

3.2. Ventilation in Sustainable Kitchens

Researches show that ventilation is the third largest energy saving opportunity after water usage and the cook line (Nyström, 2003). Combinations of soot and moisture, especially a temperature below +16ºC influence the indoor climate and also favor mold growth, which may exacerbate asthma and allergies Also, horizontal winds caused by natural ventilation through doors and windows, and vertical air movements caused by chimney effect must be controlled. You can avoid cold winds by sealing towards winds (Nyström, 2003). If you live an area that gets cold in the winter, a heat recovery ventilator which converts the heat in the exhaust air into warm air coming into your room can be ideal. Keeping a spider plant in the kitchen removes carbon monoxide (Bonoma, 1997). Aloe Vera is effective at removing formaldehyde at low concentrations. Hobs are ineffective in removing the pollutants produced by cooking. The best models are only capable of removing grease and smoke, but not steam or gases. To be at all effective, the carbon employed in the filter must be a solid block and thick enough so that you cannot see through it (Goldbeck, 1989).

3.3. Heating in Sustainable Kitchens

Heating in kitchens can be provided by different sort of appliances. It can be local, central or under the floor. Correct temperature in kitchens is 20 C and 18 C while making a hard job. Low-E, or low-emissivity, glass prevents excessive heat loss in winter. For kitchens on upper levels, top glazing provides a hint of the world outside, as well as the invigorating quality of natural light (Conran, 2010). Upgrading windows and using double glazed glass are often seen as an important step in reducing energy loss between the outdoor and indoor environments (Laskey, 2009). If you use big windows, you need double glazed glass to keep out heat or cold or glare.

Heating water is one of the most expensive commodities and kitchens use half of the hot water in the home. For energy consumption thermostatically controlled mixing valves. Solar heat can be en economical way to heat hot water. There are three main types of it; batch heater, the thermosyphons and the pump system. In cold climates the pump system is preferred, in order to eliminate the possibility of freeze up. While heating house, electricity or gas can be used. Gas is cheaper than electricity, but it can cause health problems.

Materials of the kitchen, hard materials such as enameled steel, plastic laminate, finished room, tile and glass can make kitchen colder (Goldbeck, 1989). Adding cushions to chairs, throwing rugs with nonskid pads, adding wall hangings, covering windows, for summers; shading, window insulation, split bamboo shapes can be good alternatives for comfortable heating.

Trees are important in keeping energy costs down in air-conditioned places. Just three trees planted on the sunny side can cut cooling costs by as much as one third (Goldbeck, 1989).

3.4. Color in Sustainable Kitchens

Colors absorb or reflect the light according to their kinds. The more ratios of reflection increases, the lights seem more luminous. Hot colors give energy and the cold and light colors relax people.

Kitchen in south and south west side take natural light much more than the north side, so in these kitchens cold colors such as blue, purple and green can be used. In the other side hot colors can be used (Kalınkara, 2006). Color which has high reflection ratio is more appropriate for kitchens (Yurdemi, 1992). Using those can reduce need of artificial lighting, and it can contribute energy saving.

Table 3.1. Reflectin ratio of colors

Colors	Reflection Ratio
White	% 84
Cream	% 73
Dark cream	% 70
Lemon	% 70
Grey	% 45
Black	% 8

3.5. Acoustic in Sustainable Kitchens

Relationship between acoustics and sustainable design has become increasingly evident in recent years. At the heart of sustainable design and acoustics are fundamental concerns for environmental impact, profitability and health and safety. Accounting for acoustic conditions can greatly increase the overall comfort level of a space, while poor acoustics can result in dangerous, unhealthy environments. Noise concerns in dining and kitchen environments are becoming an important issue because of several factors: Layouts with open or display kitchens and bars that flow into the dining area; metal, drywall and hard plaster have replaced acoustic tile ceilings; chairs and banquettes often have less fabric or cushion. To avoid noisy kitchens some precautions can be taken:

- Install rubber or felt bumpers to cushion the impact of slamming kitchen cabinets doors and drawers.

- Check for obvious leaks or flanking paths. Flanking refers to transmission around a barrier: Sound is conducted by structural materials or cavities that by pass the barrier intended to separate rooms and spaces. Such alternative paths increase the amount of sound transmission in buildings, even if there is a good

design and construction. For example, running a plywood sub-floor under a costly double-stud party wall can reduce sound blockage from outstanding to unacceptable.

- Several specialty ceiling products are available that can achieve both health-code guidelines and provide sound absorption. In most areas hard-surface ceilings usually are required only over actual cooking, food preparation and sanitation areas. That leaves the opportunity for using noise control acoustic tiles in aisles, pantries, service bars and so on. Spray-on cellulose products can be sprayed on new or existing ceilings and are a very cost-effective noise treatment approved for dining areas.

- Isolate refrigeration systems over 400W on a rack or in a remote location away from dining and work areas (Foster, 1999).

- Locate ventilation and air-handling fans on the roof rather than above the ceiling if at all possible. That assumes they will be isolated from the roof structure. Mount all large fans, pumps or other equipment that vibrates or rumbles on sound concrete pans with rubber isolators. Insulate ductwork with high-velocity air movements.

- Insist that the bottom of all sinks and tables have sound-deadening materials.

- Consider optional insulation packages for larger dishwashers that reduce both noise and heat generated from inside the unit.

- Request that the inside of the housings or cabinets around noise equipment be wrapped with sound-deadening materials.

- Install industrial noise control panels on walls and ceilings surrounding noisy equipment. A variety of foam barrier composite materials combine sound absorption and noise containment, with durable and waterproof facings.

- Include sound levels, rated in decibels, in your equipment selection criteria.

3.6. Waste Control in Sustainable Kitchens

A great deal of household waste is produced in the kitchen. As part of the preparation process, inedible or unappetizing parts of food-peels, seeds, bones, shells, rinds, fat, gristle and stems-are removed for disposal. All sorts of metal, glass, paper, cardboard or plastic packaging is accumulated. After a typical meal, food scraps remain.

Waste management planning in the kitchen begins by understanding the different types of waste that are generated in the kitchen and the different disposal methods for each. Waste from kitchen activities can be grouped as follows:

- Food waste: Most food waste is organic and so is biodegradable. Much food waste can be composted and need not be put into a landfill.

- Packaging waste: Packaging may need to be separated by material to facilitate recycling as much waste as possible.

- Paper products: In a typical home, a lot of paper becomes waste in the kitchen, much of which can be recycled, and some can be composted.

- Miscellaneous waste: Because of its central location, the kitchen trash easily becomes the repository for waste from other rooms and activities. Even some of this extra waste can be recycled or composted.

Waste management in the kitchen is influenced by community practices and regulations. These practices will determine how much space is needed to collect trash and recyclable items and how many separate containers are needed.

Storing waste

Two kitchen appliances can be part of the waste management process. Garbage disposers install under the sink drain, and grind up food waste so it can be flushed into the sewage system. Trash compactors hold trash and compact it to reduce the volume. For other waste, follow these management tips:

- Storage for recyclable items should be accessible, such as in errs that roll-out, pull-out or swing-out. It needs to be easily removed to transport recyclable materials side of the house.

An alternative storage arrangement would be to include space for a community-provided recycling container that could be lifted or wheeled outside for collection. Containers for recyclables need to be durable and easy to clean and non-absorbent material so that odors are not a problem.

- Include a small sink in the recycling center or close by. Many items tined for recycling must be rinsed. A gooseneck or pullout style faucet adapts to different size containers.

- Provide storage for items used in preparing recyclables, such as twine for binding newspapers, scissors for cutting packaging, extra paper or plastic bags for sorting items, twist ties for closing bags, a magnet for testing metals, or can opener for removing lids.

- Provide space for a small trash can for non-recyclable items removed or discovered in the preparation of recyclable items.

- A small counter area will provide workspace for preparing and sorting recyclables.

- If the household uses and collects returnable bottles, incorporate storage for these into the recycling center (National Kitchen & Bath Association, 2007).

3.7. Safety

Since most kitchen fires start while people are present, fire precautions and firefighting equipment like smoke detectors are important. Every kitchen should have at least one fire extinguisher for oven and small fires. Small appliances should be unplugged. Switches and power points are installed well away from the sink. Cookers and hobs should be sited away from windows. Flooring should be as non-slip as possible. Work surfaces and cooking areas should be adequately illuminated. Counters should have rounded corners.

4. METHOD

4.1. Design of the Study

This research is a survey study. It investigates thoughts of 40 kitchen users who have different types of kitchen, about their kitchens and evaluates their kitchen performance. After performance evaluation, it gives sustainable kitchen suggestions for designers and discusses sustainable kitchen design criteria in the light of literature.

4.2. Participants

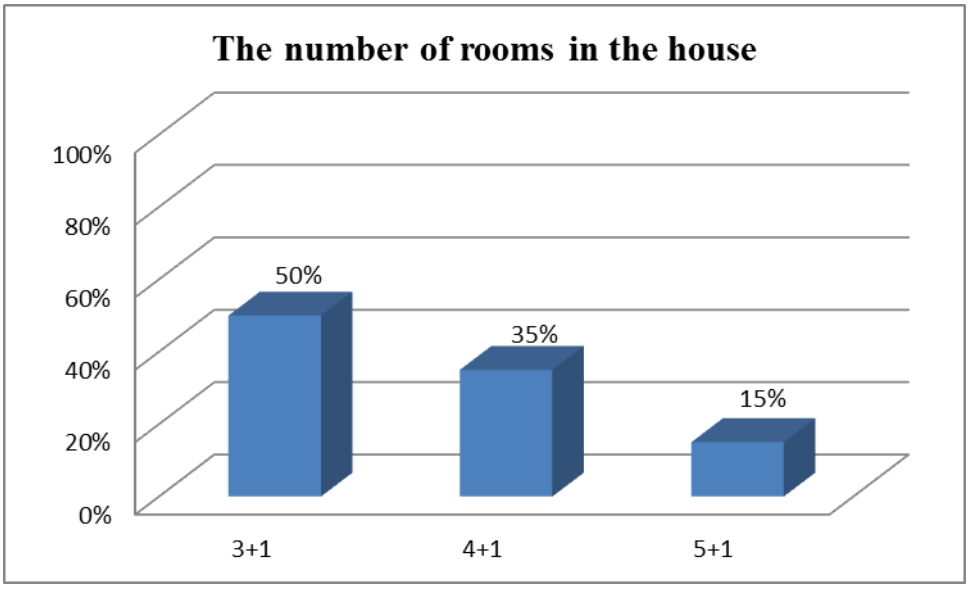
Participants of the study are from different socio-economic status and have different type of kitchen and house plan. 40 users are joined to this study. While choosing participants, it is tried to be rated stratified sampling technique and nearly the same number people who have different type of kitchens are attended to study. 7 participants have I shape, 7 corridor shape, 7 Island shape, 7 G shape, 6 L shape and 6 have U shape kitchens. 2 of them are 18 - 30, 14 of them 30 - 45, 20 of them 45 - 60 and 2 of them 60 - above aged. 15% of them graduated from primary school, 35% of them from high school, 35% of them from university and 15% have master degree. 20% of them are from low socio-economic status, 30% of them medium status and 50% of them are from high socio-economic status. When we look their ownership of house, 95% of them are the owner of house and the others are renter. Characteristic of participants are given below.

Table 4.1. Characteristic of participants.

Characteristics		**Frequency**	**Percentage**
Age	18 - 30	2	5
	30 - 45	14	35
	45 - 60	20	50
	60 - above	4	10
Ownership	Owner	38	95
	Renter	2	5
Education	Primary school	6	15
	High school	14	35
	University	14	35
	Graduate	6	15
Salary	1000 - 2000	8	20
	2000 - 4000	12	30
	4000 - above	20	12

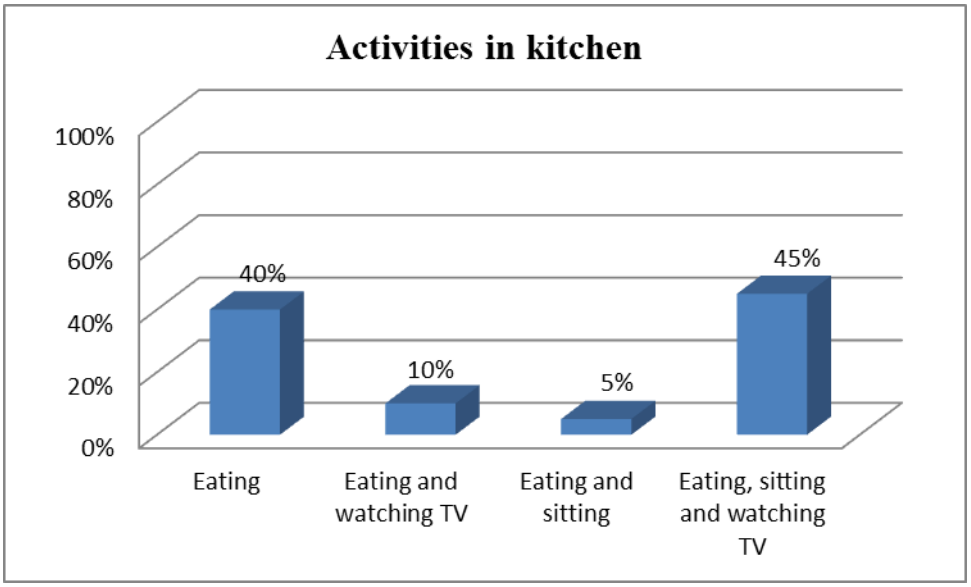
50 % of participants have 3+1, 35 % of them have 4+1 and %15 of them have 5+1 houses.

Table 4.2. The number of rooms in the house



Participants use kitchen not only for cooking, washing but also eating and watching T.V. 95% of participants eat their meal in the kitchen. 45 % of the participants use kitchen for all cooking, eating, and watching. Activities which are done in kitchen are below.

Table 4.3. Activities in kitchen



4.3. Instruments

In this study a questionnaire was applied to participants to collect data. In the first part of it, general information of users are taken and in the second part questions about their kitchens' measurements and characteristic are asked, at the last part users' view about their kitchen are collected. In the questionnaire while there are yes-no questions, also there are open-ended questions in the last part while taking users' opinions.

4.3.1. Validity of the questionnaire

While preparing questionnaire, firstly task form was prepared. Task form was given to experts to take their opinions and provide content validity. Two of them are architectures, one of them is language expert and one of them is a statistics expert. After their views, the form was rearranged and it is given to experts again. Finally the original form was written and applied to 40 users.

4.4. Data Collection

While collecting data, the researcher went to users' houses by herself. She interviewed by users' one by one. These houses are in different reasons and in different types. 20 of the house are duplex and triplex houses and 20 of them are flats. Firstly researcher interviewed the users, and then she measured the kitchens, drew their layouts and took photos. Obtained data was gathered with literature and most suitable kitchen in sustainability and user friendly is tried to be found out.

4.5. Data Analysis

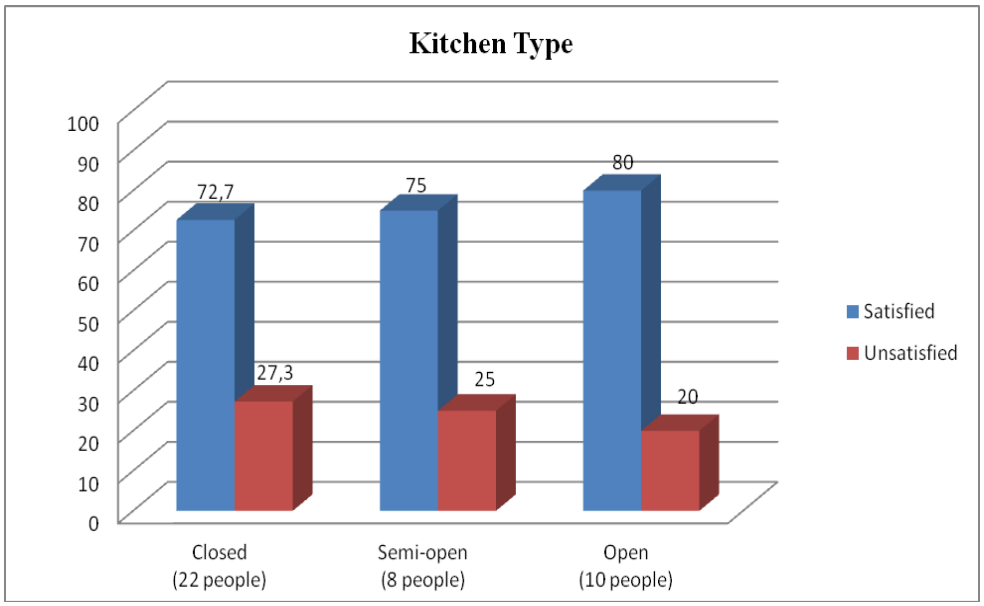
Data which was obtained from questionnaire loaded to SPSS 16 (Computer Based Statistical Package for Social Sciences). Frequency of results and mean scores were calculated. For open-ended questions researcher kept tally to find the most common answers. Results were showed by charts. To show features of kitchen photographs of kitchens were taken and kitchen's layouts were drawn. All finding were gathered with literature.

5. FINDINGS

5.1. User opinions on kitchen location and types

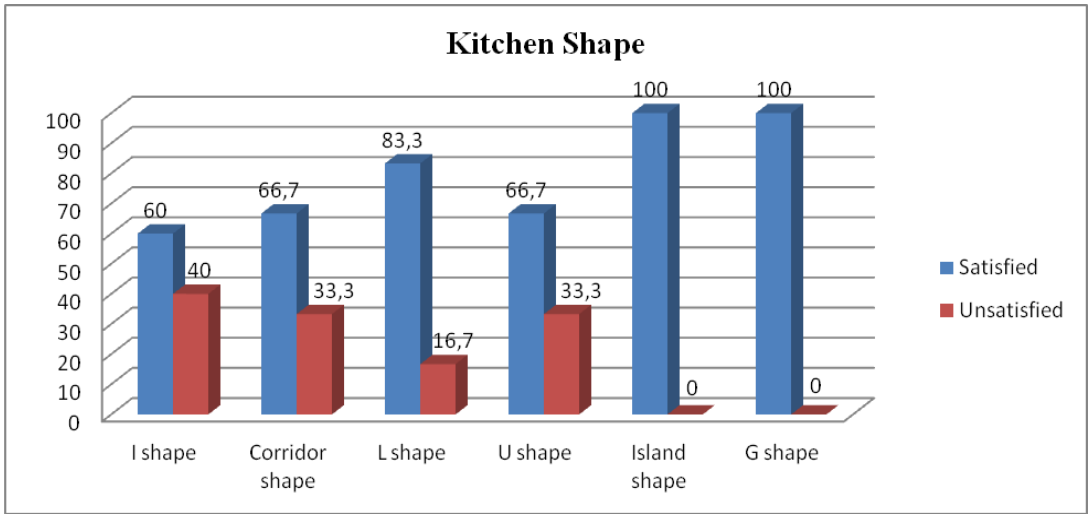
Locations of the kitchens are different. They can be open, closed or semi open. When we look at the results, 72.7% (16 people) of the users are satisfied with closed kitchen. 75% (6 people) of semi open kitchen users are satisfied. And with 80% (8 people) rate open kitchen has the highest satisfaction rate. Conran confirms that result with this statement: At the turn of the 21st century, open plan living with a bench height 'cooker island' is the common model in new houses (2010). Unlikely to this, Yıldırım and Hacıbaloğlu (2000) say closed kitchens are usually preferred.

Table 5.1. Satisfaction ratios of kitchen type.



When we look the shape of the kitchens, Island and G shaped kitchens have the highest satisfaction ratio. L shaped kitchen follows them with 82,3% (5 people). Corridor and U shaped kitchens have the same range. G shaped and Island shaped kitchens have normally high ratio, because they are big kitchens and give comfortable working areas to users. Comfort of users are important for sustainability.

Table 5.2. Satisfaction ratios of kitchen shape.



Photos of the kitchens which have the highest satisfaction ratio.

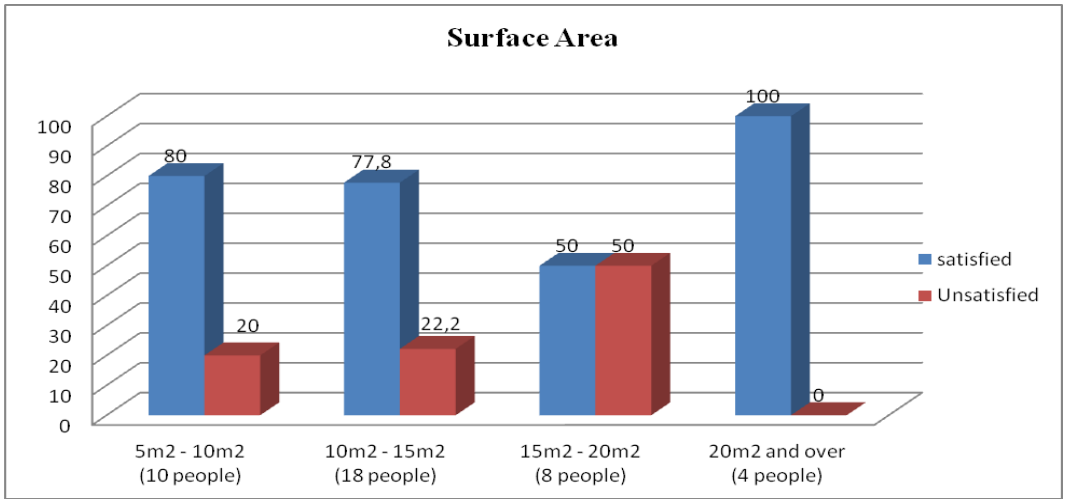
Figure 5.1. Island shape kitchen

Figure 5.2. G shape kitchen

5.2. Kitchen layout and furniture measures for user satisfaction

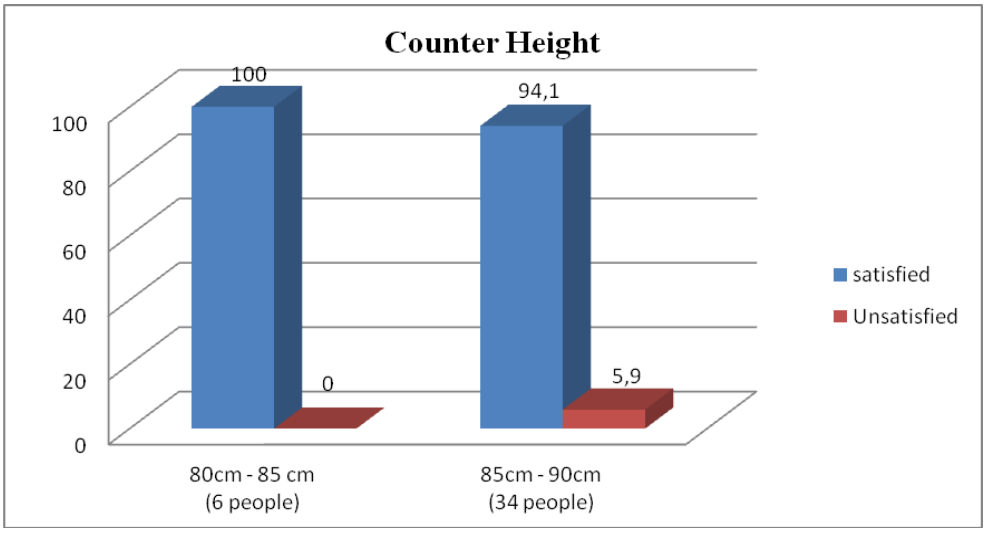
Kitchen efficiency does not depend on the size or shape of the space at your disposal: it is down to good planning. If you do not have very much space at your disposal, a fitted kitchen is the best option; adjustable shelving makes full use of height, depth and breadth. If you don't have enough budgets, you can use unfitted kitchen (Conran, 2010). As Conran said, the advantage of this approach is that you can acquire elements as your budget allows and be reasonably flexible with arrangement. Users who have 5 - 10 square meters kitchens are pleased with their kitchens, 10 - 15 square meter kitchens are mostly preferred in this research. 15 - 20 square meter kitchens are preferred by fewer people. Smaller kitchens make their users happier than the other. Because, users get tired less while working in the kitchen and they reach appliances easily. It is important to conserve human energy: kitchen work can be as demanding in terms of energy expenditure (Goldbeck, 1989). Sustainability encourages the reduction of kitchen space thereby reducing material usage and energy required to run it (both human and fossil fuels) (Holowka, 2007). Satisfaction ratios are below.

Table 5.3. Satisfaction ratios of surface area.



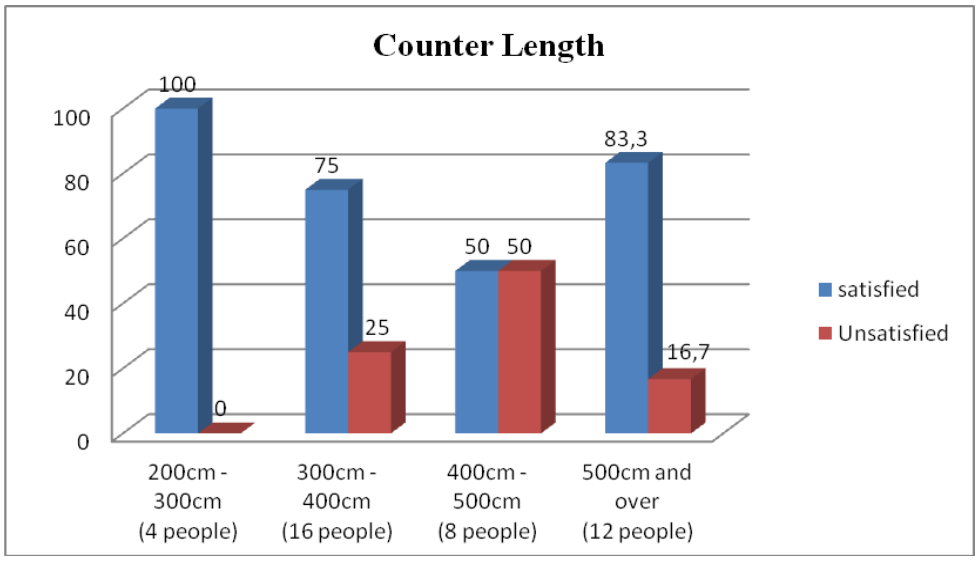
Working surfaces and cupboards are usually at the same height and depth; however height and depth of them are important for the right working position. Working position can be adjusted comfortably. Working position is adapted to the height, body size and position of the cook(s), but unfortunately in practice this is rare (Conran, 2010). A basic rule applied to establish individual dimensions: in a comfortable, upright position, bend the arm 90° and measure the distance to the floor; subtract 15,24 cm, and the correct work-height is established. If several cooks are cooking in the same kitchen, average of them is used. According to our findings, users have 80 - 85cm and 85 - 90cm counters. They are happy with these heights. Users' satisfaction rate whose counter is 85 - 90cm are 94, 1%, the others' are 100% satisfaction rate. In Altıparmak's study, height of counter is proposed to be 95 cm. (2006). Counter height can be 97cm in maximum, 77cm in minimum, 82cm mixing, 99cm sink (dishwasher, etc.), 92 general (Goldbeck, 1989). Work-depth plays a role here as well: suitable one is deeper surfaces of 70-80cm (Spechtenhauser, 2006). Altıparmak has a different depth; 65-75 cm is to be. These measures should be adjusted according to user's body size. Because sustainability supports comfort and health of users.

Table 5.4. Satisfaction ratios of counter height.



Mostly preferable counter lenght is 200 – 300cm. 300 – 400cm has 75%, 400 – 500cm 50% pleasent rate. For sustainable reasons single lenght counters are suitable so that bacteria cannot build up in the crevices.

Table 5.5. Satisfaction ratios of counter length.



30 - 35cm depth cupboards are less preferred ones. Users who have 35 - 40cm and 40 - 45cm depth cupboards are entirely pleased with this depth. Generally users prefer deeper cupboard. Also, open-ended question answers support this result, because users want more cupboard and adequate space for

storing kitchen appliances such as dishes, pans, etc. Similarly cupboards adequacy rate is low with 60% ratio. In different studies, findings are similar. Users complain about lack of storage area (Gelegen, 2009; Yeşilkavak, 2007). Researchers found people were generally satisfied with their kitchens but given a chance to make changes; they generally would opt for more storage, cabinets, and counter space (Emmel et al., 2001). In literature, total shelf area is 4.65 m^2 with not less than 1.85 m^2 in wall or base and total drawer area is 1 m^2 in minimum. Adequate cupboard capacity may provide storing more appliances in a clean environment. Clean environment means hygiene. Hygiene is a vital issue for health of human and so for sustainability.

Table 5.6. Satisfaction ratios of cupboard depth.

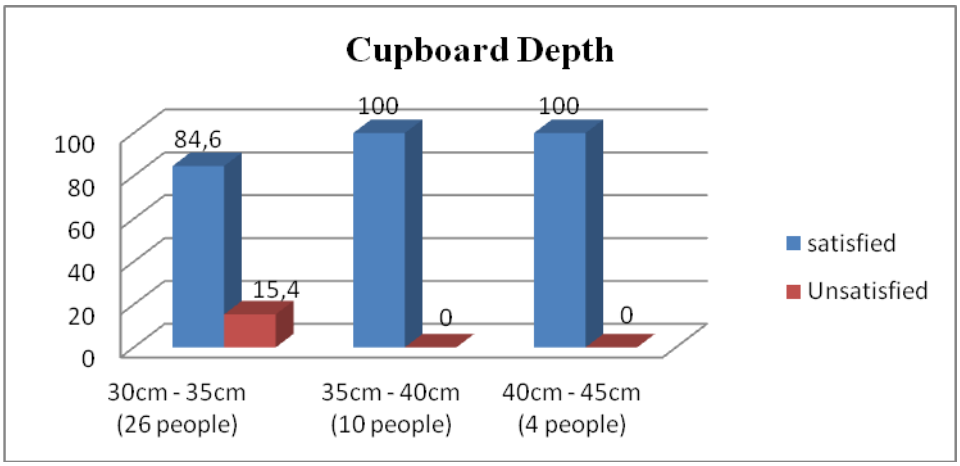
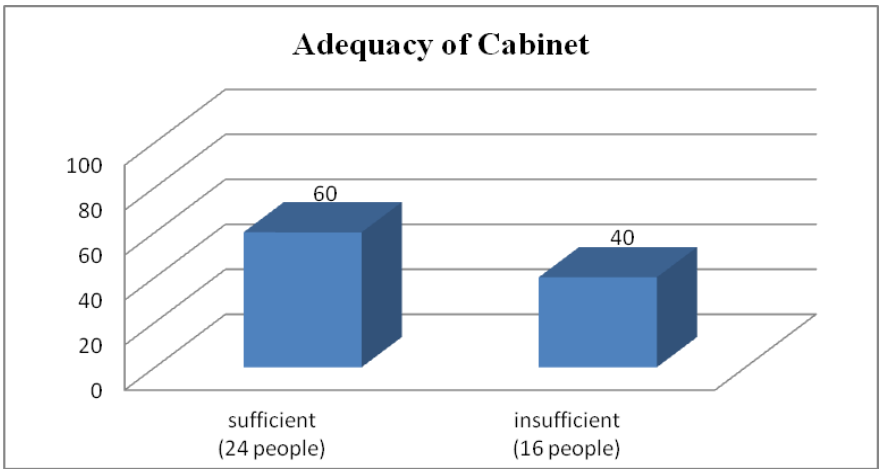


Table 5.7. Satisfaction ratios of cabinet's adequacy.



5.3. Evaluation of ergonomics by users

Kitchens are places which consume different kinds of energy. The key point in sustainability is reducing this consumption. Appropirate layout is important to decrease human energy. While designing working places, especially working triangle, comfort of users should be considered. One of key concepts in kitchen planning is the ‘work triangle’.

Distances between refrigerator – cooker, refrigerator – sink and cooker – sink are important to use people’s energy efficiently. Users are mostly pleased with short distances such as 50 – 100cm between refrigerator and cooker, refrigerator and sink and 0 – 50cm for cooker and sink. When the distance becomes further, their satisfaction rate decreases, because further distance means much more work and energy consumption. Conran tells work triangle distances similarly. İlçe and Usta find this number as 120 cm. (2003). Ergonomic studies have shown that the distances between the sink, refrigerator and cooker should not be too great in order to maximize efficiency and safety. Work surfaces between work triangles should be at least 60cm. When the distance become more range of pleasure decreases. Ideally, an imaginary line drawn between the three key areas of activity should not exceed 6m. (Conran, 2010). Sustainability requires saving energy. Human energy is one of them, so distances which has high satisfaction ratio is suitable to sustainability. All rates have been given in tables below.

Table 5.8. Satisfaction ratios of distance between refrigerator and cooker.

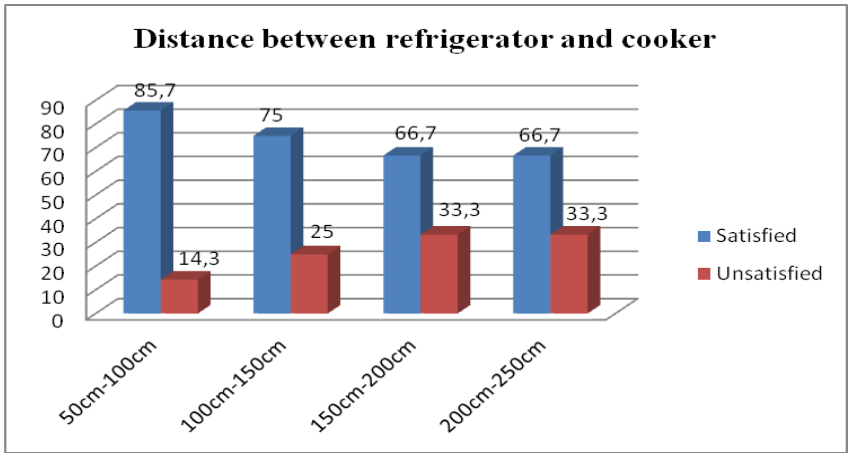


Table 5.9. Satisfaction ratios of distance between refrigerator and sink.

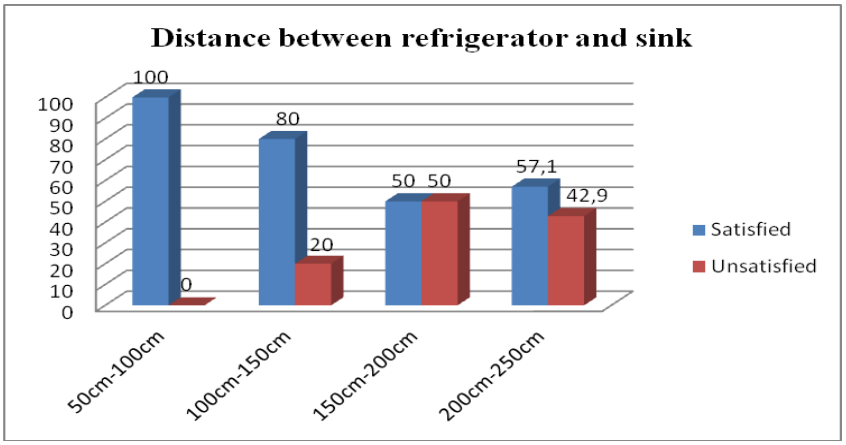


Table 5.10. Satisfaction ratios of distance between cooker and sink.

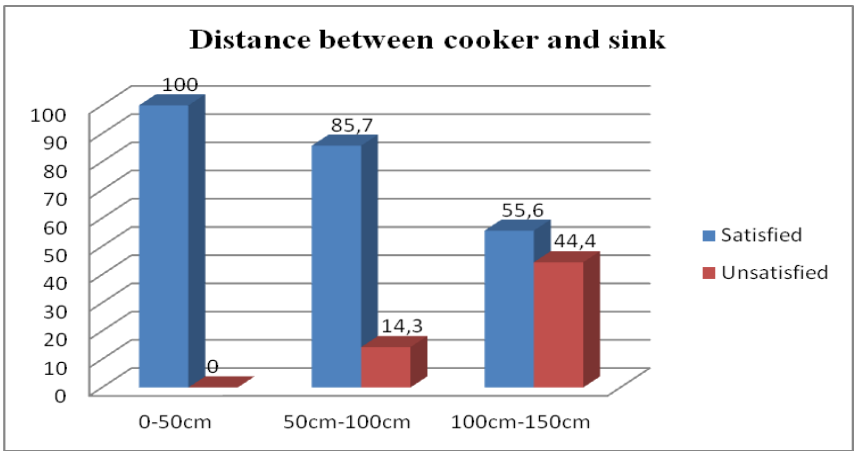


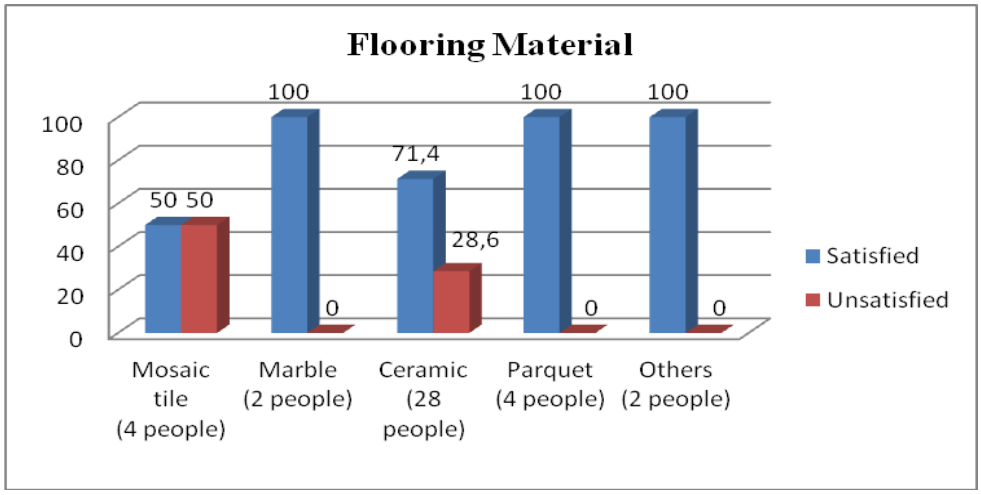
Figure 5.3. One of the most satisfied working triangle.

5.4. Preferred kitchen materials for suitability and sustainability

Material choice can change according to age, economical conditions, kitchen type, and people's pleasures. While making these choices, the materials should not damage the nature. Sustainable building has to be constructed from natural sustainable materials collected onsite, generate its own energy from renewable sources such as solar or wind, and manage its own waste. On flooring surfaces, marble, parquet users have 100% satisfaction rate. 71,4% of users are happy with ceramics. Not only the users prefer marble but also it is a sustainable material. It has got long life and it can be clean easily. On floorings, light ceramic, tile, with pale wood is a subtle way (Spechtenhauser, 2006). Ceramic tiles have a better average of environmental values than marble, carpet and mosaic tiles. Ceramic tiles have the best value in terms of global warming; the value for ceramic tiles is very close to the value for marble tiles and mosaic tiles. Unlike this, while chosing parquet users should take attention, because of its glue. Parquet should be constructed with phenol formaldehyde glue instead of urea formaldehyde. Sealing in formaldehyde is a strategy that works well it and similar products. Polyurethane will seal in most fumes.

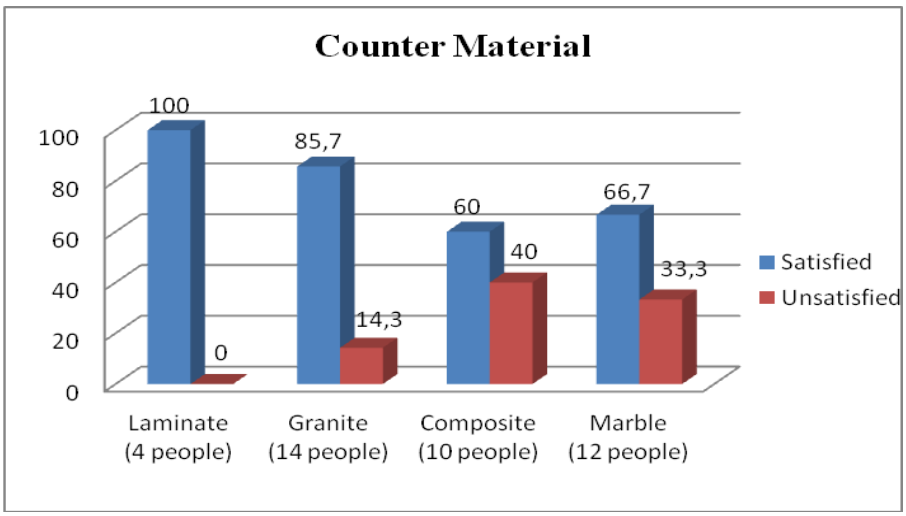
According to Özgecan "As concrete slabs can consume more cement, which is high in embodied energy and harmful emissions, it results in higher impacts on environment. Block flooring has less environmental impacts in terms of the values of climate change, human toxicity, waste disposal, water extraction, acid deposition, eutrophication, minerals extraction and recycled input. The two types of floors have same impacts according to the values for fossil fuel depletion, ozone depletion, freight transport, Eco toxicity, summer smog and recyclability" (2007).

Table 5.11. Satisfaction ratios of flooring materials.



All surfaces need different material choice. These choices change according to usage purposes. Counters are wet surfaces, so the materials should be durable and hygenic. Users which have laminate counters are pleasent with them, but it needs protecting from heat and being single lenght to avoid bacterias. 85,7% of granite users are pleased to it.

Table 5.12. Satisfaction ratios of counter material



For counters, tops-stone, granite, marble, glass, timber can be used or would be the tiles or Eco Top, manufactured from recycled paper, bamboo and wood fibers (Laskey, 2009). A good quality counter, in stone, for example, can lift a

simple fitted kitchen out of the ordinary. Thick counters are the most durable. The most common thicknesses are 3cm and 4cm. A 4cm counter will have greater resistance to heat and be less prone to cracking or warping. The counter should be fitted as a single length so that bacteria cannot build up in the crevices and it can be suitable to sustainability.

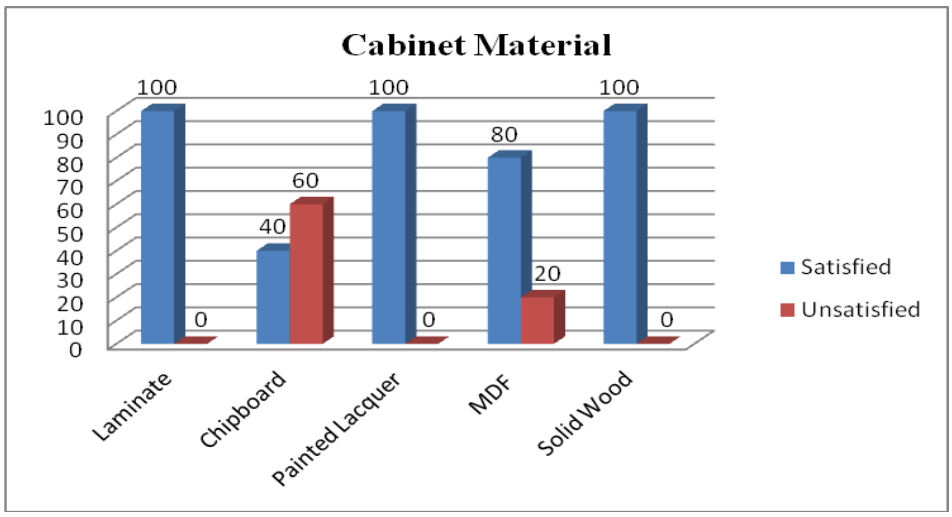
Figure 5.4. A single length counter.

Cabinet material must be strong. Users prefer painted lacquer due to decorative reasons. All of them are pleased with it, but bio-paints should be chosen for being healthy. Also solid wood has 100% satisfaction degree of users. MDF's satisfaction rate is 80%. Chipboard which has 40% ratio is the least preferable material. Satisfaction ratios except solid wood aren't suitable to sustainability. People sometimes can make choices according to visual causes, but it can not always be a healthy choice.

Cupboard doors and drawers should be painted with bio-paints and natural non-toxic materials and it can be from solid timber, timber veneer, lacquer, plywood, stainless steel and glass. Smooth flush doors and drawers fronts create cleaner and more streamlined appearance. Hard vinyl tile may be an option, but it is hard on the feet and leg joints and it is noisy. It is not very recyclable. Materials

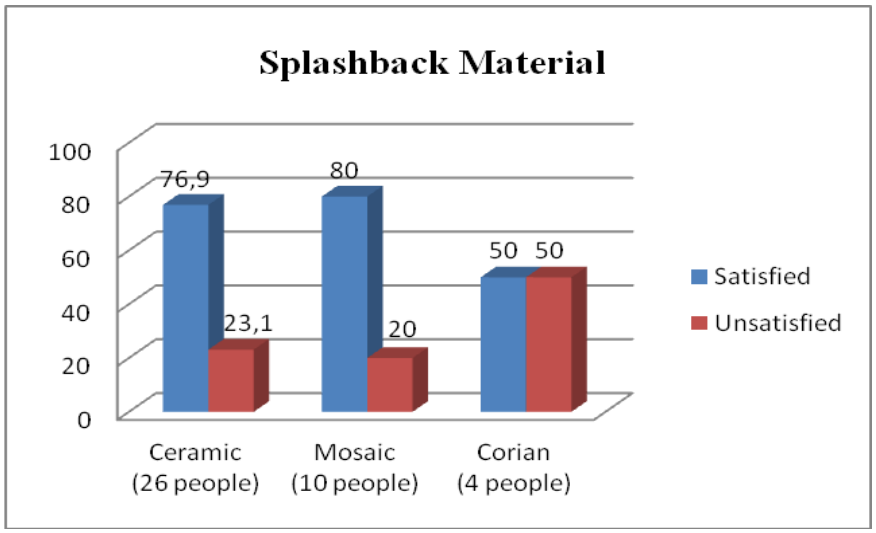
should be chosen carefully because users live with it for as long as it stays in good shape (Bonoma, 1997).

Table 5.13. Satisfaction ratios of cabinet materials.



Most preferable splashback product is mosaic and ceramic because of their variety in color and shape and also easy clean. Ceramic is a good alternative when it is thought for sustainability, because of user comfort, health and hygiene. Corian with 50% rate has the least rate of satisfaction.

Table 5.14. Satisfaction ratios of splashback materials



Counters, cabinets and flooring can all be made of eco-friendly materials. Unlike options such as linoleum flooring, they do not emit toxins. You can find cabinets made of bamboo, flooring made of concrete and counters made of recycled paper and glass. Not only are these options beautiful, but they also can actually save energy and simplify cleaning. Sustainability of a material can be evaluated according table below.

Table 5.15. Sample Information Requirements for Sustainable Building Materials (Pearce, 1998).

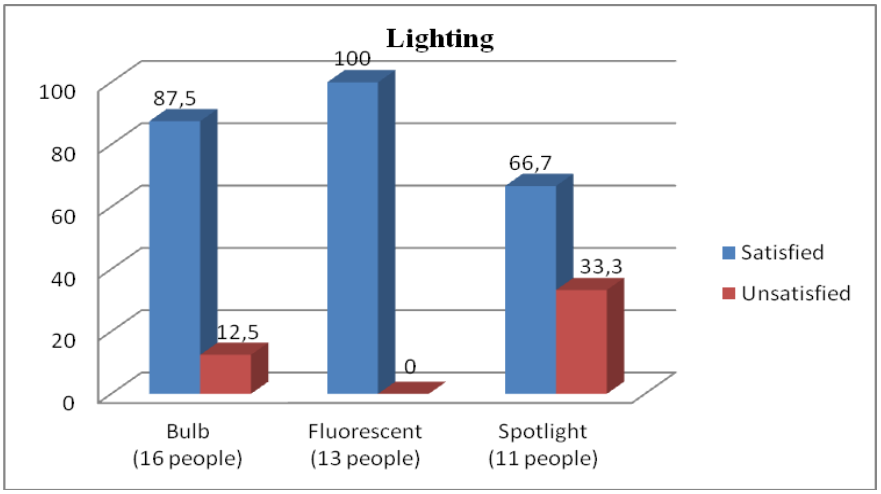
Environmental Performance	Technological Performance	Resource Use Performance	Socio-Economic Performance
Impacts on Air Quality • Carbon Dioxide • Hydrocarbons Impacts on Water Quality Impacts on Soil Quality Ozone Depletion Potential Site Disturbance Assimilability Scarceness Impacts during Harvest Processing Impacts	Durability Service Life Maintainability Serviceability Code Compliance R-value Strength Constructability	Energy • Embodied • Operational • Efficiency • Distributional Degree of Processing Source Reduction Materials • Renewable • Recycled/ Recyclability • Reused/ Reusability • Renewability • Local/Transport Distance • Packaging Requirements	Occupant Health/ Indoor Env'l Quality • VOC Outgassing • Toxicity • Susceptibility to biocontamination Appropriateness for: • Scale • Climate • Culture • Site Economics: • Contribution to Economic Development. • Cost • Labor Skill Requirements • Labor Amount Requirements

5.5. Users views of about lighting and its suitable for sustainability

Lighting is an important subject especially while working. For energy efficiency, natural lighting and kind of lamps are vital issue so the lamps which require less energy should be chosen such as fluorescents. 100% of fluorescent users, 87,5% of bulb users and 66,7% of spot users are satisfied. When we look for sustainability, Goldbeck confirms that result "You can opt for energy efficient compact fluorescents" (1989). Fluorescents consume only a fifth of the energy

and last 15 times longer and are wide range of shape. Another alternative is low-energy halogen lights, which provide fresh, clean light. If you eat in the kitchen, put the task lighting on a dimmer switch, so that you can lower light levels when you are sitting at the table (Conran, 2010). Full-spectrum bulbs should not be shielded by non-ultraviolet covers. For kitchens on upper levels, top glazing provides a hint of the world outside, as well as the invigorating quality of natural light. Removing a wall allowed more natural light in, is as possible (Hardwick, 2010).

Table 5.16. Satisfaction ratios of lighting.



Decreasing energy consumption, there are rates for lighting in terms of space's square meters. In general minimum light level should be 300 lux and it should be minimum 200 lux for counters in kitchen. Quartz halogen for counters and tubular or compact flourescents are suitable for general area of kitchen. It must be avoided unnecessery light usage. The lambs should be cleaned from dusts, dusts can prevent 50% of the light.

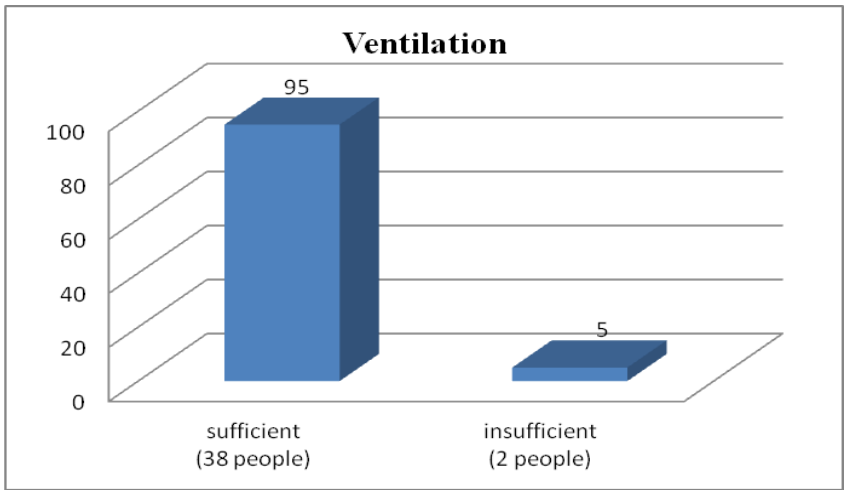
After energy effiency, direction of the light is an important situation for working comfort. The light must come from the top or front of the user. If it comes from the behind, it creates shade and gets difficult to work. Difficulty in seeing can increase cutting risks and it decreases safety.

Alternatively, the ‘Light-plants’ are communicators of environmental principles, a functional reminder of resource use. Left on a windowsill, they collect and store solar energy, and when placed on the table, they emit stored energy as light (Sherwin et.al., 1998).

5.6. User views on ventilation and its appropriate for sustainability

Climate of kitchen can causes health problems or fresh breath. To provide fresh air, ventilation is a vital component. Our kitchen users have windows, balconies and exhausters in their kitchens, so 95% of them are pleasant with ventilation system.

Table 5.17. Satisfaction ratios of ventilation.



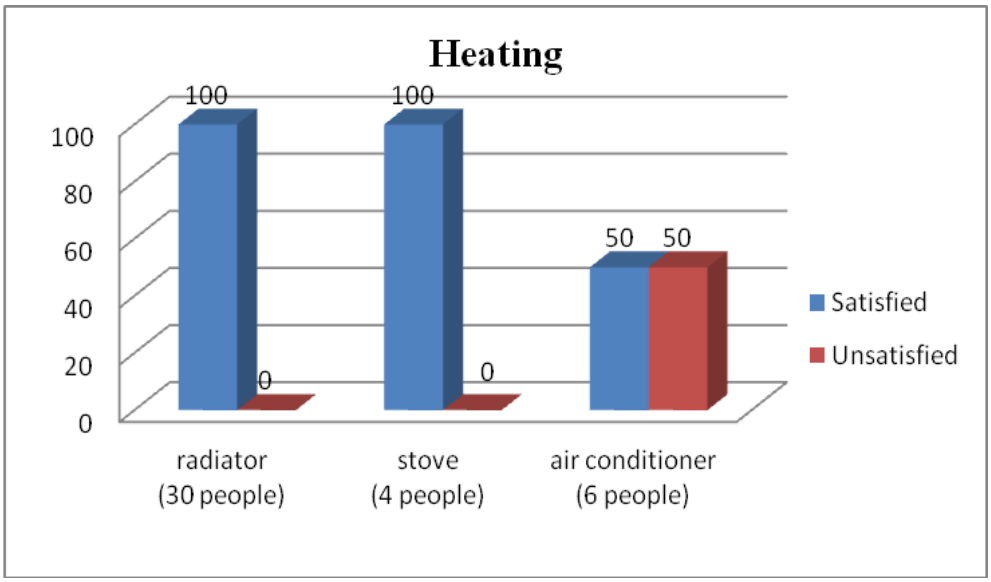
People who have extractor fans are satisfied with them on rate 76.5%, and people who use only windows are satisfied with 50%. Natural ventilation should be supported by artificial ventilation appliances. Hobs are ineffective in removing the pollutants produced by cooking. The best models are only capable of removing grease and smoke, but not steam or gases. To be at all effective, the carbon employed in the filter must be a solid block and thick enough so that you cannot see through it. Also, Exhauster should have energy efficient star (A class, B class etc.). In addition to efficiency star and economy, their voice volume is important. Noise of it must be regarded and shouldn’t be disturbing. Beside

exhausters and windows, plants can be a solution. Keeping a spider plant in the kitchen removes carbon monoxide (Bonoma, 1997). Aloe Vera is effective at removing formaldehyde at low concentrations.

Heating is provided with radiator, stove and air conditioner. Although air conditioner gives clean heat, 50% of users are not satisfied with it. Its reason can be high bills and loss of temperature easily. Other systems are more preferable. People who use radiator and stove are wholly pleasant. To heat your home economically and effectively, you should also look at the following aspects of your home that help to retain the heat: insulation in the ceilings, walls and floors sealing off draughts, heavy window coverings (i.e. curtains with pelmets), areas floor coverings (carpets and rugs). Factoring these considerations into your 'heating package' will save your household energy and money, and also help the environment.

Solar heat can be an economical way to heat hot water in all. In cold climates the pump system solar heat is preferred in order to eliminate the possibility of freeze up.

Table 5.18. Satisfaction ratios of heating.



5.7. Waste control in sustainable kitchens

Kitchen waste should be separated according their types. But in Turkey it is not applied. All waste is collected together and then they are separated. This system causes economical and ecological loss (Yılmaz and Bozkurt, 2010). Kitchen waste can be turn into green rubbish having one bin for food scraps, the second bin for recyclables and a room can be made for them. Kitchen-storage should be done with refillable and reusable containers. Smaller rubbish bins in a kitchen make users more aware of the amount of waste they are generating, since the rubbish will have to be "taken out" more often, and hence may encourage sorting of waste for recycling and better compaction of waste (Lockton et all., 2008).

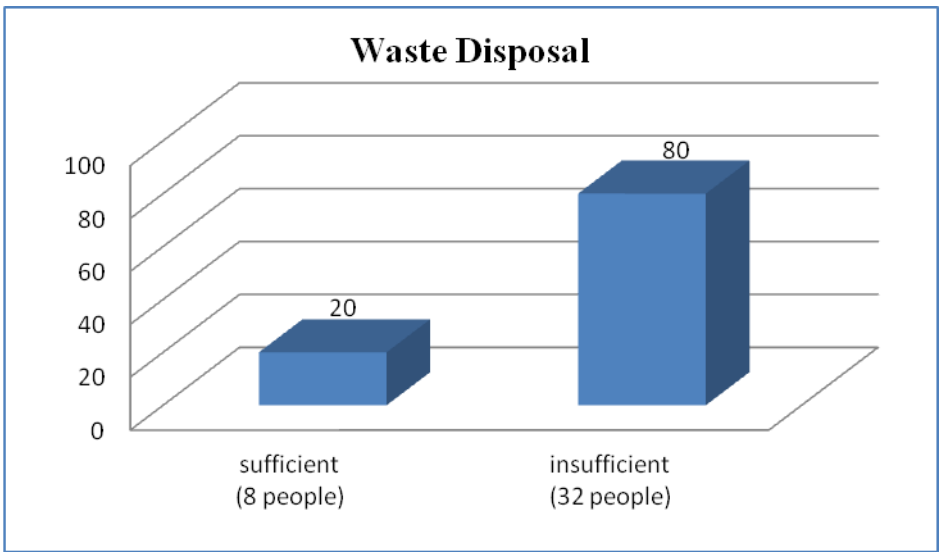
Garbage disposals, which grind up food and eject it through the sink line, and trash compactors should be avoided, since they can inhibit the natural breakdown of garbage, further adding to the global solid waste problem. Wastes can be chopped or pureed in the blender or food processor, or you can use only foods that are already quite small, such as coffee grounds, tea leaves, vegetable parings, and such. The wastes should be layered with soil.

Also, a lot of water is wasted in the kitchen. A great way to cut down on this wasted resource is by installing an efficient faucet. Some faucets save water by restricting the water flow, while others shut off automatically after a certain amount of time or if nothing is directly below them. Faucets that automatically shut off when not being used not only save water, but they can save you the trouble of shutting off water when you have something in your hands. For controlling water consumption: Installing a low-flow faucet is an alternative to cut down on water waste. By mixing air into the water stream, you get less water. You can also install an aerator onto an existing faucet (Hardwick, 2010). Simple physical constraints, smaller sinks (or sinks which noticeably expand when they are filled beyond the "inscribed" capacity — such as the Cranfield University/Electrolux Smart Sink (Sherwin et al., 1998)) set an upper limit on the amount of water that can be used.

Gray water is waste water except toilets. It is rich from organic matters and can be used in watering or feed underground water supplies (Baykal and Allar, 2007). Gray water usage is possible from two sink kitchens (Goldbeck, 1989). Household grey water includes osmosis. Purifier and a cyclone filter can be located in the pedestal, and linked to the household grey water storage.

In questionnaire, users are asked to be satisfied with whether waste control or not, their answers show that 80% of them haven't got enough waste control systems. Only 20% of users think that, they have got efficient waste control. Despite the fact that sustainability doesn't seem garbage disposal usefully, most of kitchen users want to have it.

Table 5.19. Satisfaction ratios of waste disposal.



5.8. Appliances used in sustainable kitchens

Appliances of the kitchen are very important; because they take a great place in the kitchen layout. While designing a kitchen, first of all appliances like dishwasher, refrigerator, cooker should be bought and then the layout should be drawn according to their measures.

One of the most obvious changes you can make to use less energy in your kitchen is purchasing energy-efficient appliances. Since appliances like your

refrigerator, stove and dishwasher use the most energy of almost any appliance in your house; you'll see the biggest difference in your energy costs by replacing them. Energy-efficient appliances can be expensive, but they will almost always save you money in the long run. Also, some states offer rebates to those who purchase energy-efficient appliances. Look for the Energy Star® sticker to help you find eco-friendly appliances. A class appliances consume 45% less energy than other classes (Elektrik İşleri Etüt İdaresi Genel Müdürlüğü). Moreover, noise control should be considered. Accounting for acoustic conditions can greatly increase the overall comfort level of a space, while poor acoustics can result in dangerous, unhealthy environments.

You must use fridge and dishwasher with Energy Star models to reduce their energy consumption. Top-mounted freezers use less energy than side-by-side or bottom mounted models (Hardwick, 2010). Freezers should operate at -15ºC to -18ºC while fresh food compartments should operate at around 3ºC to 4ºC. Don't set the temperature too low - a change of one degree can affect energy consumption by up to 5%. Check refrigerator and freezer temperatures with an appliance thermometer. Models free of CFCs (chlorofluorocarbons) and HFCs can be chosen to contribute to global warming. Some refrigerators have antibacterial coating on the walls and door to promote hygiene. Glass shelves are better than wire ones because they stay cool and it is easier to clean them. For providing noise control, refrigeration systems over 400W should be isolated on a rack or in a remote location away from dining and work areas (Foster, 1999).

In these energy conscious times, the natural refrigeration provided by a larder can help to reduce our dependency on refrigerators for food storage. A larder is traditionally sited on the side of the house that receives the least sun (north-facing in the northern hemisphere). If you do not have a larder, a pantry cupboard might make a good alternative although it isn't natural cooling.

Dishwasher can be chosen which one uses only 5.7 liters of water per cycle. Top-range models use much less water and energy than washing the equivalent load of dishes by hand (Conran, 2010). When it is used during the warmest part of

the day and it is got an add-on hot water booster are alternative to consume less energy. While buying a machine, decibel of voice, energy efficiency and economy should be considered.

One of the kitchen appliances is suction-fan. The two main types of suction-fans are ducted extractor fans, which remove greasy vapors completely and need to be positioned on or near an exterior wall, and recirculating fans, which purify the air. To avoid high noise; locating ventilation and air-handling fans on the roof rather than above the ceiling assumes that they will be isolated from the roof structure. Mounting all large fans, pumps or other equipment that vibrates or rumbles on sound concrete pans with rubber isolators can be less noisy and comfortable for users (Foster, 1999).

Fan-assisted gas ovens are energy saving and provide even temperatures inside the oven. Electric cooktops and electric ovens create less air pollution and fewer carbon monoxide and nitrogen dioxide fumes (Bonoma, 1997). A microwave oven can save up to one-third of the energy when you use it to heat several items at once. Microwave ovens consume as much or more energy than electric cooktops do but less than electric ovens. Adjusting gas burners are important; otherwise emissions, particularly carbon monoxide and nitrogen dioxide, will be greater. A gas oven without an electronic ignition shouldn't be bought (Goldbeck, 1989).

5.9. What is the deficiency of their kitchens according to users?

After researcher interviews with users, users tell their needs about their kitchens. Storage capacity, lighting and cupboards' volume are lack of kitchens. 25 % of users want bigger kitchens and prefer natural lighting. Lack of cupboard is a problem for 45% of users. They ask cupboards which are larger and have more storage capacity in their kitchens. They can be provided by using the space smartly by tall or narrow cupboards etc. There is an example photo below. Garbage disposal must be placed in kitchen according to 20% of users. Freezer,

material quality, plug, ventilation, direction, square layout are important characteristics for kitchens with 5 % rate.

Table 5.20. Ratios of user's requests

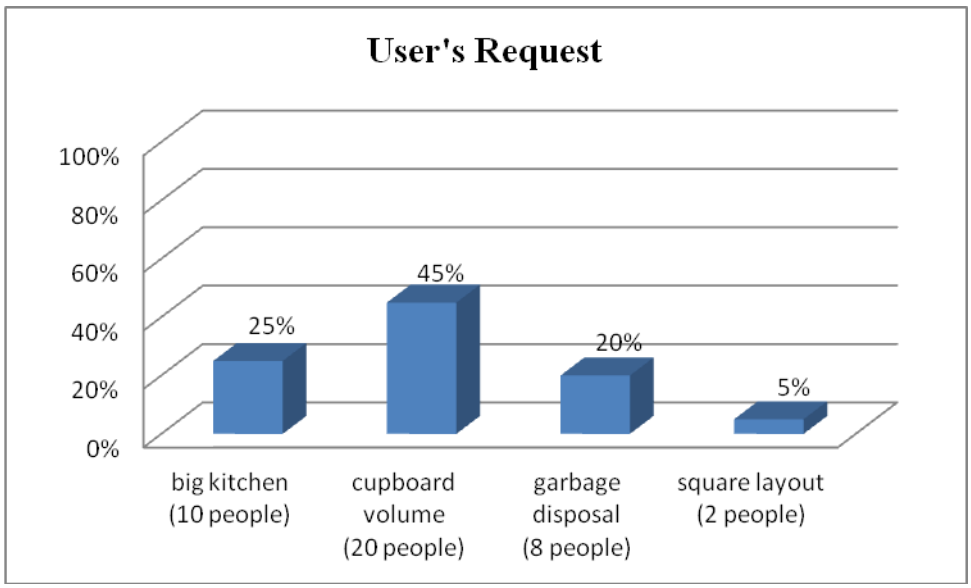


Figure 5.5. Example of adequate cupboard capacity.

6. CONCLUSIONS

In this study, how the kitchen location and type should be according to users, how the kitchen layout and furniture measures should be for user satisfaction, how the ergonomics evaluation of users is, what kind of materials on kitchen furniture users prefer and what is suitable to sustainability, what the views of users are about lighting, how appropriate kitchen ventilation is, how waste control, appliances should be in sustainable kitchens and deficiency of kitchens are investigated by questionnaire and literature. Results are summarized in this chapter.

Users want kitchens which meet their needs. Kitchen layout can be changed, but users prefer G shaped and island shaped kitchens. They are happy with 5-10 square meters kitchen size because of consuming less energy while working and reaching every appliance easily.

Counter height and depth, cupboard depth should be in harmony. 80-85 cm. counter height, 200 – 300cm counter lenght is mostly preferable. 35-40 and 40-45cm depth cupboards are preferred most of the users. Thick counters are the most durable. The most common thicknesses are 3cm and 4cm.

Ergonomy of the kitchen means comfortable working place of users. Measures of the kitchen cupboards, counter, and cabinet should be adopted according to user's body to provide comfort. These measures are individual. While adjusting top shelf height subject should place hand flat on the shelf surface comfortably without lifting shoulder and heel. Subject's eye level height is where she could see. Subject could place her hand on the plank surface comfortably without bending her shoulder down for lower shelf height. Measuring the distance from the distant edge of the wall side to tip of the middle finger should be counted while subject's hand was on the surface for depth.

Working area; distances between refrigerator – cooker, refrigerator – sink and cooker – sink are important to using efficiently people's energy. Users are

mostly pleased with short distances such as 50 – 100cm between refrigerator and cooker, refrigerator and sink and 0 – 50cm for cooker and sink.

Users choose ceramics for flooring, painted lacquer for cabinets, and marble for counters firstly. These materials are suitable for sustainability except painted lacquer and they can be used, but painted lacquer should be painted with bio-paints for health reasons.

Users have fluorescents in their house and they are entirely satisfied with it. It is a sustainable material, because it is long-lasting and energy saved. The position of the lamp should be taken attention to avoid work own shade. The lamp should be on left top or front top. Kitchen's location should be on the light place for having natural light.

Users who have fans are pleased with them, but only windows aren't adequate for ventilation. Bad odors of the kitchen should be avoided by good ventilation. Solar energy can be used to heat water.

For recycling, waste can be stored according to their types. Bins for recycled materials should be easy clean and moveable. Garbage disposals aren't supported by sustainability. Two sinks faucets, one sink for washing vegetables and also its water can be stored and used in watering. To avoid consume much water, tabs should be chosen correctly.

While choosing a machine, highest energy efficiency ratings are important. All machines should be A class and decibel of voice should be considered. They should be bought before drawing layout. Dishwasher and refrigerator should have low energy consumption. Larder can be a solution for having small refrigerators and using natural storage. Electrical cooker and ovens should be chosen. For small quantity of food microwaves should be used.

The most important lack of the kitchens is being small, inadequate cupboard capacity, and garbage disposal. Users need big kitchens but 5-10 square meters kitchen users say it is adequate for them, because they feel themselves

comfortable in 6 square meter working places. Working triangle plays an important role here, so its measures should be regard. Moreover garbage disposal seems as comfort by users but it is not a sustainable solution.

To make users happy, we must provide comfort, energy efficiency, safety and hygiene. It is better not to forget that only people damage the nature and we can decrease that with sustainable solutions. We will all have to create new lives based on ecological design principles (Van Der Ryn and Stuart, 1996). Finally, "An ice shelf cannot be refrozen; a recently extinct animal cannot be brought back to life..." (Fry, 2009), so planning a kitchen in sustainable way is a big responsibility for designers.

7. SUGGESTIONS

Suggestions are given in two different point views. First of it is a designer and the second of it is a researcher.

For researchers;

- They can examine a specific part of a kitchen. For example lighting in a sustainable kitchen would give more detailed information. They can study with one type of kitchen; for example, L shaped or they can study kitchens which have the same qualities and compare the results.

- They can evaluate kitchens in terms of sustainability and how many people have sustainable kitchens in the same districts can be found out. Energy consumption rates can be compared and solutions can be found out together with government.

- They can develop a sustainable kitchen evaluation scale.

- Sustainable architecture and eco design problems can be studied.

For designers;

- They should consider anthropometric measurements of kitchen users; they must not use common measurements. Anthropometry is an individual subject.

- Healthy and hygienic materials should be chosen by designers.

- Sustainability should be regarded beside functionality and visual.

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APPENDICES

APPENDICES

Appendix 1 Original Form of Questionnaire

Değerli Katılımcı,

Bu anket konut mutfaklarının performans değerlendirmesi ve kullanıcıların memnuniyetini ölçmek için hazırlanmıştır. Anket dört bölümden oluşmaktadır. Verdiğiniz cevaplar yüksek lisans tezinde kullanılacaktır. Araştırmada anketi dolduranın kimliği değil, verilen cevaplar önemlidir. Araştırmanın değeri ve başarısı tümüyle sizin katılımınıza bağlıdır.

Katkılarınız için şimdiden teşekkür ederim.

Ar. Gör. BURÇİN HANCI

YAŞAR ÜNİVERSİTESİ MİMARLIK FAKÜLTESİ

SELÇUK YAŞAR KAMPÜSÜ – BORNOVA / İZMİR

Konutun adresi: Tarih:

Kullanıcının adı – soyadı: Saat:

A. KONUT İLE İLGİLİ GENEL SORULAR

1. Konutun mülkiyet durumu;

☐ Ev sahibi ☐ Kiracı ☐ Aile bireylerinden birinin evi ☐ Diğer.....

2. Konutun Alanı m2

3. Konutun Yapılış Tarihi :

☐ 1980'den öncesi ☐ 1980 - 1990 ☐ 1990 – 2000 ☐ 2000 – 2010 ☐ 2010 - 2011

4. Konutta Oturma Süresi : ..... Yıl .....Ay

5. Konutun Tipi;

Müstakil Ev Apartman

..... Katlı ☐ Daire ☐ Dublex ☐ Diğer .....

6. Konutun toplam oda sayısı

☐ 2+1 ☐ 3+1 ☐ 4+1 ☐ 5+1 ☐ Diğer .....

B. MUTFAKLA İLGİLİ SORULAR

7. Mutfağınıza hangi mekanlardan girilliyor?

☐ Giriş (Antre) ☐ Hol ☐ Diğer .....

8. Mutfağınız diğer mekanlarla ilişkisine göre hangi mutfak tipine girmektedir?

☐ Kapalı Mutfak (Antre veya holden girilen diğer mekanlarla bağlantısı olmayan)

☐ Yarı Açık Mutfak (Salon veya Yemek odasına kısmi bağlantılı / kapı, servis penceresi... olan)

☐ Açık Mutfak (Salon veya yemek odası bağlantılı / mutfak + yaşama mekanı)

9. Mutfağınızın biçimlenmiş şekli;

☐ I Tipi ☐ Koridor Tipi ☐ L Tipi ☐ U Tipi ☐ Ada Tipi ☐ G Tipi

10. Günde yaklaşık kaç saatinizi mutfakta geçiyor?

☐ 1saatden az ☐ 1 – 2 saat ☐ 3 - 4 saat ☐ 5 saat ve daha fazla

11. Mutfağınızda yemek pişirme dışında hangi eylemleri gerçekleştiriyorsunuz?

☐ Tv seyretme ☐ Yemek yeme ☐ Camaşır yıkama ☐ Oturma – dinlenme

☐ Diğer.....

12. Mutfak ile yemek yeme mekanı arasındaki ilişki nasıldır?

☐ Mutfakta yemek yeniliyor.

☐ Yemek odasında yemek yeniliyor.

☐ Salonda yemek yeniliyor.

13. Mutfağınızın zemin döşeme malzemesi nedir?

☐ Sıcak ☐ Kare Mozaik ☐ Mermer ☐ PVC ☐ Halı

☐ Seramik ☐ Parke ☐ Diğer .....

14. Mutfağınızın tezgah kaplaması nedir?

☐ Mozaik ☐ Seramik ☐ Laminant ☐ Granit ☐ Mermerit

☐ Mermer ☐ Corian ☐ Diğer .....

15. Mutfağınızın dolaplarında kullanılan malzeme nedir?

Ahşap	PVC	Metal
☐ Laminant	☐ PVC	☐ Alüminyum
☐ Sunta		☐ Çelik
☐ Lake Boyalı		
☐ MDF Lam.		
☐ Masif Ahşap		

16. Mutfağınızın duvar kaplaması nedir?

* Tezgah - dolap arası

☐ Seramik ☐ Granit ☐ Corian ☐ Mozaik ☐ Mermer ☐ Diğer .....

* Duvar

☐ Yağlı Boya ☐ Su Bazlı Boya ☐ Plastik Boya ☐ Kireç – Badana

☐ Seramik ☐ Duvar Kağıdı ☐ Diğer .....

17. Mutfağınızdaki aydınlatılma nasıl yapılmaktadır?

☐ Avize ☐ Floresan ☐ Spot ☐ Diğer .....

18. Mutfağınızla bağlantılı balkonunuz var mı? Cevabınız "Hayır" ise 20. soruya geçiniz.

☐ Evet ☐ Hayır

19. Balkonunuzu ne amaçla kullanıyorsunuz?

☐ Oturma – dinlenme ☐ Depolama ☐ Çiçek kovası koyma ☐ Yemek yeme

☐ Tüp ☐ Diğer .....

20. Mutfağınızın ısıtması ne ile sağlanıyor?

☐ Kalorifer ☐ Soba ☐ Klima ☐ Diğer .....

21. Mutfağınızın havalandırılması ne ile sağlıyorsunuz?

☐ Pencere ☐ Kapı ☐ Aspiratör ☐ Klima ☐ Diğer .....

22. Mutfağınızda bulunan ekipmanlar nelerdir?

Ankastre	Normal
☐ Ocak ☐ Fırın ☐ Bulaşıkbaşı ☐ B.Makinesi ☐ Ç.Makinesi ☐ Mikrodalga ☐ Aspiratör	☐ Ocak ☐ Fırın ☐ Bulaşıkbaşı ☐ B.Makinesi ☐ Ç.Makinesi ☐ Mikrodalga ☐ Aspiratör
☐ Derin Dondurucu ☐ Şofben ☐ Kombi ☐ Çöp Öğütücüsü ☐ Tv	

23. Mutfağınızda bulunan mobilyalar aşağıdakilerden hangileridir?

☐ Asma dolap ☐ Yer dolabı ☐ Kiler dolabı ☐ Masa – Sandalye ☐ Koltuk
Diğer .....

24. Mutfağınızda kaç adet priz var?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ve daha fazla

25. Mutfağınızdaki priz sayısı yeterli mi?

☐ Evet ☐ Hayır

C. MEVCUT MUTFAĞA İLİŞKİN ÖLÇÜLER

26. Çalışma üçgeni mesafeleri;

Bulaşıkbaşı – ocak arası ..... cm
Bulaşıkbaşı – evye arası ..... cm
Ocak – evye arası ..... cm

27. Tezgah yüksekliği ..... cm

28. Tezgah derinliği ..... cm

29. Tezgah uzunluğu ..... cm

30. Asma dolap - tezgah arası mesafe ..... cm

31. Asma dolap derinliği ..... cm

32. Mutfak tavan yüksekliği ..... cm

33. Mutfak; En : ..... cm Boy : ..... cm

D. KULLANICILARIN MUTFAKLARINA İLİŞKİN GÖRÜŞLERİ

34. Mutfağınızın planından memnun musunuz? Cevabınız "Evet" ise 36. soruya geçiniz.

☐ Evet ☐ Hayır

35. Neden? .....

36. Mutfağınızın bulunduğu yerden ve diğer odalarla bağlantısından memnun musunuz? Cevabınız "Evet" ise 38. soruya geçiniz.

☐ Evet ☐ Hayır

37. Neden? .....

38. Mutfağınızda değişiklik yaptınız mı? Cevabınız "Hayır" ise 40. soruya geçiniz.

☐ Evet ☐ Hayır

39. Neleri değiştirdiniz? .....

40. Mutfağınızın aşağıda belirtilen özelliklerinden memnun musunuz?

	Evet	Hayır
Dolapların Yüksekliği	☐	☐
Dolapların Genişliği	☐	☐
Dolapların Malzemesi	☐	☐
Dolapların Yeterliliği	☐	☐
Tezgah Yüksekliği	☐	☐
Mutfağınızın Isıtması	☐	☐
Mutfağınızın Aydınlatması	☐	☐
Mutfağınızın Havalandırması	☐	☐
Mutfağınızın Elektrik Tesisatı	☐	☐
Mutfağınızdaki Atık Kontrolü	☐	☐

41. Mutfağınızda en çok neyin eksikliğini hissediyorsunuz?

.....

42. Mutfağınızda en çok neye önem veriyorsunuz?

.....

Kullanıcı Bilgileri

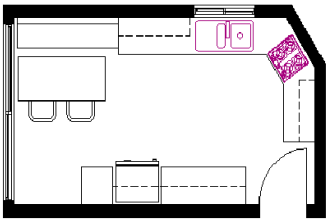
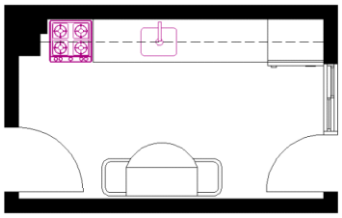
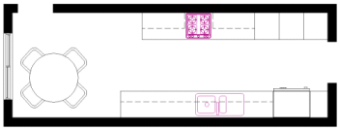
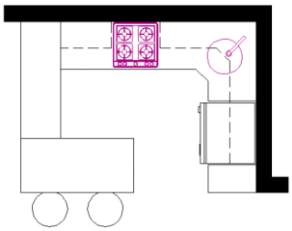
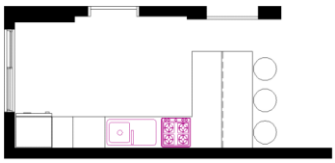
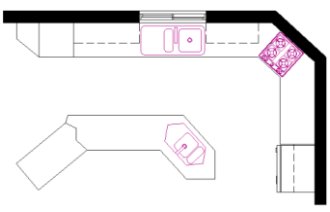
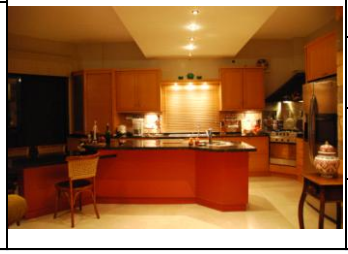
Bireyler	Yaş	Cinsiyet	Eğitim	Meslek
Kendisi				
Eşi				
Çocuk 1				
Çocuk 2				

Toplam aylık geliriniz: ☐ 1000TL – 2000TL ☐ 2000TL – 4000TL ☐ 4000TL - ve üstü

Vermiş olduğunuz cevaplara ek olarak belirtmek istediğiniz konuları bu bölüme yazabilirsiniz.

Değerli katkılarınızdan dolayı teşekkür ederim.

Appendix 2 Examples all types of kitchen which are applied questionnaire

U TYPE KITCHEN 		Age of Built:	2000-2010
		Area of Housing:	220 m2
		Type of Building:	Apartment
		Number of Rooms:	4+1
I TYPE KITCHEN 		Age of Built:	2000-2010
		Area of Housing:	136 M2
		Type of Building:	Apartment
		Number of Rooms:	3+1
CORRIDOR TYPE KITCHEN 		Age of Built:	1990-2000
		Area of Housing:	176 M2
		Type of Building:	Apartment
		Number of Rooms:	4+1
G TYPE KITCHEN 		Age of Built:	1990-2000
		Area of Housing:	155 M2
		Type of Building:	Villa
		Number of Rooms:	5+1
L TYPE KITCHEN 		Age of Built:	1980-1990
		Area of Housing:	140 M2
		Type of Building:	Villa
		Number of Rooms:	4+1
ISLAND TYPE KITCHEN 		Age of Built:	1999-2000
		Area of Housing:	445 M2
		Type of Building:	Villa
		Number of Rooms:	10+1