# Design Considerations for Seating Furniture in Urban Spaces

**Aysel Alihan**

Submitted to the
Institute of Graduate Studies and Research
in partial fulfilment of the requirements for the degree of

Master of Science
in
Architecture

Eastern Mediterranean University
February, 2016
Famagusta, North Cyprus

Approval of the Institute of Graduate Studies and Research

Prof. Dr. Cem Tanova
Acting Director

I certify that this thesis satisfies the requirements as a thesis for the degree of Master of Science in Architecture.

Prof. Dr. Özgür Dinçyürek
Chair, Department of Architecture

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

Asst. Prof. Dr. Guita Farivarsadri
Supervisor

Examining Committee

1. Assoc. Prof. Dr. Mukaddes Faslı

2. Assoc. Prof. Dr. Maya Zdravkova Nanitchkova Öztürk

3. Asst. Prof. Dr. Guita Farivarsadri

# ABSTRACT

Street furniture is important in urban texture in different ways. Street furniture and citizens/urban users have too critical relationship; we sit, eat, wait, collect our garbage, etc. But these are not the only functions they have. They also have important role in our cities' appearance. Unfortunately the subject has not been researched enough and the deserved interest has not yet been given to their very important items in our cities. Thus, the subject is worth studying thoroughly.

Especially in Cyprus, people have had a habit of sitting in the streets to drink their coffee, have a chat with their neighbours, watching their kids, etc. until the characteristics of new neighbourhoods and new houses prevented them of doing so. In addition, the increasing car population makes it impossible to sit outside. Now urban public spaces are supposed to hold this role. They are supposed to be spaces for people to carry out social interactions. In such spaces the role of urban furniture, particularly seating elements, is very important.

In terms of street furniture research, it is found that it is hard to find any research regarding seating furniture units. The aim of this study will be to investigate street furniture from different aspects such as functional requirements, ergonomics, safety, maintenance, etc. Special attention will be given to the role of street furniture in public spaces along with designs with respect to cultural and social aspects of a certain place. At the end, a framework for classifications of design criteria for this kind of furniture will be suggested.

**Keywords:** Street Furniture, Seating furniture, ergonomics, posture, material, maintenance, proxemics, climate conditions, street, park, blue side, square/plazas.

# ÖZ

Kent mobilyaları,şehir dokusu içerisinde, günlük yaşamımızda farklı ama önemli görevlere sahiptir; mesela onlara otururuz, üstlerinde yeriz, çöplerirmizi atarız, v.s. Önemli rolleri olduğu gibi, şehrin kimliğini de oluştururlar. Bu her yönüyle düşünülmesi, incelenmesi gereken mobilyalar, malesef yeterli değeri görmezler ve bu konuda yeterli dökümanı bulmak da kolay değildir. Bu tez, bu konuda başvurulabilecek kaynak kitaplardan biri olması için hazırlandı.

Kıbrıs'ta da olduğu gibi dünyanın bir çok şehrin de insanlar sokakta oturma alışkanlığına sahipti. Apartmanların çoğalması; bireyselliğin önemkazanması; arabaların yarattığı kirlilik ve sokakları ele geçirmesi; sokak mobilyalarının hak ettiği değeri görmemesi gibi sebeblerden, insanlar sokaklardan kopartıldı. Malesef Kıbrıs'ta eskiden görülen sokakta oturup komşularla kahve içerek sohbet etme, sokakta oynayan çocuklara göz kulak olma alışkanlıkları günümüzde pek rastlanmaz. Bu birçok şehirde aynıdır. Şehir mekanlarında kamu alanları tasarımı; bu eksikliği tamamlamak, yeniden insanları bireysellikten kurtarmak, toplu aktivitelere teşvik etmek için çıkarılmış bir kavramdır.

Kamusal alanları oluşturan, kent mobilyaları ve hatta en önernlisi de oturma elemanlarıdır. Ancak bu konuda yeterli araştırma bulmak mümkün değildir. Bu tezin amacı; kentsel dokuda oturma mobilyasını bir çok değişik açıdan, mesela fonksiyonel ihtiyaçlar, ergonomik, güvenlik, bakım vs. incelemektir. Kent dokusunda, sosyal ve kültürel yaklaşımlarla ilişkili olarak mekana ve kullanıcıya özel tasarım yapılması gerekmektedir. Sonuç olarak, tasarım kriterleri gruplanarak ve özetlenerek bir tasarım

için rehber liste önerilecektir.

**Anahtar kelimeler:** Sokak mobilyası, sokakta oturma mobilyası, ergonometrik tasarım, oturma pozisyonu, mazleme, bakım, proxemics, hava koşulları, sokak, park, su kenarları, meydanlar.

# ACKNOWLEDGEMENT

First and foremost, I would like to offer my thanks to Assoc. Prof. Dr. Guita Farivarsadri, my advisor, for her valuable contributions and guidance in preparing this thesis.

I would like to thank my family, Marin Aksan, Neşe Alihan, Ekrem Alihan and Önsel Alihan, for all their continuous moral and material support and I also would like to thank Kemal Değirmencioğlu, Batuhan Bayramoğlu, Hilmi Hami, Claudio Diaz Riquelme, Bilge Manik, Davut Aksular and Emine Esen for their valuable help and time.

# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

# Chapter 1

# INTRODUCTION

Seating furniture, which is one of the most important street furniture creating a common social public space, is the main focus of this thesis for several reasons mentioned below.

Ozturk (2003) explains that, "Street furniture are the components of a successful urban place which undertakes an important function" (p.358). However this is a general idea about street furniture, which "is a rarely observed topic" (Uffelen 2010, p.9). Unfortunately, despite this very important fact, the design of street furniture is not always considered carefully. Different departments, which are responsible for various public services, install different and unmatched furniture in urban spaces depending on their budgets or their designers. Transportation offices of governments take care of bus stops; municipality places dustbins; sponsors pay for benches with advertising inscriptions and the result is a visual chaos. Although all of these items may serve a functional purpose, the view becomes aesthetically a chaotic one. A solution can be to have a single office or a section in a municipality, or a single committee in a city combining all the necessary offices, which will be responsible for design or evaluation of designs of all items in the streets in correlation.

*'Time-Saver Standards for Landscape Architecture'*(1998) defines street furniture as "Elements placed in landscape or streetscape for comfort, convenience, information,

circulation control, protection, and user enjoyment are collectively referred to as street furniture. Benches, bollards, signage, lighting, tree grates, and utility boxes are but a few examples" (Dinnes & Harris l998, p.167).

Street furniture is an important feature of urban spaces, and they support social life in a positive way. From the start of the day, when people go outside they start to use urban furniture until the time they get back home. For example, they sit down on seating furniture; eat on tables in the streets or on picnic tables; wait at bus stops; figure out their direction with the help of signs, etc. However, street furniture has many more other functions beside these. They also carry out important features in forming the appearance of a city.

To summarize street furniture is comprised of elements which are placed in or designed for landscape or streetscape to meet a variety of outdoor user needs and can be used to enhance the physical environment for a better social public spaces.

*'The Time-Saver Standards for Landscape Architecture'* (1998) categorizes street furniture as follows:

1. Seating Furniture
2. Traffic Control and Protection Furniture
3. Lighting
4. Trash Receptacles
5. Bike Racks
6. Convenience Elements
7. Information

8. Surface Utility Elements

9. Fountains

10. Seasonal Elements

11. Shelters

12. Special Features

Among the above mentioned street furniture categories, seating furniture is the one which is mostly related to human body. This means people can utilize the seating furniture according to their needs while this type of furniture can definitely encourage them to socialize outside at the same time.

In 'Life Between Buildings' book, Gehl gave details about Copenhagen tripled the total area of squares and pedestrian streets in between 1968-1986. As a result the amount of sitters in those areas tripled as well, while the amount of city population stayed same (Gehl, 1987). This shows that designing more places for people to sit in public places will encourage people to sit outside more and get socialized. In addition to this, William Whyte's study provides more detail to it, he explains it as "After 3 months of checking out various factors –such as sun angles, size of spaces, nearness to transit- we came to a spectacular conclusion: people sit most where there are places to sit" (Whyte 1974, p. 30). With these evidences, it is obvious that it is important to provide more proper seating furniture in social spaces in order to increase their use.

## 1.1 Aims and Objectives

The main aim of the study is to investigate the features that healthy and comfortable outdoor sitting should have and to prepare a design guidelines for seating furniture in urban spaces to be used by designers working in the field. Ergonomics, anthropometrics, material choosing, installing, safety requirements, organization

depending on urban spaces are important aspects to be considered in design of seating furniture. As a result, the research investigate all these aspects in relation to urban seating units.

This thesis focuses on seating: because social relationship of people is a very important subject in humans' world and seating unit is the most important street furniture to make an urban space attractive for social interactions. Accordingly the following research question has been raised as: How should the seating furniture in urban spaces be designed?

## 1.2 Methodology

In this thesis, qualitative research method has been used. A thorough review of the documents written on the various dimension of urban seating furniture including books, articles, papers, journals, reports, existing standards etc., have been realized as the first part of the study. As the second part of study a checklist summarizing all related aspects to be considered in the design of urban seating furniture has been prepared to serve as a design tool for the professionals working in this field.

## 1.3 Limitations of the Study

This is a theoretical study about street seating furniture. Instead of making a specific case study in order to support the theoretically information, various examples will be provided as needed. The study focuses mainly on ergonomics, anthropometrics, and material choosing criteria, installing details, city places, allocation and safety requirements to be used in preparing the guidelines for designers. The role of furniture in relation to urban identity, although is a very important subject and is not studied within the scope of this research.

# Chapter 2

# CONSIDERATIONS IN RELATION TO HUMAN BEING

Taynsford (1975) wrote that, "The design of seating can be traced at least to antiquity. The stool, for example, had already been developed into a valued article of furniture by the Egyptians as far back as 2050 B.C. and the chair as far back as 1600 B.C. Despite its ubiquity and long history, however, seating units are still one of the most poorly designed elements of interior space" (p.10). As it can be seen in J. Taynsford's statements above, respect to comfort issues, adequate attention on indoor seating elements and this is even worse for outside space.

This chapter focuses especially on the design of seating furniture in order to have a clear understanding of how they can be designed to suit the physical dimensions of human beings and ensure correct postures.

## 2.1 Ergonomics

Hendrickson (1992) explained that, "The term `ergonomics` comes from the Greek *ergon*, meaning work, and *–omics*, meaning `natural law". (p.301) Ergonomics is a discipline which encompasses fields such as design, psychology, physiology, anthropometry, engineering, management, and the likes. It identifies the influence of seating conditions and space on people, and subsequently redesigns them to be in better accordance with human beings' natural physical and psychological state (Bridger, 1995). Ergonomics deals with designing products for human being's physiological and psychological capacities and limitations (Blum, 1952).

As far as Pheasant is concerned, there are generally significant criteria which identify a favourable link between the user and the product. These criteria are as follows: “functional efficiency (as measured productivity, task performance, etc.); ease of use; comfort; health and safety—and so on” (S.Pheasant 1997, p. 5).

Sitting is not a static activity as it may seem. It is rather a dynamic one. It has to be approached taking the comfort details of a human being along with three dimensions into consideration. (Sanders & McCormick, 1993) From another point of view, industrial designer Niels Diffrient states, in the book “The Chair: Rethinking Culture, Body and Design” by Galen Cranz, that “chair design is the acid test for designers” (Cranz 2000, p.16). Buying a chair for home or office is a difficult activity. Everyone has different comfort criteria. Due to the fact that seating furniture is designed for public use, in other words for everyone, there are not really practical opportunities to have them tested by every single person in the area and it is definitely impossible to suit them totally for every single individual. Then, how to design seats so that it fits to maximum numbers of users will be discussed in this section.

Even though ample attention is paid to the design of seating furniture, sitting is, in fact, a difficult task as Dennis Zacharkow states. He further indicates that it is difficult in terms of ergonomics and occupational health in spite of the fact that you sit comfortable and healthy enough or not. This is because there is thirty percent bigger physical force on the spinal discs while being seated than while standing (Zacharkow, 1988).

Galen Cranz, points out that the science of ergonomics provides some clear suggestions to decrease the detrimental effects of sitting on a chair. Despite applying the ergonomic recommendations, a designer may not entirely eradicate all the harm chair sitting causes, but can only reduce them (G.Cranz, 2000). Thus, this problem may solve with true postural consideration and this discussed in this chapter briefly and the criteria as for design proper furniture are given.

### 2.1.1 Postural Considerations

Depending on posture, muscular loads goes on musculoskeletal system. If the posture is not right, result is a painful body. In a long duration of sitting it can cause body injuries as well.

**Identifying Good Posture:**

"Basically, having correct posture means keeping each part of the body in alignment with the neighboring parts. Proper posture keeps all parts balanced and supported" (URL 2.1), in order to design an ideal seating furniture in public space, it is important indeed to pay regard to proper posture which would provide comfortable sitting avoiding possible injuries. Obviously, it is also a wise and necessary solution to provide different alternatives, variety of postures for street seating furniture in order to adjust to personal differences in size and shape. By doing so, every user can sit down comfortably in accordance with his/her body dimensions and postural preference. This is really crucial as nowadays there is a lack of consideration for postural variety when designing street seating furniture.

**Muscular efforts:**

If a sitting product helps to reduce muscular effort, it takes the pressure to a lower level on the back and helps to healthy blood circulation. If it manages all these, then it can be considered as a well-designed sitting product.

As Asatekin (1975) explaines, posture which "can be expressed by the angles at major joints of the body", is the good definition of posture. Adapting this information to outside seating furniture, Figure 1 below provides details of angles for public seats. This detailed figure for public seats, which is taken from Architectural Graphic Standards by The American Institute of Architects, gives detailed information about sitting positions. The angles exhibited in this figure can be regarded as a referential guide for postural considerations.

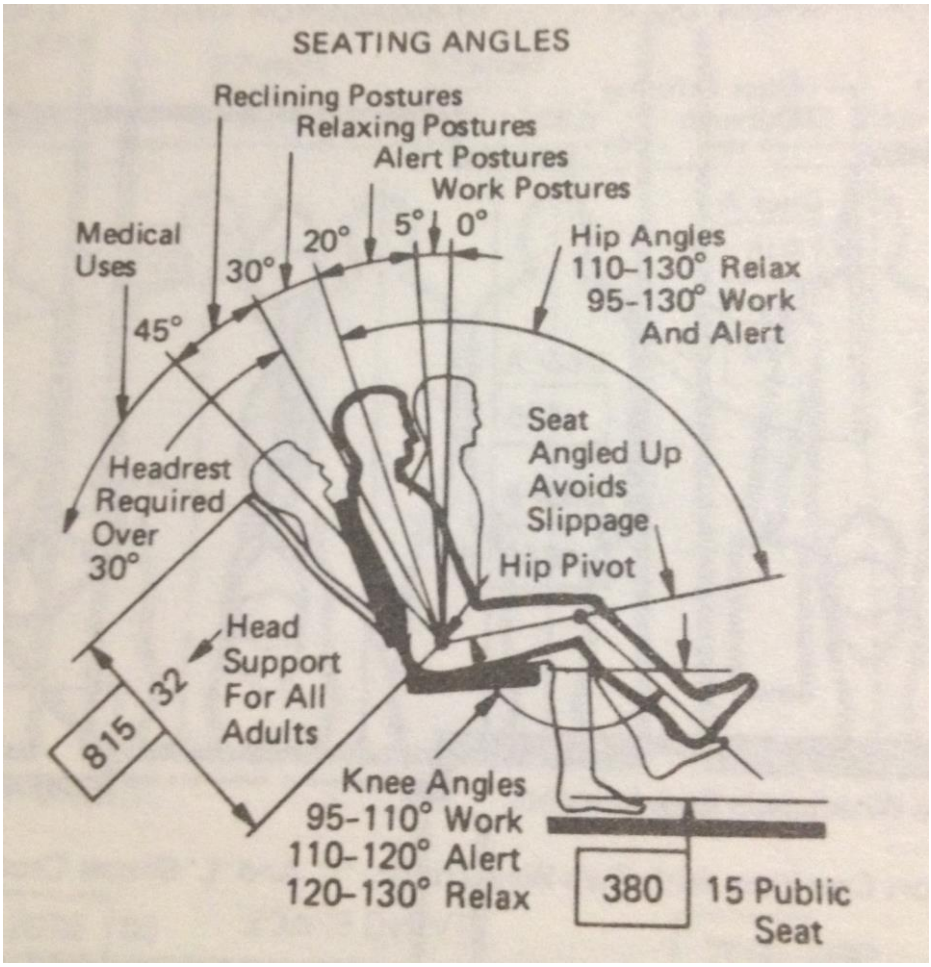



Figure 1: A well-detailed figure for public Seats
(Rampsey & Sleepers 2002, p.2)

For different functions, various postures may be used in urban furniture.

**Alert Posture and Work Posture:**

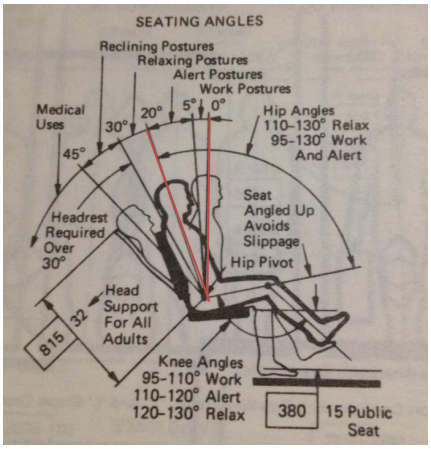



Figure 2: Alert and Work Posture
(Modified by Aysel Alihan)

Seats conceived for these postures should be angled a little upwards to avoid slippage. Knees should be angled between 95 and 110 degrees for these postures. The angles of the backrest ranges from 20 to 0 degrees. (Rampsey&Sleepers, 2002) Bus stop seats are especially designed following these criteria of alert and work postures. One of the best illustrations for this is an ergonomically designed bus stop, below at Figure 3, which was conceived by Martin Necas. When a person is waiting for a bus, s/he definitely has a feeling of alertness in this condition. One can clearly see that the angles of his design are exactly as the same as alert posture`s (URL.2.2).

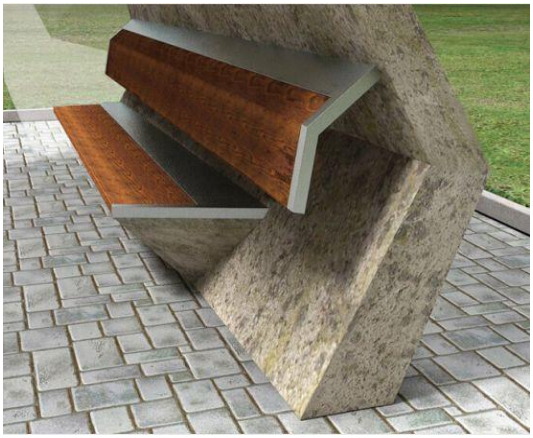


Figure 3: Ergonomically designed bus stop by Martin Necas
(URL.2.2)

Another example is the design of Wi-Fi street stations in Paris which is rather a new approach for street furniture. For this kind of stations, it is very suitable to design seats in accordance with the working posture as the French designer Mathieu Lehanneur did. As Mathieu Lehanneur's design for these stations are named Escale Numérique, which means Digital Break in English, visitors stop there for a break, as the name suggests (URL.2.3).

Figure 4: Escale Numérique, which translates as Digital Break, in Paris (URL.2.3)

**Relaxing Posture:**

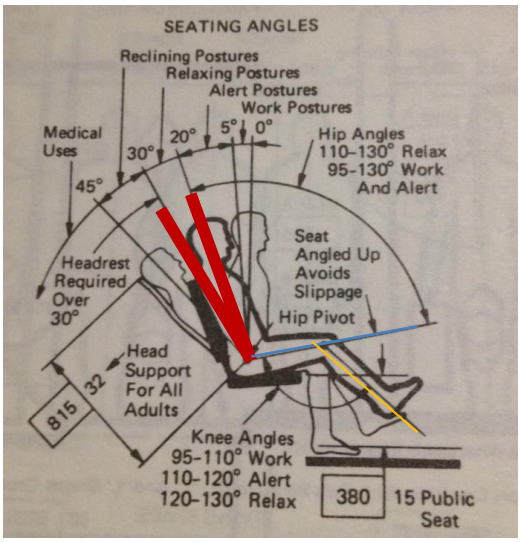



Figure 5: Relaxing Posture
(Modifyed Aysel Alihan)

This is a normal street sitting posture which is most common. It is possible to find it in general usage. With regard to this posture, the angle of the beckrest ranges from 30 to 20 degrees and the knee angles are between 110° and 130°. Headrest is not necessary for this posture. Hip angles should range from 110 to 130 degrees. (Rampsey & Sleepers, 2002)

Figure 6: The Kajen Public Bench designed Thomas Bernstrand
(URL. 2.4)

**Reclining posture:**

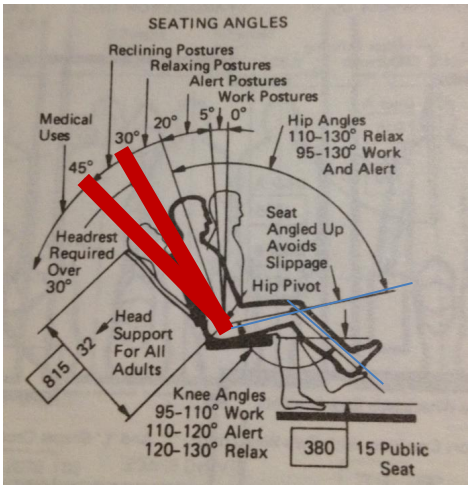



Figure 7: Reclining Posture
(Modified by Aysel Alihan)

When the backrest position is in between 30 and 45 degrees backward, the posture is called a reclining posture. The headrest is still required in this position. To support this kind of sitting posture, knee angles should be at 120-130 degrees forward. This is named as relax position for legs. (Rampsey & Sleepers, 2002) For instance, “Plage” which was designed for the Festival Ephemeral Gardens in Quebec City, Canada (Figure 8), is a fine example for reclining posture conceived as a seating furniture for public utilisation. (URL.2.5)

Figure 8: Near the beach in Quebec City, Canada
(URL.2.5)

**‘Medical Use’ Posture:**

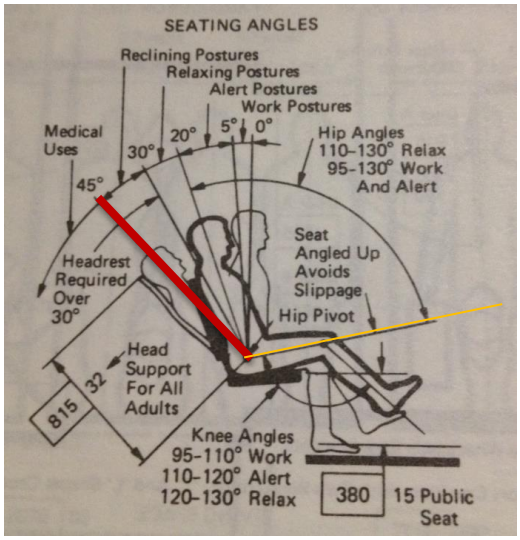



Figure 9: ‘Medical Use’ Posture
(Modified by Aysel Alihan)

Backrests designed with a backward angle at 45° and more. Seats with this range of angles must have a headrest as well as footrest which are essentially supportive parts for comfort. This kind of seating furniture are present even in urban space though they are rare. In this position, the upper body leans backwards with 45° and more, the legs below the popliteal part stretch out forward with an angle at 120°-130° and the whole body is supported (Rampsey&Sleepers, 2002). A very good example of this is Peter Newman’s design in front of London`s Hayward Gallery which is called ‘Skystation’. On this seating element, people can watch the stars at night or enjoy the sunlight on sunny days. (URL 2.6) This is hard to sit down or stand up again for elderly people.

Figure 10: UFO Urban Furniture. A design of Peter Newman called ‘Skystation’. (URL 2.6)

**‘Free Posture’:**

Kroemer (1994) defines one more posture which is ‘free posturing’. In this ‘posture’, people can sit down in a large number of various positions and postures. They can sit upright; stoop ; cross their legs; sit on their feet, straddle on chairs; balance on the front edge; sit sideways; tip back on the back legs, etc. Backless seat and walls are good examples for this posture.

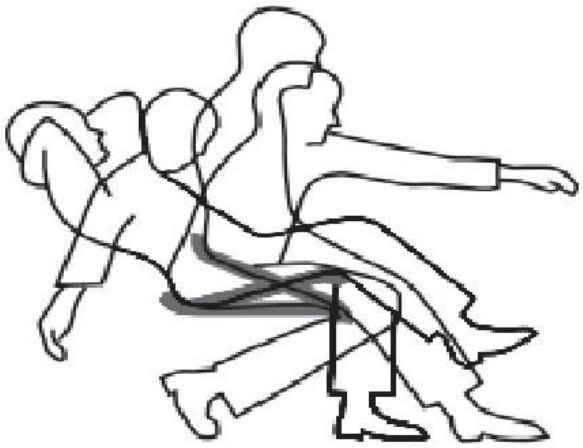


Figure 11: Free posture
(Kroemer, 1994)

Figure 12 is good example for free posture sitting. She crossed her legs and reading something.

Figure 12: Example for Free Posture
(URL 2.7)

All these above-mentioned points bring this thesis to the field of anthropometry which is an important part of ergonomics.

### 2.1.2 Seat Dimension in relation to Anthropometric Data

The word “anthropometry” originates from the combination of two Greek words: "anthropos" (human) and "metron" (measure). It is the study of human body and its measurements in size and proportions (Duyar, 1995).

The first of the vital statistics on human body were carried out during the years 30-20 BC by the Roman architect Vitruvius (Neufert, 1983). After Vitruvius, important work was done by Phourna Moku in the Middle Ages; and following Phourna Moku, Gennino Cennini defined human body proportions in a different way in the 15th Century (Bilen, 2004). First studies on seating furniture are based on the Middle Ages. During this period, measurements utilizing the body proportions were made. For

example seat height was calculated to be 5 punches in height or half of the leg length (Tilley, 1993).

Akin and Koca (2002) noted that when anthropometric data are used, five important points should be cared:

a) Feature of the reference population: Anthropometric measurements should be noted taking ethnic and racial groups of the population, age groups and gender, etc. into consideration. One anthropometric data for the use of a particular population should be avoided for the use of another population. This is because the anthropometric sizes of each of the populations are different. For example, an athropometric data obtained in Norway should be avoided for the use of people in Vietnam.

b) Data should be used after ensuring that it is gathered by the minimum human error and by professional people.

c) Anthropometric data can change in time. If the living standards and well-being of a population are in a process of healing, anthropometric data can increase too depending on that. In other words, people in better living conditions can have healthier bodies. On the other hand, predicaments such as war, food shortage, and natural disasters may cause decrease in the anthropometric data. Therefore, the date of anthropometric data is so important.

d) In order to reach reliable data while researching and creating the anthropometric standardization of society, anthropometric measurements should be taken from the subjects who are not dressed as little as possible and shoes must be off. Designers should consider this crucial detail. Beside this, they should add 2-3 cm to the existing data.

e) Static or dynamic anthropometric data should be used according to the nature of the workplace environment. Dynamic or functional anthropometry refers to physical body sizes during activity.
(Akin and Koca cited in Ersoy, 2008).

Genetic and environmental factors in the context of human reveal a role in determining the physical and biological limits which leads to the anthropometric data. It is essential for a designer to be aware of the bases of the anthropometric data and these should be taken into account when a street furniture is designed. For this reason, five points mentioned above are vitally important.

Depending on Altıparmakoğulları's idea (2009), seating furniture can be grouped in two: The seats with support and the seats without support. The ones without support have only the seat part and they help to sit down higher than the ground. Supported seats have the parts such as backrest, armrest and footrest as well as the seat itself. Sitting Action and Seating Furniture: Simply, the act of sitting is provided with a seat or seat (Random House Kernerman Webster's College Dictionary, 2010). Seating and human body are two important subjects to know simply before all other details.

Understanding human dimensions is necessary to be able to design seating furniture. In this regard, it is crucial to review the human body basically. According to Ergonomic Seating Guide Handbook, it is a challenging task to design for the human body for the reason that there are a vast number of various sizes and shapes. In this respect, one may find a design comfortable whereas another person may consider it unsuitable. It goes without saying that there are many various sizes of shoes and

clothes in order to adjust to this variety. In case a person is in physical interaction with a product for a long time in one ego, then it is really significant that it fits to the person using it (URL.2.8).

Designing a seat should start after checking an information chart like the one below. The following measurements were prepared by Pheasant. Such an information chart was prepared for all kinds of populations by following the same points.

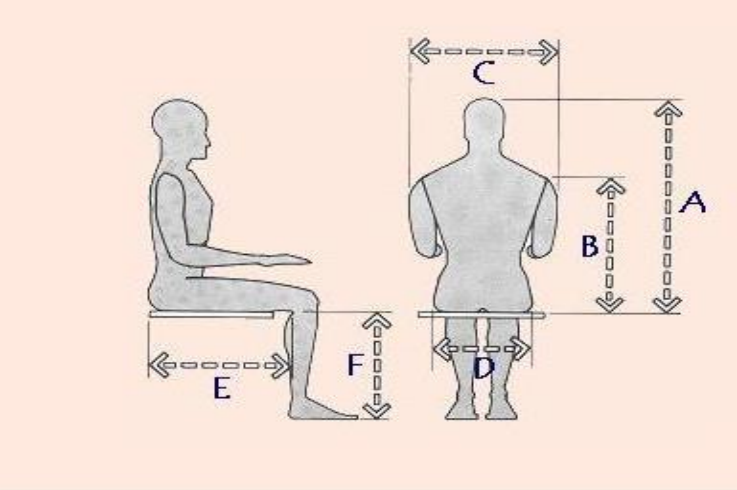



Figure 13: Guidelines for design
(URL. 2.9)

Table 1: An Example Anthropometric Table (URL 2.9)

| Anthropometric estimates for British adults aged 19-65 years (in mm, from Pheasant) | | | |
|---|---|---|---|
| *Dimension* | *5th %ile* | *50th %ile* | *95th %ile* |
| **A** Sitting height | 850 | 910 | 965 |
| | 795 | 850 | 910 |
| **B** Sitting shoulder height | 540 | 595 | 645 |
| | 505 | 555 | 610 |
| **C** Shoulder breadth | 420 | 465 | 510 |
| | 355 | 385 | 435 |
| **D** Hip breadth | 310 | 360 | 405 |
| | 310 | 370 | 435 |
| **E** Buttock-popliteal length | 440 | 495 | 550 |
| | 435 | 480 | 530 |
| **F** Popliteal height | 395 | 440 | 490 |
| | 355 | 400 | 445 |
| | | MALE | FEMALE |

('Popliteal' refers to the part of the leg behind the knee.)

**Percentiles: "**Percentiles are shown in anthropometry tables and they tell you whether the measurement given in the tables relates to the 'average' person, or someone who is above or below average in a certain dimension. If you look at the heights of a group of adults, you'll probably notice that most of them look about the same height. A few may be noticeably taller and a few may be noticeably shorter. This 'same height' will be near the average (called the 'mean' in statistics) and is shown in anthropometry tables as the fiftieth percentile, often written as '$50^{th}$ %ile'. This means that it is the most likely height in a group of people. If we plotted a graph of the heights (or most other dimensions) of our group of people, it would look similar to this (URL 2.10):"

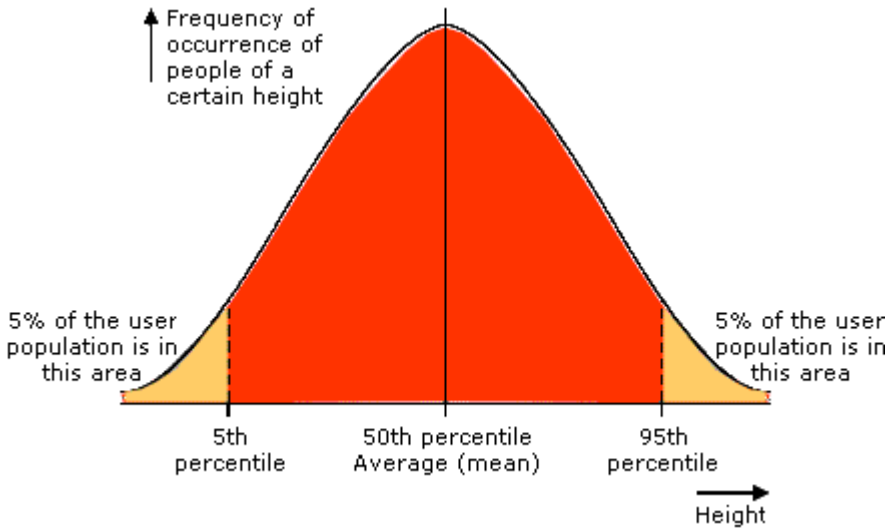



Figure 14: Percentile Graph
(URL 2.10)

Table 2: Helper Table to use the Graph (URL 2.10)

| What is it that you are aiming for with your design? | Design examples: | Examples of measurements to consider: | Users that your design should accommodate: |
|---|---|---|---|
| A good match between the user and the product | Seats, | Knee-floor height, Head circumference, Weight | Maximum range: 5th to 95th percentile |

#### 2.1.2.1 Seat Depth

It is really important to have the seat depth in the right measurement for actions such as sitting and standing up. Buttock-popliteal length should be more than the seat depth. Naturally, someone who is shorter needs less seat pan length whereas someone who is taller needs more. In this regard, the most important point for the seat depth is that fifth percentile buttock-popliteal length of all women accommodate about 95 percent of all users. Grandjean (1987) suggests that a seat depth should be 38-42 cm.

#### 2.1.2.2 Seat Height

The seating height, which is the main evaluation of the design procedure, is the same as popliteal height. If it is too short, the feet lose stability and the legs can extend and move toward front of the body. If it is too high, blood circulation will be blocked and people will be uncomfortable on such seats. The most important point for the seat height is that fifth percentile buttock-popliteal length of all women accommodate about 95 percent of all users. Grandjean (1987) suggests that the seat height should be betweeen 35,5 cm and 44 cm.

The reason for curving the front rail of chair is to eliminate the sharp edge that might cut into flesh under the knee, called the popliteal region. All ergonomists agree on this simple rule (Galen Cranz, 2011).

#### 2.1.2.3 Seat Width

Figure 15 and Table 3 below show two possibilities. One of them, which is named as low density in Figure 15, provides wider opportunities. This is a well-placed seating furniture in case the public place there is not generally crowded. An adequate space for an adult user should be provided so that she or he can stretch out his/her elbows while reading a newspaper, or for books to be placed aside, etc. J. Panero and M. Zelnik

(1979) suggest that the seat breadth should be 76.2 cm for one person. The other one is an illustration of high density seating (Figure 15) in which a space of 61 cm of hip breadth is suggested for one person. Here, every person invades another person's intimate space but they all try to ignore each other. They all pretend they are not doing so. If there are no armrests between people on benches, then there will be no limits for this kind of seats, both physically and psychologically.

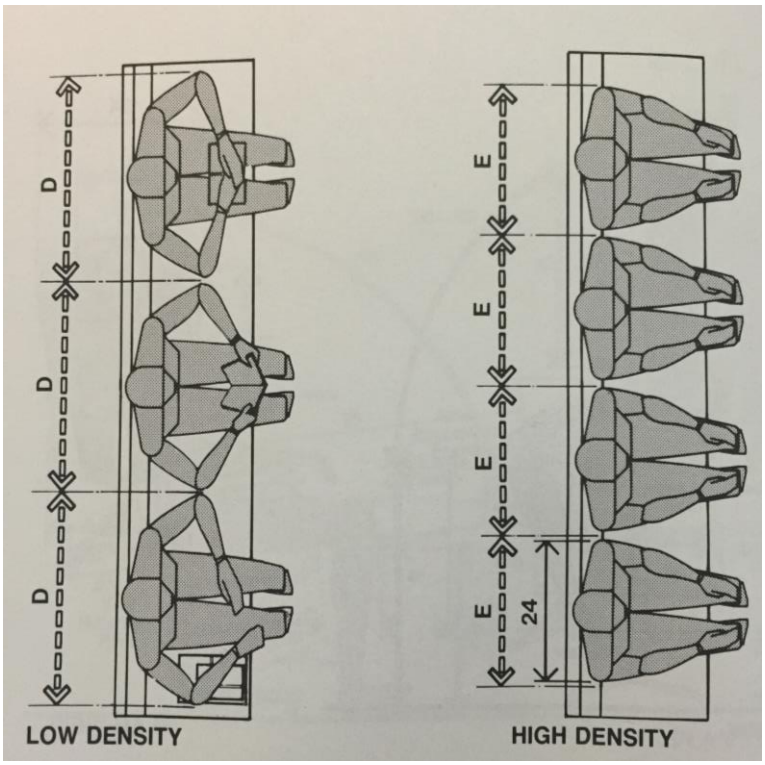



Figure 15: Banquette Seating
**(**J. Panero and M. Zelnik, 1979)

Table 3. Banquette seating anthropometry **(**J. Panero and M. Zelnik, 1979)

| | **in** | **Cm** |
|---|---|---|
| **D** | 30 | 76.2 |
| **E** | 24 | 61.0 |

### 2.1.2.4 Backrest

The backrest too is important for relaxed sitting. The shape of the backrest should be supporting the lumbar and sacral scoliosis (Güler, 2004). It should be designed in accordance with 95th percentile mid shoulder length of tall men in accommodate about 95 percent of all users.

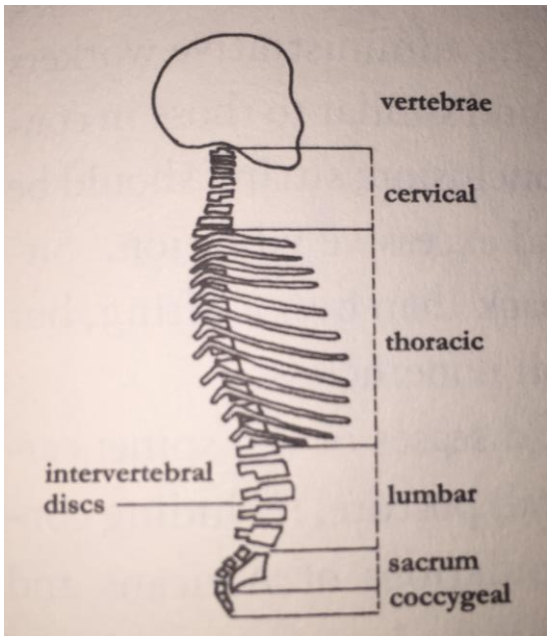



Figure 16: S-shape of the human spine in side view
(G. Cranz, (2000). P.97).

As it is on the Figure 16, lumber part of the body is very vulnerable, so it needs to be supported. The distance from the seat surface to the centre of the lumber pad is generally suggested to be 10-20 cm. Grandjean (1987) explains that a backrest level of 48-52 cm vertically above the seat level is an ergonomic need nowadays. The bench, at Figure 17, which is a product designed by Qingdao May Gao Urben Facilities Co., Ltd is one of those rare examples, which is appropriate street furniture that meets lumber support need.

Figure 17: Contemporary bench design
(URL.2.12)

Additionally, there should be a part below the lumber support for thigh clearance not to push the sitter front as it would make the sitter uncomfortable. As it is observable from Figure 18 , Panero and Zelnik suggest that the thigh clearance should be between 0 cm and 15,2 cm.

| | in | cm |
|---|---|---|
| A | 31–33 | 78.7–83.8 |
| B | 15.5–16 | 39.4–40.6 |
| C | 16–17 | 40.6–43.2 |
| D | 17–24 | 43.2–61.0 |
| E | 0–6 | 0.0–15.2 |
| F | 15.5–18 | 39.4–45.7 |
| G | 8–10 | 20.3–25.4 |
| H | 12 | 30.5 |
| I | 18–20 | 45.7–50.8 |
| J | 24–28 | 61.0–71.1 |
| K | 23–29 | 58.4–73.7 |

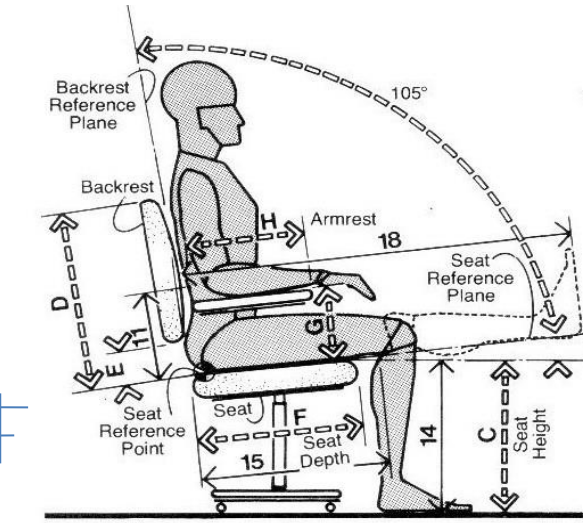



Figure 18: Thigh Clearance
(Panero & Zelnik, 1979, p. 128)

### 2.1.2.5 Armrest

The armrest should be parallel to seat part's angle (Panero & Zelnik 1979, p.129). The armrest is especially a very important need for elderly people and for people who have

some kind of physical difficulty. Properly designed armrests help these people sit down or stand up much more easily. Besides, if armrests are placed to separate each person on a bench, they provide psychological relaxation for foreign people to sit side by side. However, badly designed, which means not left place between backrest and armrest for elbow, ones can cause nerve compression. It is obviously not a correct design if a person`s shoulders stay in higher position than they should be. A person sitting down on a seat with such badly designed armrests will definitely feel discomfort even after a short while of sitting. Asatekin (1975) mentioned that the armrest at a height of 9 cm is healthy for Turkish population. By Zelnik and Panero (1979), advised the armrest height should be between 8 and 10 cm. Armrest lenght is advised between 10 and 12 cm.

**2.1.2.6 Leg Rest/Footstool**

When seating furniture is designed in reclining, it is essential to provide a leg rest. The height of the seat should be a few centimetres above the leg rest to improve blood flow while sitting. Height of the leg rest height should be between 30 and 40 cm (Zelnik, M., &.Panero, J.,(1979). 'The Kajen public bench' (Figure 19) shows that it is possible to place extra relaxing seating furniture on public places as well. This bench was conceived by the Swedish designer Thomas Bernstrand. It was produced to provide comfort for outside seating furniture. However, this kind of benches should be designed for such places where there is ample space.

Figure 19: Bench with a footstool
(URL. 2.4)

If no leg rest is provided for a seating furniture, then it is important that a person's legs do not stretch out from the seat. In the contrary case, people passing by may tread on them. In order to avoid such cases, it is necessary to have a kick space (at least 7.62 cm) below the seat if a big solid leg is used. (URL.2.4)

**2.1.2.7 Ergonomic Details for Elderly Friendly Seating Furniture**

Gosbee (2002) mentions that, "with advancing age, joints, skeletal and muscular systems are affected. This results in reduced strength, stamina and loss of flexibility. We also loose height in our spine. The net result is that older adults can no longer reach as high, bend as low or maintain the physical activity for the same length of time as they could when they were younger. 'Furthermore, Arthritis tops the list of chronic condition of older adults" (p.352). So, people in the older adult generation need to sit more deeply than the younger generation, as much as over 15 cm. At the end of a seat, there should be a thigh support in order to back for stability and keep the posture.

In the study of London Roads Service and Translink Office (2015) it is suggested that the design of each bus stop or each bench on the walking distance should be placed in

100 meters, specifically for the older adults. Australian designer Michael Oechsle conceived hybrid street furniture including many functions, such as short break seats which provide resting opportunities for elderly people. It does not need large space. It is so useful in elderly people`s life and such designs in public space encourage them to go outside.

Figure 20: Hybrid street furniture suitable for the elderly
(URL 2.14)

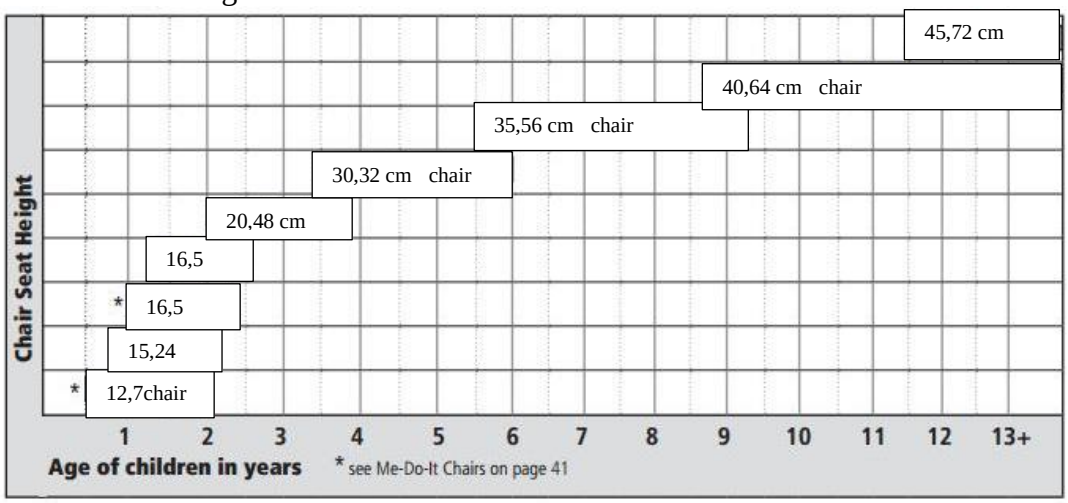
As it is mentioned above, the armrest is especially a very important need for elderly people and for people who have some kind of physical difficulty. Properly designed armrests help these people sit down or stand up much more easily.

**2.1.2.8 Ergonomic Details for Child Friendly Seating Furniture**

It is almost impossible to see any seating furniture for kids outside. As Professor Alan Hedge (2013) accentuated, "children should never sit for prolonged periods in the wrong size chair with their feet dangling. A chair should comfortably fit the child and allow the child to sit in a natural, relaxed, supported way while keeping his/her feet on the floor or a stable surface to improve postural stability." It is not impossible to design

a great variety of seats to suit kids as well. This is especially valid for squares and plazas which mostly have large space for seating furniture, and host crowd of people with children.

Table 4: Chair Height Guidelines for kids




According to Table 4, kids physically grow so fast from the age of one to the age of four. There is no need to design special seating furniture in urban spaces for infants or babies until they become toddlers. Parents generally carry their kids who are below the age of 1.5 in a push chair since most of the kids do not walk before that age. Therefore, it is better to have different seating heights of chairs, ideally between 20 cm and 40 cm, around for kids.

Figure 21: Bench for Kids
(Uffelen, 2010, p.271 )

# Chapter 3

# CONSIDERATIONS TO PHYSICAL ASPECTS

Other important considerations in design of seating furniture are those related to how to choose suitable material, how to provide ease of maintenance, and safety. No need to say that environmental consideration and issues related to green design should be the beginning point in design of any item in the city. In the following parts the technical and physical issues to be considered in design of the urban seating furniture are described.

## 3.1 Material and Structural Consideration

Generally, according to environmental consideration using acquirable local materials which are in sufficient amounts such as stone or timber are the best choices for the seat design. As Cyprus is concerned, there is not enough wood to rely on that resource. Traditionally the basic materials used in urban seat design are wood and metal in many European countries or in the U.S. Brick and stone are used in some others, but to a far lesser extent. Recently plastics are used widely too. Nevertheless, the design will fundamentally determine the suitable material. The other important factor in choice of material is the climatic condition. Of course ease of maintenance is another factor to be considered in choice of material for urban seats.

Santa & Cole mention that in developed countries, local manufacturers were and remain small companies based on single technologies, so that one would cast iron while the other worked wood. Their products were and remain technologically simple.

On the other hand, companies which are involved in design development nowadays, work with several materials such as wood, metal, plastics, stone and the new materials all at the same time. These kind of companies are able to do this because they do not consider themselves as mere metal workers or carpenters, but rather as producers of street furniture (Santa & Cole, 2015).

The following are the issues to be considered in design of urban seats developed based on the 'Environmental Building News' checklist (Martin, 2000) proposed as a guideline for the characteristics that a green and sustainable design should have.

* Use durable products and materials: Because manufacturing is very energy-intensive, a product that lasts longer or requires less maintenance usually saves energy. Durable products also contribute less to our solid waste problems. (Martin, 2000) For example stone and marble, cast iron and stainless steel are examples of durable materials that can be used in street furniture design.

Figure 22: Marble Bench
(URL 3.1)

* Choose low-maintenance furniture materials: Where possible, select furniture materials that will require little maintenance (painting, retreatment, waterproofing,

etc.) or whose maintenance will have minimal environmental impact. (Martin, 2000) Cast concrete can be good example for this.

Figure 23: Cast Concrete Bench.
(URL 3.2)

* Choose furniture materials with low embodied energy: Heavily processed or manufactured products and materials are usually more energy-intensive.

* Buy locally produced furniture materials: Transportation is costly in both energy use and pollution generation. (Martin, 2000)

* Use furniture products made from recycled materials: Recycled materials reduce solid waste problems, cut energy consumption in manufacturing and save on natural resource use. (Martin, 2000)

Using principles above, any material may be examined and the result will be environmental and economic.

There is a vast variety of furniture. Depending on points mentioned above, some materials are examined below. Firstly, it is possible to examine the furniture material types in four general types as Motkar (2012) grouped:

**Wood**

Choosing wood necessitates more information than other materials. Designers should know the types of wood and protective materials. Every wood type has different reactions against outdoor conditions. There are hundreds of wood varieties, but only few of them can stand strong against rain, sun, insect pests etc. For example, redwood, cypress, and cedar trees contain chemical compounds to get protected from bugs, bacteria etc. (Smardzewski, 2015, p.203)

According to many sources about the characteristics of wood, the best ones are northern white cedar, western red cedar and teak. "They're valued for their combination of lightweight, interesting grain pattern and extreme durability in outdoor conditions"(URL.3.3). These types of wood are best choices, especially for sea sides and marinas. Plowhearth web page indicates that eucalyptus or native white oak is the second choice for wood to use outside.

Cedar or pine in many countries is affordable to buy. Small Wood News has important information about cedar that "insects are turned off by the natural aromatic scent, which is what makes this wood an ideal choice for indoor furniture, hope chests, boat building and house siding. It is surprisingly lightweight, has attractive grain qualities with knots and cracks while still lasting better than 20 years without splitting, rotting or warping" (Motkar, 2012, p.6).

Figure 24: Letter Bench, Bristol, UK
(URL.3.4)

There are also other materials rather than wood that are used in street furniture design.

Figure 25: Wood and steel Bench, London
(URL 3.5)

**Plastic**

Beforehand, plastic was used only for garden chairs. It is now used for other furniture items as well because of its durability and light weight. Plastic is divided into two types mainly, Thermoplastics and Thermosets (Motkar, 2012, p.6).

Thermoplastics: Thermoplastic is an environmentally friendly coating for metal benches. Thermoplastic benches are very commonplace, located in facilities ranging from schools, parks, recreational spaces and office buildings. The material itself is graffiti resistant and easily repairable, as opposed to other metal coatings and, with a thorough coat, will help a metal bench withstand a variety of climates. There are endless color options and six different common pattern styles: expanded metal, perforated metal, strap style, welded wire, diamond pattern and rod style. Expanded metal is often seen in casual park settings, featuring a lattice-like look while strap style can be commonly featured trail side or embellishing a sidewalk. (Evans, 2006).

Figure 26: Seats created by Oliver Schau, Hamburg
(URL.3.6)

Oliver Schau's urban seating furniture is a creative idea produced from plastic. The project is awarded due to its low-cost and flexibility.

Thermosets: These are also known as thermosetting polymers. They are not recyclable and hence, heating the furniture made out of these polymers will only burn the it and won't turn it into a liquid form. They play a supporting role in manufacturing a

furniture piece. For example, phenolic is a thermoset plastic used only as furniture adhesive.

Figure 27: Thermosets bench with light
(URL.3.7)

**Metal**

Metals have the highest melting points and densities. Metals can also be turned into different shapes without breaking them. The types of materials used to make metal furniture pieces are steel, aluminium, and wrought iron. Each of these metals have special properties related to ease of maintenance, resistance to rust, heat conductivity etc. that should be considered carefully while using them in urban seats.

As generally metals are highly heat conductive, they are not suitable materials for extremely hot or cold environments as they can be very dangerous.

Figure 28: Serac Bench by Zaha Hadid
(Frearson. 2013, p86)

**Earth**

Where stone is hard to find and timber is rare, earth can be an alternative material. This is a material that is suggested for every part of the world because it is a local material. There are two main forms of it: adobe or mud bricks dried under the sun (sometimes reinforced with straw) and bricks or pieces which are baked in kilns and thus made harder (Motkar, 2012, p.6).

Figure 29: Brick bench, Snow Hill
(URL.3.8)

Positive characteristics of clay seating furniture are as follows:

a) It can carry large amounts of load except edges of the furniture;

b) It is a material which can be found everywhere;

c) It can be fixed much more easily in comparison with other materials.

d) It cannot be stolen by anyone due to its characteristics.

Negative characteristics of clay seating furniture are as follows:

a) It is not strong against weather as all other materials.

b) It can absorb moisture and cause material degradation and color fading.

c) It can help algaes, mushrooms and moss grow on the surface.

(Motkar, 2012, p.6).

Figure 30: Earthen Bench, Dogon Country, Mali
(URL.3.9)

## 3.2 Maintenance

Maintenance, cleaning and repairing of urban furniture can be very costly and energy consuming, because it is necessary to use specialist cleaning equipment and qualified painters or installers (URL 3.10). It is important to know that corrosive cleaners or other abrasives can give damage to seating furniture. On the other hand any pollution for stainless steel or aluminium items, should be quickly cleaned to keep off corrosion or the presence of such caused by cross-contamination (URL 3.4).

General issues related to maintenance that are to be considered in design of street furniture are as follow:

**Ease of repair**: All parts of the seating furniture should be easily replaced in case of damage without the need for throwing the whole parts in the garbage. (Winchip, 2011, p.139)

**Ease of cleaning**: As seating furniture are affected by dirt caused by man use as well as environmental conditions such as rain, the material used in this furniture should be easily cleanable one. Now a days developments with nanotechnology provides us with various materials and paints that can clean themselves in contact with sun light etc. that may be a good choice to be used for seating furniture. Besides, many of big street furniture companies offer maintenance service with their sales as well. (Winchip, 2011, p.139)

**Durability**: Materials used for seating furniture should be stain, heat and scratch resistant. It should be able to carry big loads and should be resistant to the miss uses such as jumping over of by different groups of users. The environmental factors such as temperature, humidity, amount of rain, sun light strength etc. should be considered while choosing the proper material for urban seats. (Winchip, 2011, p.139)

**Vandalism:** Vandalism is another problem that should be considered when choosing material. Literature and municipality's reports divide vandalism in four categories: Vegetation, graffiti, fixing advertisement signs and removing part(s) of a seating furniture.

**Vegetation:** This is a kind of nature's vandalism to furniture. Depending on Main & Hannah`s (2010) report, algaes, mushrooms and moss grow on the surface of concrete and wood/timber. (p.234).

Figure 31: Algeas on a bench
(URL.3.11)

Often the application of a biocide solves this problem. Some anti-graffiti treatment also reduces the appearance and development of these vegetal organisms. Choosing a smooth finish is also preferable to a "skin" finishing type to prevent this. But in some designs this can be aesthetic as in Figure 32.

Figure 32: Aesthetic of vegetation on bench
(URL.3.12)

**Graffiti;** It is illegal in many cities. It spoils street furniture and it is very costly to remove. In research stages of this thesis, it was found that Cambridge City Council informs that "aim to remove offensive graffiti within one day of receiving a report and all other graffiti within five days. Offensive graffiti includes graffiti which is racist, sexist, obscene or inflammatory" (Ruppert, (2006). p.132). This adds another point of

view that it does not only spoil the furniture, but also social relationship and peace of the community.

Figure 33: Grafitti as an act of vandalism on a bench
(URL 3.13)

**Fixing Advertisement Signs**: Fixing advertising signs to seating furniture is generally illegal and damages them much. Generally these are removed by the council/municipality workers. Removing of these advertisements can give damage to the furniture. That is why the chosen material should be durable and resistance to cleaners and scratching caused by this action. (Main & Hannah, 2010, p.235).

**Removing Part(s) of a Seating Furniture**: This may not be a general vandalism type for ordinary seating furniture. However, it may frequently be encountered with unique designs such as in places of touristic and historical attraction. Gaudi's seating units in famous Park Güell is a fine example for this problem. The parts covered with white plaster seen in Figure 34 show the missing parts, which are taken by tourists from these tile covered concrete seating units. This kind of vandalism is so tedious, aesthetically displeasing and costly for municipalities or institutions.

Figure 34: Picture shows repaired vandalism on tiles at Park Güell in 2007 (URL 3.14)

## 3.3 Safety Requirements

Seating furniture are used by different groups of users in urban places including the children elderly etc. The design should be in a way that it does not give any harm to any group of user. Some of the issues to be considered under this topic are as follow:

**Round edges:** In order to avoid any injury to the people and any damage to their clothing, the seating elements must be rounded on the edge. On the other hand, if seat is not rounded, sitters' blood circulation in leg region become blocked.

**Balance of the seating furniture:** Furniture must be conveniently fixed to the floor. If it is not fixed, seating furniture must be designed in a way to balance the downward force of gravity (weight) so that no one falls down and in case someone does so in an unordinary action, the design must not give way to any injury. The seating furniture must be light enough that in case it falls on someone it does not damage any parts of the body. In addition to these, it is possible to locate the seating element on a soft surface such as grass which can prevent the user from being injured in case s/he falls off. This is explained as 'tolerance for error' in the principal of universal design.

**Trip someone up:** Whoever sits on a seating furniture, it is important that his/her legs do not stretch out from the seat. In the contrary case, people passing by may tread on them. In order to avoid such cases, it is necessary to have a kick space (at least 7,62 cm) below the seat if a big solid leg is put to use.( Marcus & Francis, 1990) The same thing is also valid for the seat's legs themselves. They should not stretch out from past the seat.

**Fire Resistance**: Materials used for seating furniture should be fire-proof to decrease the fire risk to minimum.

**Toxic Fumes:** Some paints, some polishes or plastic materials, especially any material which contains phenol or formaldehyde must not be used under direct sunlight. These gases smoke out from furniture and have negative effects on health. (Hudson, J., 2008)

**Non-reflecting surfaces:** Street furniture should have non-light reflecting (matte) finishing in order not to cause eye strains. Especially, if light reflecting furniture is placed on to the side of the street or close to vehicles' ways, it can cause traffic accidents. Apart from these, seating furniture should have non-heat reflecting material in order to reduce injuries. If aluminium or iron types of materials are left plain, in other words, is not covered with non-reflecting paint or polish, they will cause injuries to people such as burned skin and even stuck skin, especially in extreme weather conditions, namely hot climate. It is the same for extremely cold climates. The skin of people may stick on icy cold iron.

# Chapter 4

# CONSIDERATIONS IN RELATION TO URBAN CONTEXT

Social places in cities can be explained as places where individuals come together to interact, thus functioning as a platform which bring together social aspects such as cultural classes, ethnic groups and all different segments of the community. It is especially observable that there has been so far a significant role of communal places in the progressive foundation phase of cities. Inhabitants of a city carry out their socio-cultural experiences through activities within these physical urban environments. In this sense, the great majority of the structuring of the sociality takes place in outdoor public places in which inhabitants form a connection with each other by way of physical surroundings (URL 4.1).

Public spaces are important places for social relationships. Citizens can gather, express themselves freely, individually or collectively in these spaces. Society, spaces and public behaviours in social spaces have become significant research subjects. Social spaces such as public spaces in a city create opportunity for meeting others by in planed way or by chance. In this sense, streets, squares, parks and seashores are important places to keep people in touch and represent the main elements and most vivacious faces of cities.

Greed (1996) states that, “Throughout civilizations, city and town centers have played important roles as meeting places for people, a place where people of different

backgrounds can come together to exchange information and ideas and goods and services. The city today has taken on an important role as a center for arts, leisure and culture" (p.205). In addition, the quality of squares and streets shows the identity of a city. The most important function of public places is creating a social space in the city as well as having a variety of activities and events.

As a general rule, well-functioning city public areas offer many opportunities for sitting. Only where there exist good opportunities for sitting stays for longer durations are possible. If these opportunities are poor and bad, or if these places are designed badly, then people just walk away.

In this respect, Joardar and Neill as early as in 1970s about importance of seating elements in the public spaces state that: "Different people want to sit in different ways, and given enough choice, each will seek out the setting best suited to him or her. Thus, to serve a variety of users, every plaza(/park/ sea shore/ square) should provide a variety of seating, not only in location, but also in different forms of seating posture" (Joardar and Neill,1978).

William H. Whyte (1980), an American urbanist, sociologist and writer who examined behaviours of human beings in urban settings points out that there are different factors affecting people's choice for a place to sit in a plaza. These factors which matter indeed include the angles of the sun, size of a place, proximity to public transport, trees, tables, food, sunlight, shade, fountains, etc. So, after all the research he made, he draws an impressive conclusion that people "sit most where there are places to sit" (p.205). He added that a place to sit, the simplest of all these facilities, is by far the most crucial element in the utilization of plazas (William & Whyte, 1980).

For orienting the seats, it is important to offer variety. Marcus & Francis when emphasizing the need for variety in seating alternatives suggest that “Benches that are 90 cm x 90 cm or 90 cm x 180 cm, and backless seem to be the most versatile in terms of social groupings and sight lines” (Marcus & Francis, 1990, p.32). Joardar and Neill (1978) classify some reasons need for variety in seating as:

- Climate and weather conditions of the city: providing variety of seats related to different weather condition is desirable. There can be some seats under shadow, some seats under sun light, some protected from wind etc. This subject will be discussed in more detailed in coming parts.
- View and visual issues: There can be seats oriented towards different views or where some activities are going on. In some places such as water fronts the view can become the main consideration in orientation of the seats.

## 4.1 Urban Seat Users

According to Marcus and Francis, (1990, p.32), there are several groups of users of the urban street seating as follows:

- Fence sitters, who want to watch the traffic of vehicles or pedestrians.
- Short time sitters, who are waiting for something like bus or taxi
- Secluded\intimate space sitters, who are mostly lovers or woman groups, who want to be alone at the less exposed places.
- “Most of the users tend to sit not too close to traffic and sidewalk and not too close to building entries. These can be both groups and people alone. Both types
- tend to gravitate first to edge or island seating”( Marcus and Francis, 1990, p.32).

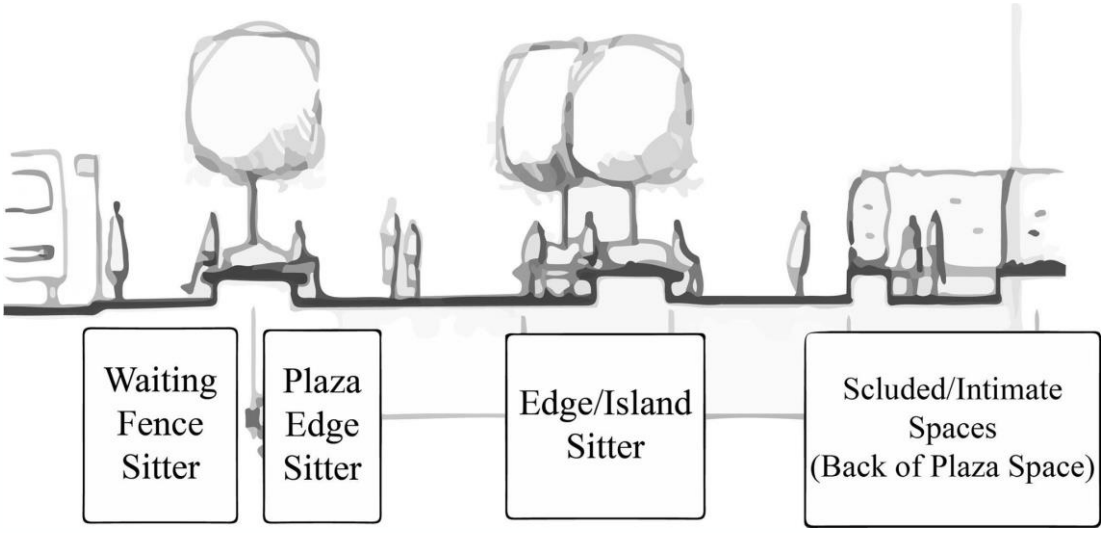



Figure 35: People want to sit in a variety of seating.
(Francis & Mercus, 1990)

The above users can be in different age groups and different abilities and limitations. In design of seats in urban spaces the needs of these different groups should be considered. This is also a requirement of universal design approach that anything designed specially in common spaces should provide equitable use. Generally the population that mostly use urban spaces include elderly, children or people with children. Each of these groups have special requirements. The requirements in relation to allocation of urban seats are described below. The ergonomic requirements for these groups were mentioned in the Chapter 2.

### 4.1.1 Seat Allocation for Disables and Elderly Needs

When designing seating place on pathways, or on streets, distance for disable and elderly people should be considered as well. If possible a pocket place can be provided. Figure below (Figure 27) shows an example of such pocket area.

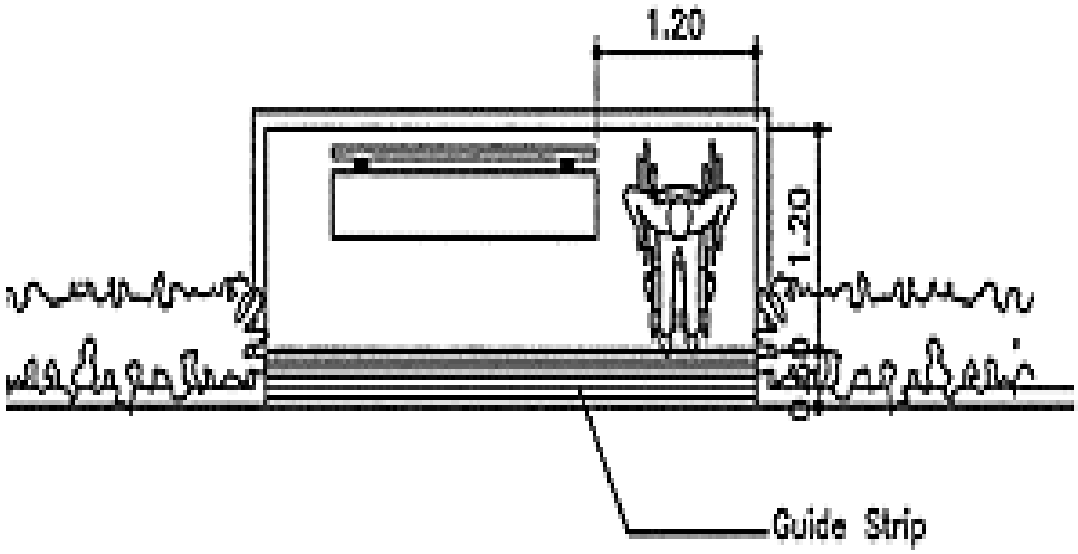



Figure 36: Sitting pocket beside pathway
(URL 4.2)

This allows all people to seat comfortably without blocking pedestrians' passage on their routes of travel. British standards institute in this respect mentions that it is essential to have guide strips on pavements for people who are blind or visually impaired. To put it differently, textural differences in the surface of the pathway help these people in order to recognize where the public facilities are so that they identify their location. The width of the guide strip should be 20 cm. The length of it relies on the pocket area of seating. The front part of the guide strip should have enough space for two sightless people (2 x 1.20cm= 2.40 cm) so that they do not hit each other and can use their long white canes with ease. There is a need for minimum 120 cm for a wheelchair distance to take place beside the bench in the back of the guide strip. There should be a space provided for a visually impaired person's assistant dog to rest at the side of a sitting group or within it. This reserved space should be beneath the seat or at the end of the seating furniture and definitely should not obstruct pedestrian routes. Labelling of the seats should be clearly visible because it is strategically important and remarks priority utilization for people who have impaired mobility. (BS 8300:2001)

After allocation of seating unit, in the path way and the pedestrian way still necessary clearance for passage of disable users with various aid and tools and people with push chair should be remained. Figure 28 summarizes necessary distances to be considered in this respect.

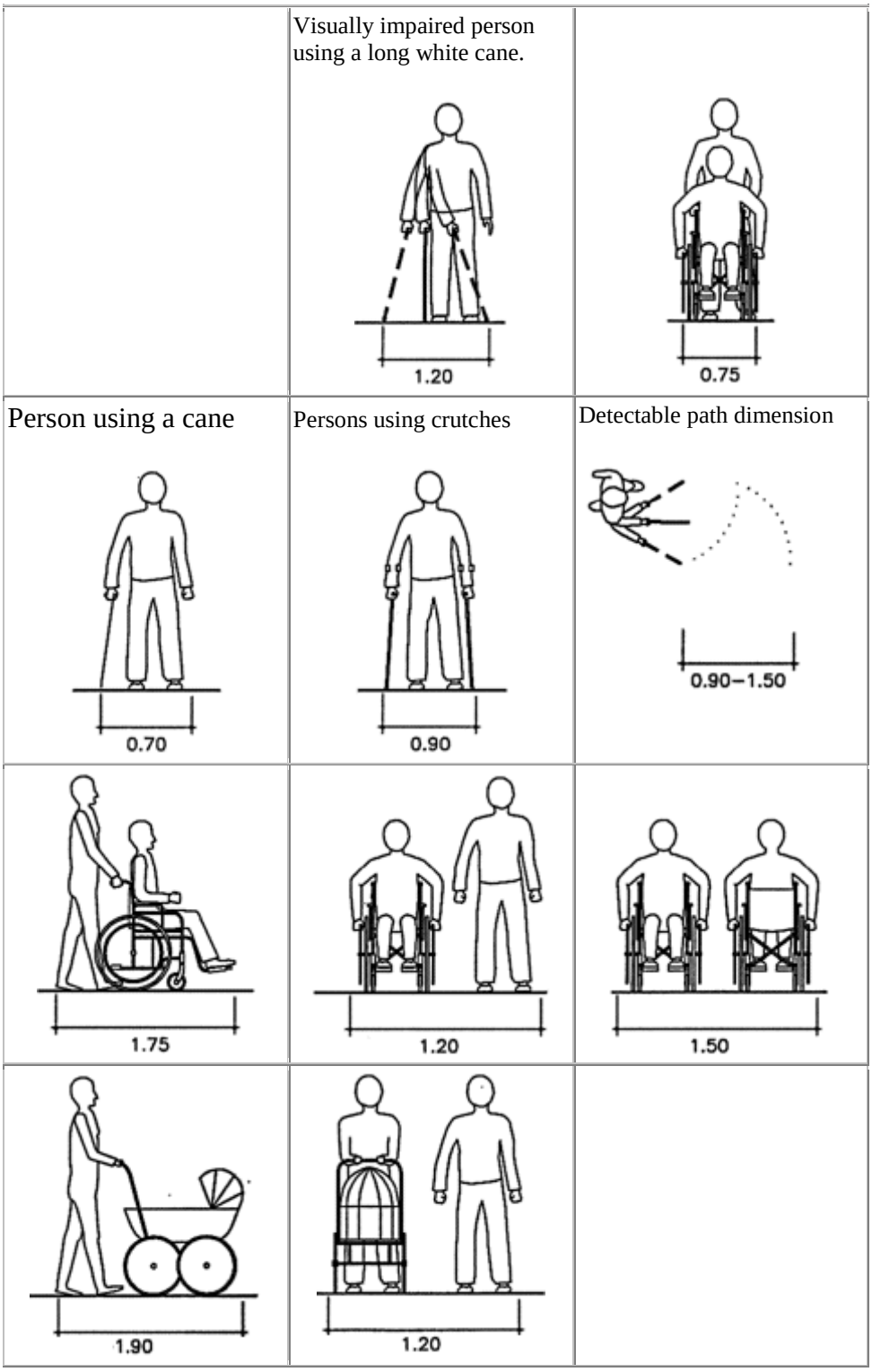



Figure 37: Pathway or taking place dimensions around seating furniture (URL 4.3)

For elderly people, Gehl mentions that “a good rule of thumb for a good city residential environment is that suitable places to sit should be located at regular intervals, for example, every 100 meters” (Gehl, 1987, p.164). This is the healthy distance for elderly to take rest and keep going again.

Figure 38: Elderly need to sit each 100 meters
(URL 4.4)

## 4.2 Consideration Related to Social Interaction

As was mentioned before seating furniture are the most important urban elements in encouraging people to use the urban areas. The allocation of the seats should be done in a way that facilitates the proper social interactions between the users. To decide about the correct distances that people need to have healthy social relationships Hall’s Proxemics theory can be helpful.

### 4.2.1 Proxemics

Proxemics which is the study of nonverbal communication was developed by Edward T. Hall (1968). A considerable amount of analyses were made by him in order to understand how people arrange their distances in social interaction and the effects of their culture on it. According to Edward T. Hall (1968), people use four distances in their social relationships. They are as follows:

**Intimate Distance:** The space in regard to intimate distance spans from direct contact to 60cm. Apparently, it is spared for the people who are the most reliable and the most loved in a person's social spheres: namely, partners and siblings (E. T. Hall, 1968). Lovers or people in similar relationships generally prefer to use the same seat with no distance in between.

Figure 39: Intimate Distance
(URL 4.5)

**Personal Distance:** The space in personal distance spans from 60cm to 1.5 meters. People spare this space for their family members and friends whom they know well and rely on. It's a zone that makes people feel comfortable and carefree for certain behaviours such as speaking, making gestures, frowning as well as shaking hands (E. T. Hall, 1992). This is distance that many people, who are friends or family use when they chat. A seat about 1.5 meter wide can provide this distance.

Figure 40. Neoromantico classico benches by Miguel Mila
(URL 4.6)

**Social Distance:** This zone ranges from 1.5 meters to 3.6 meters. A person can easily start a conversation with people s/he does not know well enough in the social distance zone, because it provides the highest feeling of comfort and neutrality in comparison with all the other zones. In this zone, one can communicate with other people who are strangers but at the same time s/he keeps a distance (E. T. Hall, the Hidden Dimension). The arrangement of seat to encourage social relationship with other people should provide this distance. Figure 32 shows a possible arrangement for this purpose. In general it is easier to provide this distance using 'L' or 'U' or 'C' shape seat.


Figure 41. Social distance seating
(Drawn by Hilmi Hami)

**Public Distance:**

This zone is spared for speaking in public when addressing a big group of people in general. In this case there should be at least 3.6 meters between people (E. T. Hall, 1992). This is also the distance that people prefer to maintain when sitting near someone that they do not know and they do not want to have social interaction with.

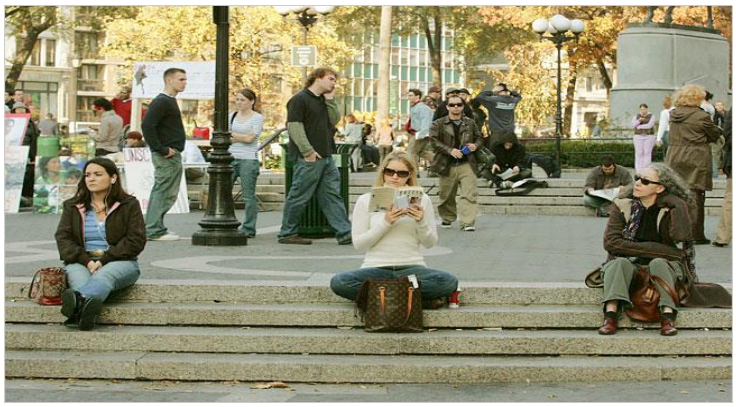


Figure 42: Observable ‘Public Distance’
(URL 4.7)

As it is observable in Figure 42, when people who do not know each other share a common space in crowd, but they do not communicate at all by keeping the public distance. In this way they can even ignore each other even though they are aware of each other’s existence. They feel much safer in such distance which is in the public space.

Figure 43: Steps of Brooklyn Borough Hall in Brooklyn, New York
(URL 4.8)

Figure 43 displays specially designed blue ‘squares’ that were placed on the stairs of Brooklyn Borough Hall. The ‘squares’ were designed by the New Yorker artist Mark Reigelman in 2007(URL 4.8). Coincidently, wide sitting stairs are the best seating

elements to support ‘public distance’. In the picture at Figure 34, the little blue square tables are easily helping to keep this distance.

### 4.2.2 Marcus & Francis’s Classifications of Public Space Users

People come to urban spaces for different reasons and different expectations for social interactions. “Vancouver study reported that variety in the shape, size, and arrangement of seating or leaning facilities significantly affected the public use potential…” (Joardar and Neill 1978, p.489). Marcus & Francis (1990) categorize the behaviour of users of urban spaces in relation to desire for social interaction into two, which are ‘sitting alone’ and ‘sitting in group’.

Some people come alone to a public place and have to sit near, but not within eye contact with other sitters. For these people two seating types are advised. First types are straight benches, ledges, or steps which allow necessary space between sitters without eye contact. Benches can be allocated back to back or in a linear arrangement to prevent eye contact from bench to bench. Second, a circular seating furniture around a planter with flowers or a tree allow many strangers to sit quite close but to continue their privacy by seeing different directions. This is known as ‘sociofugal seating’ (Marcus & Francis, 1990, p.35).

The other group of urban space users are the ones who prefer sitting in group. Marcus & Francis (1990) describe the suitable types of furniture for this group as: “To accommodate groups of three or more, the following arrangements are recommended: wide, backless benches, benches forming right angles at corners, or benches curving inward” (p.35).

## 4.3. Urban Seat Typologies

People can seat in the urban spaces on seats designed for this purpose (Primary seats) or any other possible place. "Benches are primary seating furniture, because benches are there just for seating needs. When it is regular day time, benches are enough to use for regular times, which it is not crowded. A social location that offers plenty of places to sit that are not all benches does not appear so empty when people are present" (Project for public spaces, 1978). This kind of seats do not necessarily have to be prefabricated benches which can be bought and installed, but they can also be specially designed ones just for an urban place and only for seating purpose.

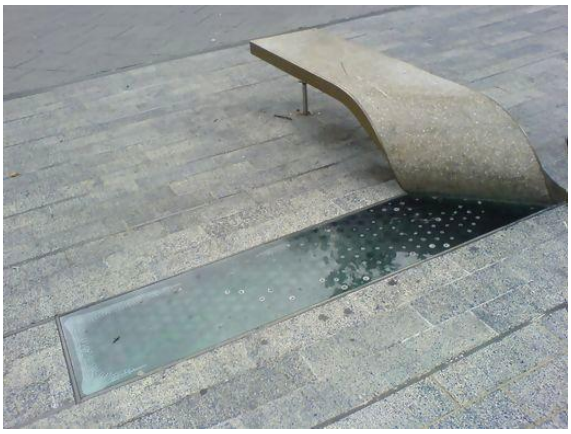


Figure 44: Designed as part of floor
(URL 4.9)

On the other hand, people may seat also on anything else too. These are called as secondary seating. 'Project for public spaces' (1978) define these seats as "Secondary seat are mounds of grass, steps with a view, seating walls, and retaining walls that allow seating- they can appear as part of the design and need not look lonely when de-voided of people" (Project for public spaces, 1978).

Figure 45: Planter ledge seating, New York
(URL.4.10)

There are several configurations that can be used allocation of urban seats, which are as follow:

**Linear Arrangement:** This arrangement does not allow for much face-to-face interaction. It is suitable for strangers to sit without having eye contact as it is shown in Figure 46 at Namık Kemal Square, Famagusta.

Figure 46: Namık Kemal Square
(Photo taken by Mehmet Gül)

Due to the fact that seats arranged in this way allow one directional seeing they are more suitable for watching things such as kids in parks (as shown in figure 47), historic buildings, artistic landscapes, local scenery, etc.

Figure 47: Watching Seat
(URL 4.11)

**Face-to-Face and 'L' Shape Arrangements**, allow for better communication as it encourages people to interact with each other. These arrangements are appropriate when a group of friends gather in a public space to spend time together. In addition, if strangers want to meet new people, these types of seating would be the best choice for them.

Figure 48: Face to face sitting
(Drawn by Hilmi Hami)

As it is shown in Figure 48, in Montreal, seating face-to-face and having fun is possible at the same time. It allows people to play on teeterboards with light and sound as well.

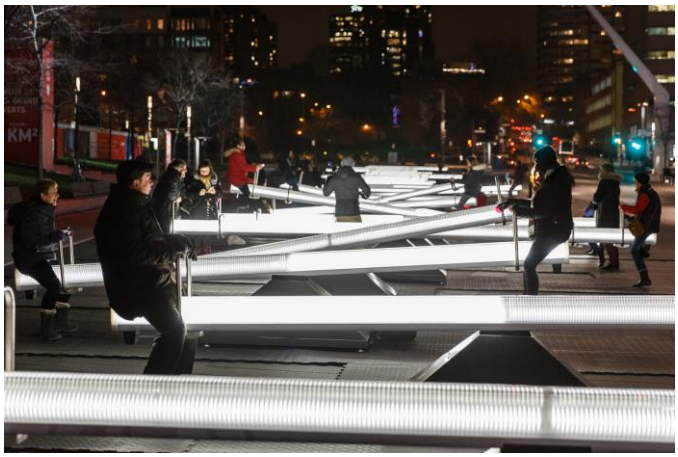


Figure 49: Face to face seats for fun in Montreal
(URL 4.12)

**'S' and 'C' Shape Arrangement;** These shape arrangements allow a group of people to chat while sitting and facing each other in a semicircle as the seat curves inwards. On the other hand, people can have a view of around when they sit on the outward curves of these shape seats. Sitting on the outward curve gives one an impression of open area and spaciousness (H., Hertzberger, 1991, p.211). Meandering parapet benches in Gaudi's Park Güell in Barcelona, Spain are an ideal example for this.

Figure 50: Variation with Gaudi's design on parapet benches in Park Güell
(H., Hertzberger, 1991, p.211)

## 4.4. Climatic Considerations

When designing a seat or locating a bench, design should be in relation to climate as well. Faced with the task of locating seating, a designer should be aware that people will seek a sunny spot quite frequently during the winter time. (Whyte, 1974) Therefore, sunny locations during day time should receive the most attention for winter times. For some countries, sunny locations can get attraction all year round. But for example in Cyprus, summer is too long and too hot. Shady places are the most favourite places during the summer period. A designer should take account of the shadows of the buildings depending on the sun angles and should place the seating elements accordingly or, alternatively, she or he can design a canopy or any other shadow element. In recent years, sun beams have become warmer due to global warming, and it can be dangerous indeed if people stay for extensive amount of time under direct sunlight. To provide shaded area, shadow of trees (Figure 41) as well as specially designed pergola (Figure 42) can be used. Sometimes using plants (Figure 43) to create shadow has the advantage of having shadow in summer and sun in winter

when the leaves are fall down.

Figure 51: Two alternative to sit
(Drawn by Hilmi Hami)

Figure 52: Seating under pergola
(Drawn by Hilmi Hami)

Figure 53: Sheltered bench for lovers
(URL 4.13)

Protection against rain is another consideration in urban seat design related to environmental conditions. In many aspects it is similar to protection against sun.

When roof allocated on top of a seat is completely covered, it can protect the users from both excessive sun and rain at the same time.

The Rolling Bench used in South Korean Sung Woo Park, which is a special design to be utilized especially in rainy places is a good example of how an urban seat design can be done according to the special climatic conditions. It is a smart design as one can rotate the seating part of the bench by turning the handle and the use the dry side after a rain.


Figure 54: The Rolling Bench
(URL 4.14)

Sitting corners and urban seats can be protected with hedges or walls against wind when necessary. Plus, designers should know that in big cities such as New York, high-rise buildings can create wind corridors in streets around ground floors, and it can be really problematic for people sitting exposed to the winds in the windward (Marcus, & Francis, 1990). This should be considered in allocation of seats in such places or a wind shade should be used.

Figure 55: Bench with hedge
(URL 4.15)

## 4.5 Urban Places

In general, all types of seating furniture, which detailed above, can be design or placed in urban spaces. But, depending on urban place's type, seating furniture may vary in different rules and get affected as well. There are different street types, parks, 'blue space' sides, squares/plazas which achieved below in the aspects of seating furniture.

### 4.5.1 Streets

Oxford dictionary defines street as; a public road in a city, town, or village, typically with houses and buildings on one or both sides (URL 4.16).

Functionally, streets are the physical elements of cities which at the same time have a social function as well. In other words, beside that they are corridors to go from one place to another, they are a social place that people socialize on. You can use streets as a pedestrian or within vehicles. Street can be a big market place too. Most of this kind of streets are close to vehicular traffic (Hoskara & Doratlı, 2001, p.2l).

Herman Hertzberger (1991) gives a name for streets: 'communal living room'. Peter Hamilton supports his ideas but uses 'communal-street' instead of 'communal living room'. He explains it as a place where children play; the life of the community is transacted and it is safe to walk; where much of social goes on. Unfortunately

nowadays many times the motorized traffic gains priority over pedestrians in urban designs. In this respect, Fred Kent (2005) states that: "If you plan cities for cars and traffic, you get cars and traffic. If you plan for people and places, you get people and places" (p.2).

Figure 56: Wide Street Pathways
(URL 4.17)

On wide pedestrian ways in streets it is possible to allocate benches, water fountains, bicycle parking racks, and other street furniture on the pedestrian way but these should be carefully placed to create an unobstructed path for pedestrians. Generally in streets linear arrangement is used. Pocket Places on wide streets can be suitable places to take a break, and get socialized.

On narrow streets, mostly it is hard to place seats. Especially for safety reasons as ambulance and fire engines would not be able to move in emergency situations. 'Finferlo Seat' is an example solution for narrow streets. Similar designs may be done.

Figure 57: Finferlo Seat, design by Anouk Vogal Landscape.
(Uffelen, 2010, p.246)

When there is no car traffic, sometimes it is possible to use movable seats in streets. For example in Cyprus, many people take their chairs to the narrow streets of old towns to sit outside. Especially in summer afternoons, as it can be cooler than inside. It can become an important place for socialization. When it is not possible to allocate other kinds of urban seats in a street, niches can be one of the solutions to let people take a break of walking, enjoy the environment, get energy again to continue, or chat with friends for a while if there is a suitable wall to build a niche in it.

Figure 58: Molehiya preparation in a narrow street in Cyprus.
(URL 4.18)

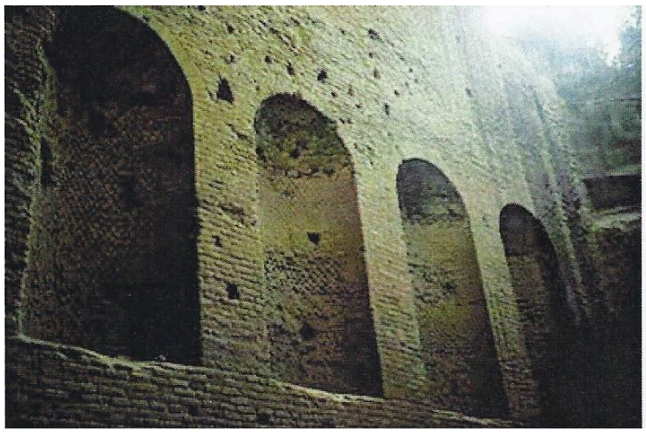


Figure 59: Niches on Wall, Iran
(URL 4.19)

### 4.5.2 Squares/Plazas

Marcus and Francis (1990) defines the square or plaza as one of the most important elements of city design. A square or plaza is an open public area framed by buildings. It is a place where people can meet, sit, and socialize and it may also contain sculptures, fountains, lighting elements, etc. Many times Plazas can hold other functions such as being the place for the local open markets. Vitruvius, the first theorist of architecture in ancient Greek (80–70 BC-15 BC) mentions that a square should be proportionate to the number of inhabitants who use it, so that it may not be too small a space to be useful, nor look a dessert waste or lack of population.

For example, 'West 8 Timber Seat' monumental design suits well to the scale of the square. Its welcoming character invites passers-by to stay there and provides comfort and protection.

Figure 60: West 8 Timber Seat, Schouwburg Square
(Uffelen, 2010, p.270)

Figure 61: West 8 Timber Seat, Lippensplein Square
(Uffelen, 2010, p.271)

If there are stairs or level differences available in these plazas they can be used as seating places too. A 40 cm high level can act as a temporary seat and placing wooden pieces on these levels can make them warm places to sit on.

A successful plaza design provides ample seating. Seating allows users to rest, converse, and observe the world. Movable chairs or benches can be used when possible as they allow people to assemble seating groups as needed. Design of seats in the plazas should be in accordance with the surrounding environment.

Pioneer Courthouse Square (Figure 62) is a very good example for how to design the

seats in a plaza as a part of design concept not as added elements.

Figure 62: Pioneer Courthouse Square
(URL 4.20)

### 4.5.3 Water Fronts

Tim Smedley (2013) reportes that, “New research has found that 'blue space' including sea, rivers, lakes and even urban water features can have a positive impact on wellbeing” (p.14). Riversides, sea sides or canal connections in the cities are places to go for walking, running, fishing, swimming, making picnic, seating or laying for relaxing, tanning, playing with kids, etc. The common seating arrangement used in water sides is linear arrangement allocated towards the lake or sea etc.

For example, Riva Split Waterfront is the main public square of city’ as well. There is a variety of views. One side is Mediterranean Sea, and other side is Diocletian’s Palace. So benches with backrest are allocated toward both sides, but there are also backless benches for providing variety in shape of wave.

Figure 63: Waterfront seating, Riva Split Waterfront, Croatia
(Uffelen, 2010, p.148)

Figure 64: Waterfront wave seat, Riva Split Waterfront, Croatia
(Uffelen, 2010, p.149)

It is sometimes possible to design stairs around Natural water sources to be used for sitting purpose as well. Fun can be a part of design too. An example is 'The Sea organ' which is a set of large marble steps designed by the architect Nikola Basic as a part of the project to redesign the old city coast (river) in Zadar, Croatia. These steps play music when the sea waves and wind strike the steps due to the tubes located underneath. The waves create somewhat random but harmonic sounds. It is now a

centre for gathering, a good destination for a walk through town, and also a great place to enjoy sunset. It is secondary seating, but really popular to use for seat.

Figure 65: The Sea organ
(Uffelen, 2010. p.90)

### 4.5.4 Parks

Butler, Steiner & American Planning Association (2007) defines park as "A park is an area of natural, semi-natural, or planted space set aside for human enjoyment and recreation or for the protection of wildlife or natural habitats. It may consist of grassy areas, rocks, soil, and trees, but may also contain buildings and other artifacts such as monuments, fountains or playground structures"(p.195). Parks generally contain vast green areas and many types of plants. As Deasy, & Lasswell, (1985) mention in an apartment house neighbourhood park may be the only accessible open space for hundreds of families. They also believe that "the fact that people are brought together in pursuit of leisure activities inevitably generates social involvement" (p.127).

Seating furniture are some of the main elements to be provided in various parts of the parks for different purposes such as watching kids in the play areas, resting, enjoying design of park or having social time with friends. Design of each groups of these seats and arrangement should be suitable for that function. For instance, in playground part,

it is necessary to place seats in linear way, so parents can watch their kids playing. In Glendale 'Product Line office' designed a rectangular space as a chess park. Seats and chess tables are designed in this space as a set.

Figure 66: Chess Park at daytime, Glendale.
((Uffelen, 2010. p.94)

Figure 67: Chess Park at night-time, Glendale.
(Uffelen, 2010. p.97)

Especially for socialization in the parks, movable seating can be most suitable alternative. In this regard Whyte (1988) states that "One of the most exciting possibilities with seating is to provide chairs that users can move about and group as they wish" (p.102). On the other hand, Shaftoe mentions that "Generally it is thought that movable seating can only be provided in areas that can be secured at night

(Shaftoe, 2012, p.102)" such as Parade Gardens in Bath and the Jardin du Luxembourg in Paris.

Figure 68: Movable seating, Jardin du Luxembourg, Paris
(URL.4.21)

On the other hand, Lennard and Lennard (1995, p.46) against this idea say that "Critics who warned that the chairs would be stolen or vandalized have, happily, been proved wrong. The chairs are enormously popular and have contributed significantly to the success of Munich's pedestrian zone"(cited in Shaftoe, 2012, p.102 ).

As was mentioned before, there are many activities taking place in different parts of parks, such as resting and/or reading books. Suitable seats for these activities should be provided too.

Figure 69: Fountain Promenade at Chapultepec Park 1, Mexico City, Mexico
(Uffelen, 2010. p.144)

Figure 70: Fountain Promenade at Chapultepec Park 2, Mexico City, Mexico
(Uffelen, 2010. p.144)

The ‘Brick Bench’ in Kastellet Park is a good example of multi-functional park seats. The National Committee built a piece of furniture made from bricks in the park. This example shows that a seat can be also a play furniture for kids as well.

Figure 71: A seating unit at Kastellet in Copenhagen.
(URL.22)

Figure 72: A play seat at Kastellet in Copenhagen. (URL.24)

# Chapter 5

# CONCLUSION

This thesis analyzes the design and/or selection of seating furniture in terms of three main aspects; its relation with human being, the phisical properties, and the relation with the urban context. As mentioned in the chapters, several factors should be considered in the design of seating furniture for public places. Some of these are related to the ergonomic design of seating furniture whereas some others are related to the basic design considerations, to the human sociol interactions and to the city itself.

From these aspects, it seems considerations in relation to human being, is one which is generally a less researched area. Since there is serious lack of information and research on ergonomic data for street seating furniture, the already existing data for office and living room seating furniture have been adapted to find the proper ergonomic features of the urban seats. It also includes necessary information for ergonomic details. Seating furniture in urban spaces should be designed in accordance with the postures of human body, and they should support the body at important points by necessary angles and measurements because they are placed or constructed with the aim of providing people with healthy and comfortable rest.

Besides these, all the important points in choosing materials for seating furniture have been listed so as to guide designers. Selection of environmentalist materials is especially significant. Therefore, it has been tried to guide designers along with the

details taken from important resources on this subject. After all, there can be hazardous results both economically and environmentally unless the right materials are selected. Broken or damaged materials which cannot be dissolved in the nature cause wastes that can stay for a long period of time in the nature. This cannot be an acceptable situation when the environmental crisis of the world is taken into consideration. On the other hand, ease and practicality of installation, maintenance, cleaning and repairing are so important details to save money, energy and time for municipalities. Wrong selection of materials and/or error of design may be the cause of serious damage to human health, so the details of this subject, safety and health, have also been examined in Chapter 3.

When designing, choosing and placing seating furniture for any public place in a city, the characteristic of space, functions, quality, user groups, and climatic conditions should be taken into consideration. Different sizes and people from different cultures should be able to come together outside in social spaces. In this context, knowing about 'proxemics' can help place and shape seating furniture correctly and adequately. It is not only important to design primary seating solutions, but secondary seating opportunities should also be kept in mind, especially for crowded times. People need variety of seating furniture on all areas of public spaces: on streets, water fronts, parks, and squares etc. In addition to all these, different public spaces need to be designed with respect to their characteristics. For example, seating furniture on the waterfront should be designed towards the water; and seating furniture in narrow streets should be designed in a way that it does not block the street in emergency cases. All these crucial details which should be considered attentively by designers have been examined with different sample designs in Chapter 4.

On the other hand, children and elderly people have different anthropometric data and so different body requirements, which have been mentioned in this study. Besides that, although disabled people do not really need specially designed seating furniture. Necessary details such as distance and signs around the seating furniture should be taken into account to meet these people's needs. Details regarding all these have been mentioned in the relevant chapters.

In conclusion, it can be stated that the aim of this thesis is to provide a tool for responsible authorities and designers to choose and design seating furniture in public spaces in harmony with target groups, and towns/cities, which in turn will encourage people to spend more time in social spheres, in an ideally social environment.

The author of this thesis hopes that the findings and suggestions of this study will help organizations and designers to take important steps in improving the quality of outdoor social spaces. In sum, based on the findings of this thesis, the author suggests that designers of public places firstly should analyse the urban space and its general users. Secondly, they should provide the users with various alternatives of seating furniture to meet their different needs, such as body size, age, culture, etc. They should also take safety, health, environmental, and economic aspects into account.

A checklist has been prepared by focusing on the important points among the data gathered during the study of this thesis. Designers of street seating furniture and offices which are responsible for choosing, installing, designing, or constructing the seating furniture can use this checklist as a supplementary reference. This resource has

a huge potential to fill the gap in this field to a great extent as well as playing a significant role to raise awareness.

Although several aspects of seating furniture in urban spaces have been examined in this thesis. The relationship between the seating furniture and the city identity is an important subject kept outside the scope of this study and can be the subject of a further research

## REFERENCES


Akın, G. & Koca, B. (2002). "Ergonomide Antropometrinin Önemi", Standart Dergisi, Sayı 490, Ankara.

Asatekin, M. (1975). Postural and Physiological Criteria for Seating_ A Review. 1, 55-83. METU Journal of the Faculty of Architecture, Ankara.

Blum,M.L. (1952). *Readings in Experimental Industrial Psychology*. Prentice - Hall, New York.

Bridger, R.S. (1995). *Introduction to Ergonomics*. p.3. McGraw-Hill, Inc., New York.

British Standard, (2001). *Design of buildings and their approaches to meet the needs of disabled people- Code of practice. (*p.144) BSI, London.

Butler, K., Steiner, F.R., American Planning Association, (2007). *Planning and Urban Design Standards***.** p.195. John Wiley & Sons, Inc., New Jersey.

Cranz, G. (2000). *The Chair: Rethinking culture, Body, and Design,* Norton paperback. (pp.21-119), New York.

Deasy C.M., & Lasswell T.E., (1990). *Designing Places for People.* BPI Communications, Inc., New York.

Dines, N.T., &, Harris, C.W. (1999). *Time-Saver Standards for Landscape Architecture*. p.95. John Wiley & Sons, Inc., New Jersey.

Ersoy, E. (2008). Erzincan ilinde 65 yaş ve üstü bireylere yönelik bazı antropometrik vücut ölçüleri ve mutfak tasarımı. (Anthropometric body measurements in the Erzincan province for individuals at the age of 65 and over and kitchen design), Erzincan.

Gehl, J. (1987). *Life Between Buildings: Using public space*. Van Nostrand Reinhold, New York.

Grandjean, E. & Kroemer, K. H. E. (1997*). Fitting The Task To The Human, Fifth Edition: A Textbook Of Occupational.* (pp. 63-76). UK Taylor & Fracis Inc, London.

Greed, C., 2014. *Investigating Town Planning: Changing Perspectives and Agendas*, Routledge taylor & Francis Group, London and New York.

Hall, E.T. (1992). *The Hidden Dimension*. New York: Doubleday.

Hendrickson III, K.,E.,(1992). *The Encyclopedia of Revolution in World History*, p.301. Volume 3, Rowman & Littlefield Publishers, Maryland.

Hertzberger, H., (2005). *Lessons for Students in Architecture*. p.211. 010 Publishers, Rotterdam.

Hoskara, Ş., & Doratlı, N., 2001.*Arch 455/Urban Design Major Elective Supplementary Lecture Notes*, p.2l. EMU Press, Famagusta.

Hudson, J., (2008). *Process, 50 Product Design from Concept to Manufacture*. Laurence King Publishing Ltd. Canada.

Joardar, S.D., and Neill, J.W. 1978. *People Places: Design Guidelines for Urban Open Space*. p. 68. John Wiley & Sons, Inc., Canada.

Hall D.J., (2000-2016). *Architectural Graphic Standards*, American Institute of Architects, p.2. Wiley & Sons, Inc., New York.

Hedge, Ph.D.A. (2013). *Director Human Factors and Ergonomics Laboratory Cornell University*. CPE, Ithaca, New York.

Kent, F. Project for Public Spaces. (01.2016). Retrieved from http://www.pps.org/about/team/fkent/

Main, B., & Hannah, G. G., 2010. *Site Furnishings* p.234. Wiley & Sons, Inc., Canada.

Martin, S. 2000. *Mother Earth News*. Ogden Publications Inc., USA.

Motkar, S., Types of Furniture Materials, (2012) Retrieved from http://www.onlinedesignteacher.com/furniture_design/furniture_materials.html.

Ozturk, A. (2003), *II. International Symposium for Street Furniture & Fair*, p.358. İstanbul Büyük Şehir Belediyesi, İstanbul.

Pheasant, S., (1997). *Bodyspace, Anthropometry, Ergonomics and the Design of Work*, p. 5. London & Philadelphia: Taylor and Francis Ltd.

Project for public spaces, (2008). *Planning, Designing and Maintaining Safer Parks*. Toronto Parks & Recreation, Toronto.

Random House Kernerman Webster's College Dictionary, © 2010 K Dictionaries, Random House, Inc.

Rampsey. C.G. & Sleepers. H.R. (2002). *Architectural Graphic Standards, American Institute of Architects*, p.2. Wiley & Sons, Inc., New York.

Ruppert, S., E., 2006. *The Moral Economy of Cities: Shaping Good Citizens*. p.132. University of Toronto Press, Toronto.

Sanders, M.S. & McCormick, E.J. (1993), *Human Factors In Engineering and Design*. American Psychological Association, New York.

Santa, T. & Cole, F. (2015), *Street Furniture and Lighting*, Aizlewood's Mill Ltd. Sheffield.

Shaftoe, H., (2012). *Convivial Urban Spaces: Creating Effective Public Places*, p.102. Routledge LTD., London.

Smardzewski, J., 2015. *Furniture Design.* Springer International Publishing, (p.203). Department of Geography, Bonn University, Germany.

Taynsford, J., (1975). *The Story of Furniture*, (p.10). HAMLYN, Shrewsbury, United Kingdom.

Tiesdell, S.,&, Carmona, M .,(2007). *Urban Design Reader*. Elsevier Ltd., Oxford, UK.

Uffelen. C., (2010). *STREET FURNITURE*. Braun Publishing, Berlin.

Urban Land Institute, *`the Design of Public Places', URBAN SPACES*, (2004). Visual Reference Publications, Inc., New York.

Wheeler, J., C., & Woodward, R. L., Ucovich, J. P., and Walker, J. M., (1988). *Rising from a Chair Influence of Age and Chair Design*, p.22. Routledge LTD., London.

Whyte, W. (1974). *The best street life in the world*. New York Magazine, July 15, p.30. Aizlewood's Mill Ltd. Sheffield.

Whyte, H.W., (2001). *The Social Life of Small Urban Spaces*. Project for Public Spaces, New York.

Zacharkow, D., (1988). *Occupational Health and Safety*, vol.50, (pp. 24-26). Gower Publishing Ltd., Surrey, England.

Zelnik, M., &.Panero, J.,(1979). *Human Dimension & Interior Space*: A Source Book Of Design Reference Standards. Watson-Guptill Publications, New York.

URL.2.1 http://www. spine- health.com /wellness/ ergonomics /good –posture – help s-reduce-back-pain (1999-2016)

URL.2.2 https://tr.pinterest.com/pin/483503709971784862/ (08.2008)

URL.2.3 http://www .yooko.fr /escale –numerique -la-paus –urbaine -high-tech-par-mathieu-lehanneur-pour-jcdecaux/ (01.2016)

URL.2.4http://www.contemporist.com/2009/12/06/the-kajen-public-bench-by-thomas-bernstrand/ (12.2009)

URL.2.5 http://archinect.com/firms/project/8987233/plage/9020866 (01.2016)

URL.2.6 https://tr.pinterest.com/pin/398216792026012884/ (09.2009)

URL.2.7http://news.archiexpo.com/press/public-spaces-O-_11.html (01.2016)

URL.2.8http://www.haworth.com/docs/default-source/documents- files-very-task /ergonomic_seating_guide_handbook-pdf-13337.pdf (2000-2007)

URL. 2.9 http://www.ergonomics4schools.com/lzone/seating.htm(1998)

URL 2.10 http://www.ergonomics4schools.com/lzone/anthropometry.htm (1998)

URL 2.11 https://tr.pinterest.com/ARQJAVIERTS/urbandesign/ (2016)

URL.2.12 http://www.coroflot.com/moechsle/tranSIT (01.2016)

URL 2.13 http://www.skyhighpartyrentals.com/childrens-tables-chair-rentals-for-kids-parties (01.2016)

URL 3.1 http://www.archiexpo.com/prod/metalco/product-56172-1543444.html (01.2016)

URL 3.2 http://www. Concentricsecurity .com/products /architectural –pre –cast -concrete.aspx (2004)

URL 3.3 http://www.marshalls.co.uk/dam-svc/AssetStore/Marshalls- Street-Furniture-Maintenance-Guide-7986.pdf (2013)

URL 3.4http://www.boex.co.uk/project/letter-timber-bench/ (2016)

URL 3.5 https://tr.pinterest.com/pin/327425835389211229/ (2016)

URL 3.6 https://www.tumblr.com/search/oliver%20schau (2016)

URL3.7 http://www.home-light.eu/lng /en /illuminated- seating- bench -and.html (01.2016)

URL.3.8 http://inkazan.ru/kuda-ischezli-skameyki-s-ulitsyi-baumana/ (01.2016)

URL.3.9 http://earthenhand.com (01.2016)

URL3.10http://www2.worksafebc.com/publications/OHSRegulation/part12.asp (01.2016)

URL.3.11 www.tuindeco.com (01.2016)

URL.3.12 www.kcrhythmandribs.com (01.2016)

URL.3.13 https://www.travelblog.org/Photos/5238882 (01.2016)

URL.3.14 http://www.gaudiallgaudi.com/AA010c.htm (01.2016)

URL 4.1 thtp://www.mimarist.org/mimarist/index.cfm?sayfa=bulten& Chapter ID=154& MID =158 (2006)

URL 4.2http://shop.bsigroup.com/Navigate-by/Standards/ (01.2016)

URL 4.3http://www.un.org/esa/socdev/enable/designm/AD5-03.htm (01.2016)

URL 4.4 http://theaccessiblecity.com/ (02.2015)

URL 4.3 http://img08.deviantart.net/5e35/i/2010/239/6/e/shaded_bench_by _elleonnass.jpg (01.2006)

URL 4.4 http://www.hafifdergi.com/category/sayi-13/ (01.2016)

URL.4.5 http://www.eatdreamtravel.com/2012/03/2-parks-montjuic-ciutadella.html (01.2016)

URL 4.6 http://www.santacole.com/en/catalogo/bancos/neoromantico-clasico/ (2016)

URL 4.7 http://humanshelpingaliens.weebly.com/distance.html (01.2006)

URL.4.8 http://urbanomnibus.net/2013/04/cultural-fluency-intersections-of-art-and-urbanism/ (01.2016)

URL 4.9 http://blog.dashburst.exampleq.com/creative-city-benches/ (01.2016)

URL 4.10 www.nyc.gov (01.2016)

URL4.11 http://www. shutterstock. com / video/ clip- 1331878 - stock - footage-pregnant –woman – watching – the – children – on -the-playground.html (01.2006)

URL 4.12 http://www.thisiscolossal.com/2015/12/impulse-light-seesaws-montreal/ (01.2016)

URL.4.13 http://www.shutterstock.com/g/plerch (2008)

URL 4.14 http://www.gizmag.com/rolling-park-bench-rotating-dry/34660 (2003-2016)

URL 4.15 http://www.sfbetterstreets.org/wp-content/uploads/2012/04/integrated-seating .jpg (2009)

URL 4.16 http://www.Oxforddictionaries.com/definition/English/street (01.2016) (2006)

URL 4.17 http: //www. sfbetterstreets. org/ find –project -types/ streetscape -elements/street-furniture-overview/benches-and-seating/(01.2016)

URL 4.18 http://www.fotokritik.com/arama/kom%C5%9Fular (01.2016)

URL 4.19 www.nancarrow-webdesk.com (2008)

URL 4.20 http :// cargocollective .com /studiobananarama/ THU- HIEN-DINH (01.2016)

URL 4.21 http://www.alamy.com/stock-photo/chairs-in-park.html (2006)

URL 4.22 http://www.bygningskeramik.dk/helle4e.htm (01.2016)

# APPENDIX

# Appendix A: Checklist

## Considerations in Relation to Human Being

Ergonomic Considerations:

**a) Postural Considerations:**

Relaxing posture is the general postural to be used in urban seats. Reclining Postures and rarely 'medical use' postures can be used in especial cases.

Table 5: Postural Angles (Modified to table by Aysel Alihan)

| | Head Support | Backrest Angles | Hip Angles | Knee Angles |
|---|---|---|---|---|
| Alert and Work Postures (Can be used for bus stop seat or Wi-Fi stations) | No | 0°- 20° | 95°-130° | 95°-120° |
| Relaxing Posture | No | 20°- 30° | 110°-130° | 120°-130° |
| Reclining Posture | Needed | 30°- 45° | - | - |
| 'Medical Use' Posture: (For unusual designs) | Needed | ≥ 45° | - | - |

**b) Dimensions:**

The proper dimensions for seating furniture for urban spaces dimensions are:

-Seat Depth: 38 - 42 cm.

-Seat Height: 35,5 cm - 44 cm.

-Backrest Height: 48-52 cm

-Lumber Pad height: 10 cm – 20 cm

-Thigh Clearance: 0-15,2 cm

-Armrest height: 8 cm - 10 cm.

-Armrest length: 10 cm – 12 cm

-Leg Rest/Footstool height: 30-40 cm

-Width for one person with wide elbows (low density): 76,2 cm.

- Width for one person without elbows (high density): 61 cm.

Ergonomic Details for Elderly Friendly Seating Furniture:

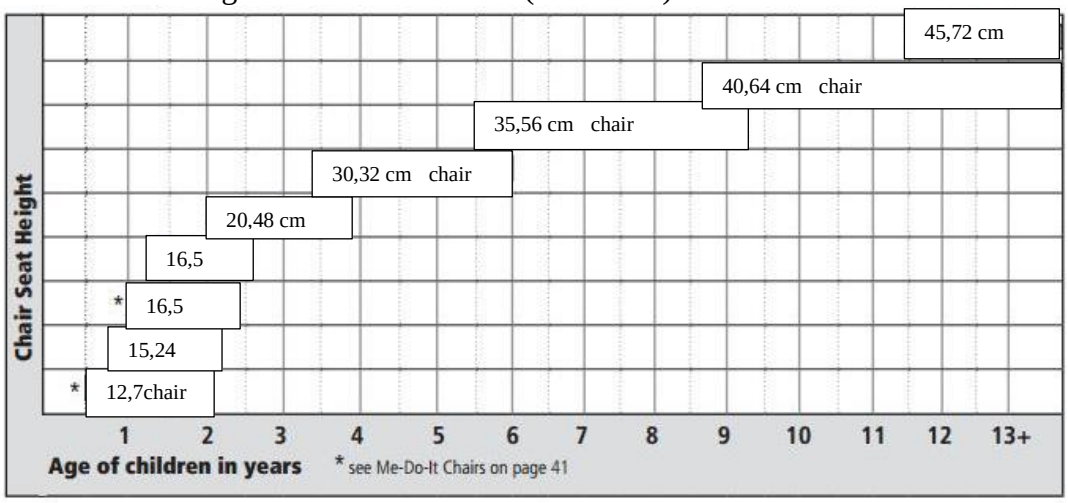
- Deeper sit for elderly- up to 15 cm.

-The armrest is necessary.

Ergonomic Details for Child Friendly Seating Furniture:

-Different heights for chairs between 20 cm to 40 cm.

Table 6: Chair Height Guidelines for kids (URL 2.15)




**Material and Structural Consideration**

**Material Considerations:**

-Use durable products and materials

-Choose materials with low maintenance requirement.

-Choose materials with low embodied energy.

-Use locally produced materials.

-Use recycled materials.

**Maintenance Requirements:**

- Use materials that can be repaired easily.

- Use materials that can be cleaned easily.

- Use stain, heat and scratch resistant materials.

**Safety Requirements:**

- The seating elements must be rounded on the edge.

- Furniture must be conveniently fixed to the floor

- If seating furniture not fixed, it must be designed in a way to balance the downward force of gravity (weight).

- It is necessary to have a kick space (at least 7,62 cm) below the seat.

- Seating furniture`s material should be fire-proof.

-Material should not contain toxic fumes.

-Street furniture should have non-light reflecting (matte) finishing.

-Non heat reflecting material should be chosen.

**Considerations in Relation to Urban Context**

- Don’t allocate seating places too close to traffic/sidewalk/building entries.

Seat Allocation for Disables and Elderly Needs

- Pocket places for sitting should be marked with a textured guide strip for people with visual impairment. The width of the guide strip should be 20 cm.

- There is a need for minimum 120 cm for a wheelchair distance to take place beside the bench in the back of the guide strip.

-The front part of the guide strip should have enough space for two sightless people (2

x 1.20cm= 2.40 cm).

- There should be a space provided for a visually impaired person's assistant dog to rest at the side of a sitting group or within it.

- Seats should be located at every 100 meters for elderly citizens.

**Consideration Related to Social Interaction**

-When designing or choosing seating furniture, nonverbal communication needs should be responded:

a) Intimate Distance: Seat opportunities should be placed from 0 cm to 60 cm distance for two people.

b) Personal Distance: Seat opportunities should be placed from 60cm to 1.5 meters distance for two people.

c) Social Distance: Seat opportunities should be placed from 1.5 meters to 3.6 meters distance for two people.

d) Public Distance: Seat opportunities should be placed at least 3.6 meters distance for two people.

**Urban Seat Typologies**

- Linear Arrangement: This arrangement does not allow for much face-to-face interaction. It is suitable for strangers to sit without having eye contact.

-Face-to-Face and 'L' Shape Arrangements, allow for better communication as it encourages people to interact with each other.

-‘S’ and ‘C’ Shape Arrangement; These shape arrangements allow a group of people to chat while sitting and facing each other in a semicircle as the seat curves inwards. People can have a view of around when they sit on the outward curves of these shape seats.

## Climatic Considerations

-Design should be in relation to climate.

-Buildings around, trees should be considered for wind protection or shade.

-Pergola, greenery, canopy, hedges, arches etc. may be designed to create wind/rain/sun protection.

## Urban Places

### Street

- On wide pedestrian ways in streets it is possible to allocate benches, etc. but do not forget to create an unobstructed path for pedestrians.

-In narrow streets design niches or special seats for safety reasons.

### Squares/Plazas

- If there are stairs or level differences available in plazas/squares they can be used as seating places as not interrupting crowded activities. A 40 cm high level can act as a temporary seat.

- Movable chairs or benches can be used when possible as they allow people to assemble seating groups as needed.

### Waterfronts

- It is sometimes possible to design stairs around Natural water sources to be used for sitting purpose.

**Parks**

- In playground part, it is necessary to place seats in linear way, so parents can watch their kids playing.

- Especially for socialization in the parks, movable seating can be most suitable alternative.