

Full Length Research Paper

Investigation of the hygienic situation of kitchens, bathrooms and toilets in the traditional residential architecture

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This study investigated the hygiene state of kitchens, bathrooms and toilets and how they are used in the traditional houses (their characteristics, the changes in their uses and the extent of these changes). The study also attempted to find the principles and criterions on which the arrangements that are the products of accumulated experiences were based in the spaces or systems. Furthermore, the study investigated how and at what level the new equipment that the new age presents are reflected in the traditional house. The dimensional, positional, directional, constructional, equipment and material characteristics of these elements were investigated in accordance with the knowledge, theories and principles of architecture and instructive data on these were obtained from the traditional houses. The traditional Turkish houses, Greek houses and hybrid houses in the city of Trabzon, Turkey, were chosen as the sample of the study.

Key words: Kitchen, bathroom, toilet, location, direction, construction, equipment, traditional houses.

INTRODUCTION

Architectural concepts are prospective and therefore they have the power to change the environment. That these decisions are taken under certain contexts and conditions make them dependent on both the past and present (Dickens, 1989; Edwards et al., 2005). In our expectations from the future, we need to try to evaluate, interpret and explain the past and present in an interaction. This affects our decisions for the future and therefore creates the context for change.

In order to improve the comfort conditions in the space that separates man from the physical environment to a suitable state, some auxiliary equipment is needed. Buildings must have heat, water and moisture insulations and there should be enough ventilation. There must be

enough skylight and heat (Ranson, 1991; Heyman et al., 2005; Jones et al., 2007). Fresh water, one of the most important needs, must be brought into the building and waste water must be taken away from the building and in this way building conditions must be improved to make the use of different systems possible.

Building construction is a biological process, not an aesthetic one (Meyer, 1991). A building must, first and foremost, respond to a function and this requires the building not to fail in its use in any way. However successful a building is in terms of aesthetics, if it does not perform this function, it can never be a healthy building (Ineichen, 1993). Protection from the unwanted conditions of the physical environment is the most important need of man (Novoselac and Siegel, 2009). The above mentioned factors must be controlled through the help of building elements.

According to Özdeniz (1978), it is possible to remove the unwanted climatic variables from the building:

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- i) By allowing enough of them to permeate in the building if they are necessary for the user's comfort,
- ii) By allowing the excess of them to permeate in the building if prevention of the possible effects of them is not economical,
- iii) By removing the rest of them from the building by controlling the forces that enable permeation.

At the time when there were no mechanical tools to control the physical environment and when building materials were simple raw materials, climate was a very important factor in the formation of buildings. Especially the buildings which were designed and built by the users show how wisely the climate can be controlled for a liveable environment (Van den Bulcke et al., 2009). The traditional building materials and construction systems used in house construction have not changed remarkably until now. The natural materials found in the immediate surroundings of the building make up all kinds of building materials and therefore they are the main components of the building (Ravetz, 1995; Arthur and Stamps, 1999; Ravetz, 2001). In today's buildings and in the buildings that have come from the past to the present day, the same building-sanitary equipment that are shaped by the same principles have been used (Nauman, 1991).

Buildings consist of many elements that have different characteristics depending on their functions in the house. Depending on their functional characteristics, these elements can be classified as follows:

- (i) user-related building elements,
- (ii) building-related building elements,
- user- and building-related building elements (Berkun, 1979; Ipekoğlu et al., 2007).

There is the possibilities that the new age presents change the user demands and needs. As a result of this change, traditional houses undergo some modern adaptations that aim to meet the needs of modern life. This results in the removal of the traditional borders between the social groups at cultural, national and even local level (Dickens, 1988; Mazumdar and Mazumdar, 1997; Kim and Kaplan, 2004; Youngen and Hostetler, 2005).

This study aims to probe into the elements that are important for man and therefore for the building which accommodates man; that give the building a livable quality; and that are called building-sanitary equipment. This study aims to meet the needs of a building regarding sanitation, hygiene and comfort, and investigates these factors which will provide the environmental conditions to be evaluated and controlled. With a correct evaluation of the above-mentioned factors, buildings that have no technical failures in terms of vitally important uses must be built. As a result of the provision of these uses in the building and of the evaluation and control of these factors

in the building, the building is equipped with some systems, which are known as building-sanitary equipment and of which each architect should have full knowledge were conceptually discussed and such related spaces as kitchens, bathrooms and toilets were also included in the study.

The study investigates the relationships between life and built-up environment in terms of building-sanitary equipment in the traditional houses. Another issue that this study investigates is the presence of suitability and unsuitability in the applications of the building-sanitary equipment and whether there are concrete and applicable solutions. The study also investigates the reflections of the possibilities that the modern life presents for the buildings, types of application and the direction of the preferences. The study covers such areas in the traditional houses as:

- (i) kitchens,
- (ii) bathrooms and
- (iii) toilets.

Field work

The fieldwork of this study contains the

- (i) traditional Turkish houses,
- (ii) traditional Greek houses and
- (iii) traditional hybrid houses

in the historical settlements, in the city of Trabzon, in the Eastern Black Sea Region of Turkey (Figure 1).

During the selection of the sample houses, attention was paid to

- (i) the selection of the houses that were built before 1940
- (ii) the identification of the neighborhoods which were intensely populated by traditional houses,
- (iii) whether the houses had the characteristics of the traditional urban houses.

The reason for choosing the houses that were built before the industrial revolution in Turkey is to find out about the reflections of the industrial products in the traditional houses in terms of building-sanitary equipment. The study informs us of the users, preferences for and applications of building-sanitary equipment and questions the extent of the suitability of these preferences.

METHODS

This study is a fieldwork that aims to investigate building-sanitary equipment in the traditional houses. During the implementation process of this study:

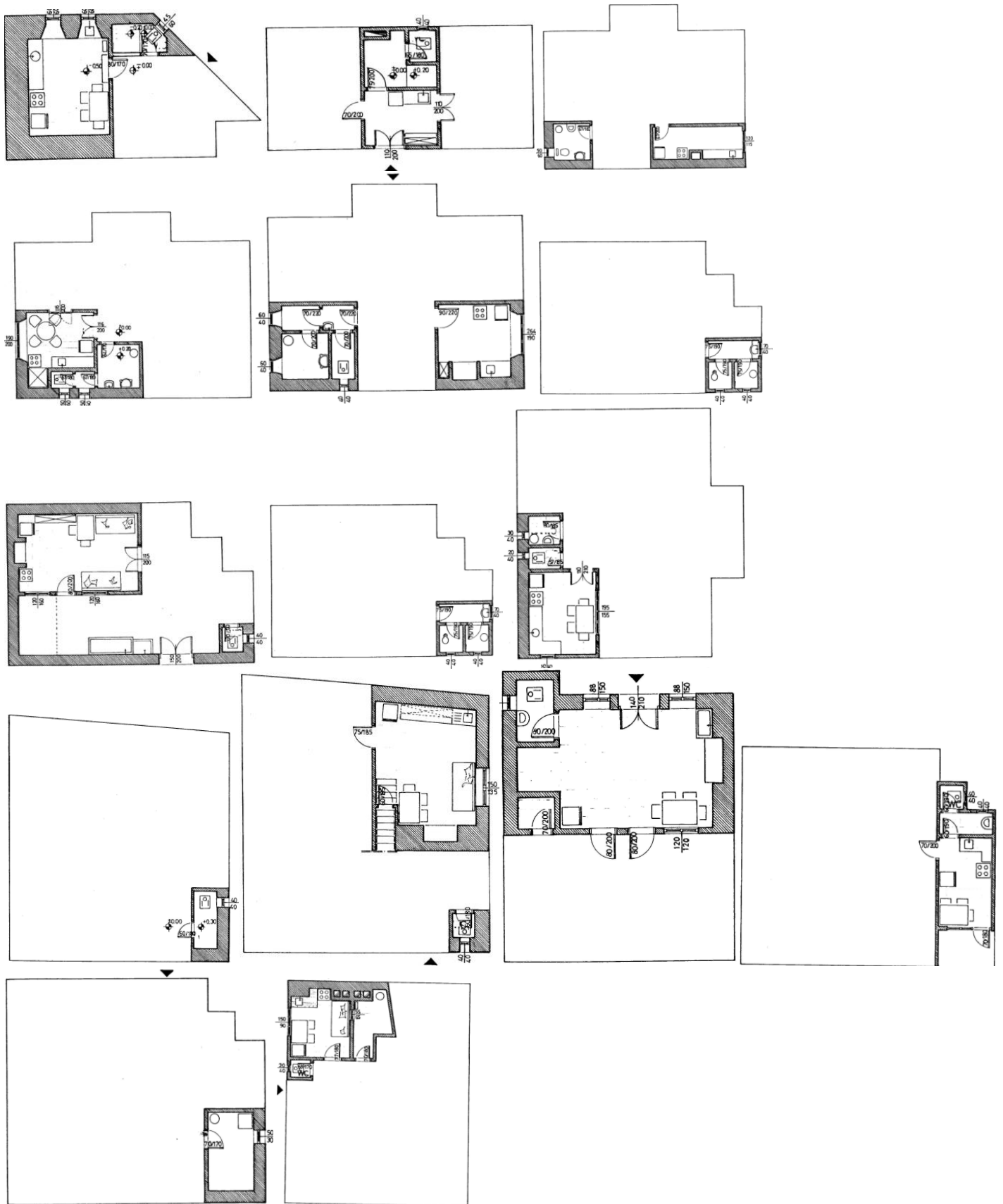






Figure 1. Plans of the building–sanitary equipment in the sample houses studied.

(i) the related literature was reviewed and the details of the aims of spaces for kitchen, bathroom and toilets were identified,
 (ii) a questionnaire was developed in order to gather data about the general characteristics of the spaces for kitchen, bathroom and toilets in the traditional houses that this study investigated,
 (iii) the sample houses in the study were selected with the observation technique,
 (iv) the data that were obtained through observation, interview and identification about the general characteristics of the sample

houses and about the spaces for kitchen, bathroom and toilets in the sample houses were recorded in the questionnaire and the measured drawings of the relevant spaces were taken in order to identify their institutional and technical arrangements.

By evaluating the data obtained, the following were intended to be made clear;

(i) the consistencies and contradictions of the applications at

system level,

- (ii) the dimensional characteristics of the elements at space level,
- (iii) the preferred sizes of the various equipment and the degree of the accuracy of preferences,
- (iv) the consistencies and contradictions of the elements at system and space level in terms of material, size and application,
- (v) the consistencies and contradictions of the new possibilities (products) in the applications at the level of building-sanitary equipment in the traditional houses and
- (vi) putting forward the special and general cases at the level of spaces for kitchen, bathroom and toilets and drawing conclusions about the comfort conditions in the traditional houses.

Designing the questionnaire

This part contains 4 items which aim to identify the general characteristics and elicit data about the construction system, direction and material characteristics of the spaces for kitchen, bathroom and toilets in traditional houses. These are:

- (i) Information on the structural characteristics: This part contains 7 questions which aim to identify the general characteristics and elicit data about the construction system, direction and material characteristics of the traditional houses.
- (ii) Kitchen: This part of the questionnaire contains 13 questions which aim to elicit information about the present condition of the kitchen and the changes that the kitchen has undergone up to the present day; to identify the characteristics of the technical equipment, accessories, materials in, and dimensions of, the kitchen; and to find out about the demands, complaints and preferences of the users.
- (iii) Bathroom: This part contains 14 questions which aim to elicit information about the present condition of the bathroom; to identify the changes that the users make in the bathrooms; to identify the characteristics of the technical equipment, accessories and materials in, and dimensions of, the bathroom; and to find out about the users' views about the bathrooms.
- (iv) Toilet: This part contains 15 questions which aim to elicit the present condition of the toilet; to identify the types of change that the toilets have undergone; to identify the characteristics of the technical equipment, accessories and materials; and to find out about the users' views of the toilets.

GENERAL INFORMATION ABOUT THE TRADITIONAL HOUSES IN TRABZON

Most of the time, the traditional architectural products are marked by culture, climate and material. Despite the similar climates, building materials and types of production, we come across traditional houses with products full of contradictions and mysteries (Sümerkan, 1990).

The local architecture is of a character which has completed its evolution and which has started to disappear. This traditional architecture is known to be a superior architecture at its time (Gür, 1990). The houses that reflect the traces of a rich historical background show different characteristics in the areas in which they were built. Although the building materials are the same, the construction techniques and building formations show variety from region to region; however, each region makes its deep-rooted construction tradition felt and continues this tradition. The most obvious evidence of this continuity are the old urban houses themselves that have come down to the present day (Güngör, 1987).

The houses are the products of a heavily forested region with ample rain. Until the end of the 18th century, the open-sofa plan type was used and later on the inner-sofa and central-sofa plan types became common (Akok, 1991). The walls of the houses that face the north are usually blind. The entrances are usually protected from winds. In the houses, large sofas were built so as to face the east and everything was made to make use of the large scenery. Large sofas face the well-designed courtyards and the daily activities take place in this space. In the traditional houses, upper floors are usually used as living spaces and the ground floors are used as service spaces. However, ground floors have undergone tremendous changes in the modern day.

Rooms receive light generally from the street, courtyard, and sofa. The sofa on the upper floor is reached through a wooden staircase built on a stone base.

In traditional houses, the foundations and some walls of the ground floor are rubble and stone. The inner partitions of the ground floors and the walls of the upper floors are timber-framed infill walls. The spaces between the frames are filled with flat stones and lime mortar, which is similar to adobe filling. The filling material is unplastered brick or stone in older houses. In time, the filled walls lost their original characteristics, and with the enlargement of the jointing surfaces, walls can be wholly plastered now.

The outer sofas have a rich appearance with their consoles, kiosks, seats, outer staircases and eaves. Consoles are mostly seated on supports. These supports may be flat as well as overlapping. Eaves are very wide and the rafters are placed on the projecting purlins. Roof cover is tile.

Almost all living rooms and sometimes the sofas have large fireplaces. These fireplaces have wooden or gypsum or stone frames. The rooms have gypsum windows, gypsum fireplaces and gypsum niches as ornamental elements. The flooring material is stone or brick on the ground floor, and wood on the upper floors.

The climate in the Eastern Black Sea Region is very rainy, mild and humid (Özdeniz, 1987). In a very rainy and highly humid climate, a scattered settlement pattern was adopted for good ventilation of the houses (Orhan, 1994). There are a lot of diagonal windows so as to allow ventilation. The plans of the houses are zigzagged so as to let the hot air in the summers leave the house easily. The walls of the ground floor are made of stone due to the dampness of the soil. Upper floors are usually made of wood in order to prevent the accumulation of hot air in the summers.

FINDINGS IN THE FIELDWORK

Here we present the conditions, materials and sizes of the kitchens, bathrooms and toilets.

Kitchens

Kitchen has an important role in the successful design and application of a house. If enough care is not taken during the design process, some unwanted consequences may occur. Some of these unwanted consequences may later be compensated for through various modifications but some may not. For this reason, it is necessary that the area, dimensions and working order of a kitchen be chosen and handled with utmost care (Kaitilla, 1993; Lai and Ho, 2008).

A kitchen should cover 10 to 12% of the utility area of a house (Ağat, 1985). In the past, the most important

element of a kitchen was the fireplace. It was also the most important element of a house and it held the position of focal point of a house. What made the fireplace so important was probably the value of the fire in it.

It is clear that a space which does not allow one to cook in it cannot be called a kitchen, though it has all the necessary utensils and equipment that a kitchen must have. Therefore, even today, the fireplace is the primary component of a kitchen.

Before the industrialization of Turkey, the life and kitchen shared the same space in all rural and urban houses. Today, too, the examples in which the same is true make up the majority of the houses (Hasol, 1988). This space contained the fireplace and it served as a place for all kinds of kitchen activities such as cooking and eating as well as a place for all living activities. As a result of the characteristics of the fuels and cooking equipment that have been used after the industrialization movement of Turkey, the kitchen has lost its characteristic of being a living space. Stoves or fireplaces are not needed any more in order to cook meals. Because stoves and fireplaces are not used, the kitchen is not heated and therefore it is not necessary to live in this space. In the new houses, because a separate space is reserved as a living space, the kitchen has become a small service area. As a result, the spaces reserved for the kitchens in the houses become smaller, and kitchens are designed in such a way as to allow the users to use only the most convenient equipment and to carry out only the kitchen-related activities such as cooking and eating. Water is the most important element in a kitchen and getting water from outside into the kitchen has been considered to be an important development (Ghali et al., 2008; Yang et al., 2008). With the ever-developing technology and to meet the ever-changing needs, kitchens are in a constant change and development in terms of materials and equipment (Heilweil, 1973; Eisemon, 1975; Altman, 1976; Hofman et al., 2006).

(i) The place and direction of the kitchen in a house: The direction of the kitchen is important in the correct design and direction of a house. Placing kitchens on the sides that take sunlight is undesirable because a kitchen is a space where different foods are prepared and stored.

(ii) Kitchen types according to their functions: These are work kitchens, dining kitchens, living kitchens.

(iii) Kitchen shapes: Kitchens have the I, L, H, U and G shapes. In all kitchens, the rational working order must be like this (left to right): kitchen sink–worktop–fireplace.

(iv) Kitchen sizes: Depending on the users' movements and the characteristics of the equipment that are used, the sizes of the kitchen and equipment can be figured out. The sizes that affect kitchen designs can be studied as plan size and section size. The most important one of the plan sizes is the width of the free movement area in a

kitchen. In the H or U kitchens, the distance between the two worktops must be at least 1.10 m. However, this distance is enough when only one person works in the kitchen (Ağat, 1985).

(v) Kitchen materials (paints, tiles, taps, pipes, etc): The first characteristic that is to be sought in kitchen materials is that they should be easily cleaned. At the same time, they should be resistant to heat, vapour and excessive use. As for the color choice, relief and color harmony must be sought. Kitchens with these characteristics make the work in the kitchen easy and please the families when dining. The floor covering must be easy-to-clean and durable. Marble, terrazzo tiles, vinyl floor covering or ceramic tiles can be the correct flooring materials for the kitchens. Walls are the surfaces that can easily get dirty. Therefore such surfaces must be covered with faience tiles or ceramic tiles. Because the cupboards in a kitchen cover most of the walls, all the kitchen may be covered with such material. This creates a good effect and makes it easy for the user to clean the kitchen.

(vi) Kitchen windows: All parts of the kitchen and especially the work surfaces must get enough natural light. If possible, the kitchen should see the outside space where it can be reached by more sunlight. At least part of the window should see the outside. In cases where windows are to be used for ventilation, the air current line that may happen between the kitchen door and open window sash must pass from the opposite side of the work area in order to protect the kitchen user from the air current.

(vii) Kitchen doors: Doors that open to the kitchens must be wide enough to allow the kitchen equipment to easily move into and out of the kitchen. If flush doors are used, the door wing must be fitted in such a way so as not to cause any accident when it is open. In small spaces, sliding doors are more convenient.

This study investigated the kitchens and kitchen-related materials and equipment, components of building-sanitation equipment, within the field of work of this study. When the directions of the kitchens in the houses in this study were examined, it was found that the kitchens that face northeast and south constitute the majority. Northeast is an appropriate direction for kitchens while south is an undesirable one. East is a suitable direction for the kitchen but west is one of the directions which the kitchens should not face. The number of kitchens that face north and northwest is the least and there are no kitchens that face southeast. North is a suitable direction for work kitchens only and when we consider the fact that kitchens in the traditional houses are usually designed as living kitchens, it can be inferred that this was a rational practice (Table 1).

When the kitchens are investigated in terms of their functions, we observe that although in the past kitchens served as spaces where all kinds of dining-related activities took place and which met all the needs of living,

Table 1. Kitchen directions and kitchens according to their functions.

Kitchen characteristics	Location/Function	Number of kitchens	Percentage
Kitchen direction	North	2	7.41
	Northeast	6	22.22
	East	4	14.81
	Southeast	–	–
	South	6	22.22
	Southwest	3	11.12
	West	4	14.81
	Northwest	2	7.41
Kitchen type	Work kitchen	6	22.22
	Dining kitchen	10	37.04
	Living kitchen	11	40.74

Table 2. Changes in the kitchens.

Changes in the kitchens	Number of houses	Percentage
No changes	–	–
Change of equipment	9	32
Repair	10	44
Enlargement	–	–
Relocation	6	24

they now gradually lose this function (Table 1). The existence of fireplaces in the kitchens of the traditional houses has an important role on this. Because the fireplace in the kitchen heated the space when cooking, people did not need to heat other spaces. However, because the modern cookers do not heat their spaces when cooking, it is not necessary any more to use the kitchen as a living space. Due to the technological advances, less time is spent for kitchen activities and spending the remaining free time in the kitchen is not preferred. In the traditional houses, the kitchen is gradually losing its function as a living space and has been, for some time, in a process of transformation into dining and work kitchen. For all these reasons, the area reserved for the kitchen in the houses is decreasing day by day.

(i) Kitchen shapes: No specific kitchen shape was identified in the traditional houses.

(ii) Kitchen sizes: The average area of the 27 kitchens in the 25 traditional houses is 14.67 m². In the traditional houses, the proportion of the long side to the short side is 1.31.

(iii) Kitchen worktop heights: In all traditional houses, the kitchen sinks are on the worktops at certain heights from the floor. The average worktop height in the traditional houses is 81.85 cm. The height of the worktop or sink is important for a healthy work.

(iv) Alterations made in the kitchens: In all houses that the study investigated, the new kitchen equipment and materials that the developing technology has put in the service of man are attempted to be used through necessary alterations and arrangements in the existing kitchens. The fireplace which was the most important component of the kitchens until recently is not used any more. These alterations may be in the form of changing any kitchen equipment and/or material with a new one or of complete relocation of the kitchen in the house (Table 2). The study found that no kitchens have come to the present day without any alterations. In 32% of the traditional houses, although the existing materials and functions of the kitchens have not been altered, the old and broken equipment have been replaced. Such changes do not introduce fundamental alterations in the kitchens and only the old and broken equipment (that is, taps, pipes, siphons, etc.) are replaced. In the traditional houses, there is no tendency to extend the kitchens; on the contrary, the place reserved for the kitchen decreases. It was found that in 24% of the houses, the kitchens that were outside the houses were relocated. In some examples, the stoves that are set up in winter times in the kitchens used as living kitchens are used as secondary cookers.

(v) The materials and sizes of the fresh water pipes: All the pipes that are used in the kitchens in fresh water installation are galvanized iron pipes. It was found that

Table 3. Diameters and materials of fresh water and waste water pipes.

Type of pipes	Pipe diameter (mm)	Number of kitchens	Percentage
Fresh water	20	7	25.93
	25	18	66.67
	30	1	3.70
	35	1	3.70
	40	1	3.70
	50	5	18.52
Waste water	60	11	40.74
	70	10	37.04
Material			
	Cast iron	17	62.96
	PVC	10	37.04

the majority of the fresh water pipes are 2.5 cm in diameter. Considering the sizes of the traditional houses and places of use of the pipes, it can be said that these pipes are adequate to supply the required fresh water (Table 3).

(vi) The materials and sizes of waste water pipes: The most common material of the pipes that are used for the disposal of waste water from the kitchen is cast iron. In kitchens which undergo repairs, when the waste water pipes need to be replaced, the cast iron pipes are usually replaced with PVC pipes due to the ease of use and application. When the distribution of the cross-sections of the waste-water pipes were examined, it was found that the most common pipes are 60 mm in diameter, then 70 mm and then 50 mm (Table 3). Considering the number of the places where waste water pipes are used, it can be inferred that the cross-sections of the pipes are adequate for the disposal of waste water.

(vii) Wall, floor and ceiling materials in the kitchens: It was found that the wall material in the kitchens is whitewash and that the walls around the worktops and sinks are covered with ceramic tiles. Stone flooring is the most common flooring type. The number of samples with wood flooring is also high. It was also found that in the kitchens, the ground around the fireplace is covered with stone and other areas with wood.

The kitchen areas in the traditional houses are congruent with their purposes of use. The sizes of the equipment used in the kitchens conform to the ergonomic characteristics of human beings. Traditional houses have successful kitchen applications.

Bathrooms

Today, bathrooms are the spaces where all

washing-related activities take place. Bathrooms are not used only for personal hygiene, they also meet all the needs related to the cleaning of houses. In the past, clothes were washed outside the houses; however, today this is done in the bathrooms of the houses. Therefore, a secondary space is not needed in the house to do the washing. Bathroom sizes, water heating devices in the bathrooms and the characteristics of other equipment are all important in the use of bathroom area (Henning, 1977; Singhal et al., 2008).

Place and importance of bathrooms in the houses

In an architectural structure, the best directions for the bathrooms are south and northeast. Because bathrooms are wet spaces, facing these directions is important to benefit from the sunlight. When considered in terms of ease of installation, designing bathrooms together with other wet spaces is more rational (Gürer, 1994).

Bathroom sizes

The sizes and types of bathrooms differ according to the purposes of use. The sizes of bathrooms differ according to the sizes and types of materials and equipment in them. The sizes of bathrooms must be determined by taking into consideration the materials and equipment to be used in them (Neufert, 1983).

(i) Bathroom materials: The first thing to be considered when choosing bathroom materials is that a bathroom is a space which has a direct contact with water. When choosing materials and equipment to be used in the bathrooms, water resistant materials and equipment must be preferred.

(ii) Among the bathroom equipment are water heaters (with or without storage), washing equipment (bathtub, shower tray, marble basin) and other equipment (washbasin, toilet bowl, bidet).

(iii) The light that the bathroom gets is important in the design of bathrooms. Bathroom windows must be big enough to provide the necessary ventilation and level of lighting. Bathroom doors should open inwards in order to prevent the unwanted odors in the bathroom from directly going out when the bathroom door opens.

The direction of the bathrooms in the traditional houses that the study investigated were determined, and in this way, the distribution rates of bathroom directions were obtained. In determining the directions of the bathrooms, the directions of the bathroom windows were taken as the basis. In cases where bathrooms did not have any windows, the directions of the outer walls of the bathrooms were taken as the basis (Table 4). It was found that the bathrooms facing the west constitute the majority (24%). North, east and south are the second most preferred directions (16% each). In general, houses face east with a concern of making the most of the sunshine, and therefore the living spaces also face this direction. Such service facilities as bathrooms and toilets are built on the back of the houses and therefore they face the west. The average area of the 25 bathrooms in the 25 traditional houses is 3.67 m².

In the bathrooms of the traditional houses, the proportion of the longer side to the shorter side is 1.45. The required area of a bathroom which have a bathtub, a water heater, a washbasin, a toilet bowl and a bidet is 3.84 m² and the proportion of the longer side to the shorter side is 1.30. The values that were obtained from the traditional houses are very close to these norm values, which shows that enough space is reserved for the bathrooms in the traditional houses.

Alterations made in the bathrooms: In all houses that this study investigated, it was found that the old bathroom materials and equipment are slowly replaced with the newly developed and improved materials and equipment. Highly luxurious and healthy bathroom examples were also found in the traditional houses. 28% of the bathrooms in the traditional houses have had no repairs up to the present day. The rate of the bathrooms in which any one of the equipment was replaced is 20%. The bathrooms which have undergone large-scale repairs make up 16% of the bathrooms while extended bathrooms make up the 4%. Relocation of the bathrooms makes up the majority of the alterations by 32%. Alteration here means that previously there had not been a bathroom inside the house but later on a space in the house was designed as a bathroom.

(i) Special washing spaces: Of the 25 traditional houses, 9 have special washing spaces in the bedrooms. Each of these special washing spaces has the size of a small

cabinet, does not have any bathing equipment, and is called "small hammams" (hamamcik). However, it was found that these small hammams are not in use today.

(ii) In most of the bathrooms, thermosiphons that use solid fuels are used as water-heaters, which also heat the space. Bathrooms without any washing equipment make up the majority. Marble basins are the most common washing equipment in the bathrooms of the traditional houses.

(iii) The material of the fresh water pipes is galvanized iron in all houses. The pipes that convey the fresh water to the bathrooms are mostly 25 mm in diameter. It was observed that pipes that are 20 mm in diameter were also used (Table 4). Considering the sizes of the traditional houses and the water use areas in these houses, it can be said that these pipes are adequate to convey the needed fresh water.

(iv) It was found that cast iron is the main material of the waste water pipes. In the bathrooms which underwent repair works, the cast iron pipes were replaced by PVC pipes which are easy to use and apply (Table 4).

Cast iron is still used in most of the bathrooms in the traditional houses. It was found that the waste water pipes that are preferred are 100 mm in diameter. In a few examples, it was observed that pipes that are 70 and 60 mm in diameter are also used. All these pipe sections are enough for the bathrooms in the traditional houses.

(v) It was found that bath traps were used in 48% of the bathrooms, and not used in 52% of the bathrooms.

It was found that the majority of the walls of the bathrooms in the traditional houses are whitewashed, and that the number of examples of the bathrooms whose walls are covered with ceramic tiles up to a certain height is too few. On the other hand, it was found that the floors of the bathrooms had been covered with a layer of rough cement finish, and that this was later replaced by terrazzo floors or, in very few examples, by ceramic tiles.

Toilets

The locations, sizes, materials and other equipment of the toilets in the houses are very important. As in the case of bathrooms, the best directions for the toilets are south and northeast. Due to ease of piping, it is useful to build the toilets near the other wet spaces. The size of toilets are very important for ease of use. The sizes of the toilets vary according to the sizes of the equipment used in them (Henning, 1977; Singhal et al., 2008). When the sizes of the toilets are examined, it was found that the proportion of the long side to the short side is 1.45 in toilets where the doors open inwards. The proportion of the long side to the short side is 1.37 in toilets where the doors open outwards (Neufert, 1983).

The materials used in toilets must have the same characteristics (water resistant, easy-to-clean) as the

Table 4. Characteristics of the bathrooms in the traditional houses.

	Characteristic	Number of bathroom	Percentage
Bathroom direction	North	4	16
	Northeast	2	8
	East	4	16
	Southeast	1	4
	South	4	16
	Southwest	3	12
	West	6	24
	Northwest	1	4
Changes in the bathrooms	No changes	7	28
	Change of equipment	5	20
	Repair	4	16
	Enlargement	1	4
	Relocation	8	32
Water heating equipment	Thermosiphon	16	64
	Gas heater	1	4
	Thermosiphon+gas heater	3	12
	None	5	20
Washing equipment	Marble basin	7	28
	Shower	–	–
	Bathtub	–	–
	Bathtub+Marble basin	1	4
	None	17	68
Fresh water pipe diameter	20 mm	10	40
	25 mm	12	48
	30 mm	3	12
Waste water pipe material	Cast iron	10	40
	PVC	6	24
	Not identified	9	36
Waste water pipe diameter	120 mm	1	4
	100 mm	12	48
	70 mm	2	8
	60 mm	1	4
	Not identified	9	36
Floor drain	Yes	12	48
	No	13	52

materials used in other wet spaces. Toilets must have windows and if this is not possible, there must be a good ventilation (Tung et al., 2009).

The direction of the toilets in the traditional houses that the study investigated were determined, and in this way,

the distribution rates of toilet directions were obtained.

As in the case of bathrooms, the best directions for toilets are south and northeast. Because of the general location of the traditional houses, the toilets in these houses are mostly located on adverse directions. The

majority of the toilets face west (Table 5).

(i) Until recently, toilets had been built outside the houses due to the bad smell and the difficulties in terms of getting water into the house; however, with the eradication of such problems toilets were taken into the house. Toilets are the spaces with the least intervention. It was found that the only changes that are made in the toilets are mostly the replacement of the fittings. There are also examples of toilets that have come down to the present day without any changes. Furthermore, it was found that the toilets that had once been built outside far from the house at a corner of the garden were demolished and that new and modern ones were built inside the house (Table 5).

(ii) The majority of toilets are located on the east-west direction which is the opposite of the living spaces that are located in the north-south direction (Table 5). When the closets were examined, it was found that alla turca toilets are used in 64.51% of the toilets. All the pipes that convey the fresh water into the toilets are galvanized iron pipes. The pipes that are used in the water installation in the toilets are mostly 20 mm in diameter. The cross-sections of the pipes are adequate to convey the fresh water to the toilets (Table 5).

Waste water pipes in the toilets are mostly cast iron. The use of PVC waste water pipes is very rare and PVC pipes are mostly found in toilets which underwent large-scale repairs (Tables 4 and 5). It was found that the pipes that are used in waste water installation are 120 and 100 mm in diameter. Considering the uses in the houses, these pipe cross-sections are adequate.

On the other hand, it was found that 61.29% of the toilets have the syphon element and 38.71% don't. Stopples were used in 5.26% of the toilets and lids in 5.26% in order to prevent possible malodors from occurring in the toilets without siphons (Table 5).

It was found that the toilets lack the materials and equipment that are required for the necessary comfort conditions.

CONCLUSIONS AND RECOMMENDATIONS

This study investigated the spaces of kitchen, bathroom and toilets in the traditional Trabzon urban houses that have completed their evolution and that have original characteristics. The study aimed:

- (i) to make the reader have an insight into the spaces of kitchen, bathroom and toilets in the traditional houses,
- (ii) to reach some conclusions and identify some applications that can be taken as the bases for today's works and applications.

In their studies, Eisemon (1975) and Altman (1976) clearly demonstrated that the kitchen and toilet in a

house must be next to or close to each other, that the toilet must have a direct relationship especially with the dining space, that the bathroom must not be far from the bedrooms, and that all these spaces must have very good ventilation. In addition, they determined various sizes for kitchens, toilets and bathrooms. On the other hand, Heilweil (1973) and Kaitilla (1993) explored the unhealthy living conditions that were caused by kitchen, toilet and bathroom activities and equipment that had not been well designed and that had had bad relationships with living and dining spaces. They determined the importance of size, location, direction, equipment and materials of the kitchen, toilet and bathroom in a house. The study investigated the notions of kitchen, bathroom and toilet under the title of building-sanitary equipment, and stressed the importance of these facilities in the traditional houses.

(iii) In the kitchen spaces, the study found sizes that can be used as model sizes in the new designs. The length-width proportions of the kitchens and the required heights for different uses in the kitchens are big enough that we can take from the traditional houses and use in today's applications. The possibilities that the modern age presents find their ways to the applications in the kitchens of the traditional houses with necessary modifications. When the changes in the kitchens are examined in terms of materials and equipment, we see that the traditional kitchens have been, and will be, in a process of massive change.

(iv) Bathrooms are very important for health. In the bathroom applications in the traditional houses, it was found that bathroom spaces have the length-width proportions which we can take as the bases for today's applications. The study also identified the necessary areas for bathrooms. The study confirmed that bathrooms are the spaces whose importance has been ignored and that the number of houses without bathrooms cannot be underestimated.

(v) The study identified in the traditional houses the length-width proportions and the space sizes of the toilets, which have an important place in the wet spaces. It was found that, as in the cases of kitchens and bathrooms, the users are in a considerable attempt to improve the comfort conditions of the toilets. That the toilets are now in the houses shows that the problems related to their presence in the houses have been solved; however, it was also found that most of the toilets in the traditional houses do not have the required comfort conditions.

When the relationships among the kitchen, bathroom and toilet spaces in the traditional houses were investigated, it was found that the users are in an attempt to collect these spaces together during the repairworks (Figure 1).

In the traditional houses, there is a continuous intervention in such spaces as kitchens, bathrooms and

Table 5. Characteristics of the toilets.

Characteristic		Number of toilets	Percentage
Toilet direction	North	3	9.68
	Northeast	2	6.45
	East	6	19.35
	Southeast	3	9.68
	South	5	16.13
	Southwest	3	9.68
	West	7	22.58
	Northwest	2	6.45
Changes in the toilets	No changes	3	9.68
	Change of equipment	15	48.39
	Repair	6	19.35
	Enlargement	–	–
	Relocation	7	22.58
Location of the toilet	Inside the house	27	87.10
	Outside the house	4	12.90
Sitting direction of the toilet	Northeast	3	9.38
	East	9	28.12
	Southeast	8	25.00
	Southwest	3	9.38
	West	5	15.62
	Northwest	4	12.50
Toilet equipment	Toilet	20	64.51
	WC bowl+washbasin	7	22.58
	WC bowl+urinal	1	3.23
	WC bowl+washbasin+closet	2	6.45
	Closet+washbasin	1	3.23
Fresh water pipe diameter	20 mm	15	48.39
	25 mm	12	38.71
	30 mm	4	12.90
Waste water pipe diameter	120 mm	11	35.48
	100 mm	10	32.26
	Not identified	10	32.26
Waste water pipe material	Cast iron	18	58.06
	PVC	3	9.68
	Not identified	10	32.26
Syphon in the toilet	Yes	12	38.71
	No	19	61.29
Measures taken against malodor in toilets without syphons	No	17	89.48
	Stopples	1	5.26
	Lid	1	5.26

toilets. The reason for this is the endless possibilities that the modern era presents to human beings to make life easier and to improve the living conditions.

(vi) Despite the developments and changes in the constructional domain, most of the best building-sanitary equipment in the traditional houses have still been the same and superior. In this case, we must definitely stick to the traditional. If we are in unnecessary attempts to try again and again, we shall deprive ourselves of a sturdy basis. Consequently, the need for the investigation of the samples that belong to the past but that give us information about the building-sanitary equipment is apparent. As a result of such an investigation of such samples, the findings must be presented clearly.

It is necessary that the relationships between the sanitation needs and other needs (visual needs, security needs, hygiene needs, comfort needs, etc.) of the houses be identified and investigated. These needs of the houses must be dealt with not individually but altogether within the way of life of the society. This can be achieved only when the needs are dealt with altogether.

The increase in the number of such studies is important in that it gives us an opportunity to investigate and interpret what we should make use of.

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