YASAR UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

ANALYZING THE MULTI-STORY RESIDENTIAL BUILDINGS IN TERMS OF SUSTAINABILITY, DISABILITY ACCESS AND EARTHQUAKE DURABILITY; EXAMPLE PROJECTS FROM 1980-1990,1990-2000,2000-2013 PERIODS

Seda ŞAHİN

Thesis Advisor:

Assist. Prof. Dr. Eray BOZKURT

Department of Architecture

Bornova – İZMİR

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This study titled " Analyzing The Multi –Story Residential Buildings In Terms Of Sustainability , Disability Access And Earthquake Durability ;Example Projects From 1980-1999,1990-2000,2000-2013 Periods' and presented as Master Thesis by Seda ŞAHİN has been evaluated in compliance with the relevant provisions of Y.U. Graduate Education and Training Regulation and Y.U. Institute of Science Education and Training Direction and jury members written below have decided for the defense of this thesis and it has been declared by consensus / majority of votes that the candidate has succeeded in thesis defense examination dated

15.01.2014.

Jury Members: **Signature:**

Head **:** Assist. Prof. Dr. Eray BOZKURT ..……...

Rapporteur Member **:** Prof. Dr. Tayfun TANER ..……...

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

TEXT OF OATH

I hereby certify with honor that this MS c/PhD. thesis titled **"ANALYZING THE MULTI-STORY OF SUSTAINABILITY, DISABILITY ACCESS AND EARTHQUAKE DURABILITY ;EXAMPLE PROJECTS FROM 1980-1990,1990-2000,2000-2013 PERIODS** was written by me, without aid that would not comply with scientific ethics and academic traditions, that the bibliography I have used is that indicated in this thesis and that appropriate reference has been given whenever necessary.

15/01/2014 Seda ŞAHİN

ÖZET

ÇOK KATLI KONUTLARDA SÜRDÜRÜLEBİLİRLİK, ENGELLİ ERİŞİMİ VE DEPREM DAYANIKLIĞI KAVRAMLARI GELİŞİMİNİN 1980-1990, 1990-2000, 2000-2013 DÖNEMLERİNDE ARAŞTIRILMASI

ŞAHİN, Seda

Yüksek Lisans Tezi, Mimarlik Bölümü

Tez Danışmanı: Assist. Prof. Dr. Eray BOZKURT

Ocak 2014, 163 sayfa

Artan nüfus ile birlikte konut ihtiyacı da artmıştır. Konut ihtiyacını karşılamak için; bina yapım tekniklerinin de gelişim göstermesi ile birlikte çok katlı konutların sayılarının gün geçtikçe arttığı gözlenmiştir.

Artan çok katlı konut sayıları ile birlikte yapılardaki bina performansının gelişim ve değişim gösterdiği gözlenmiştir.

Tezin amacı 13-25 kat arası çok katlı konut yapılarındaki performans gelişimini; sürdürülebilirlik, deprem dayanımı ve engelli erişimi kavramları üzerinden 1980-1990,1990-2000,2000-2013 dönemlerinde örnekler üzerinden incelemektir.

Anahtar Kelimeler: gelişim, çok katlı deprem, engelli erişimi konut yapıları ,sürdürülebilirlik

ABSTRACT

ANALYZING THE MULTI-STORY RESIDENTIAL BUILDINGS IN TERM OF SUSTAINABILITY, DISABILITY ACCESS AND EARTHQUAKE DURABILITY; EXAMPLE PROJECTS FROM 1980-1990;1990-2000;2000-2013 PERIODS.

ŞAHİN, Seda

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With globally increasing population the need for housing increased rapidly. In order to satisfy the need in housing, number of multistory also housing buildings have increased with the advancements in construction and architectural design techniques. Accordance with the advancements in technology, the needs of the individuals and the concepts of house have been altered. The multistory residential buildings have differed in order to satisfy the needs of the tenants in respect to the specific time periods; 1980 to 1990, 1990 to 2000, and 2000-2013.

The purpose of this dissertation is to investigate and compare the 13-25 story residential buildings' sustainability, earthquake durability and accessibility factors within their respected time period. According to the findings of this thesis, the advancements in sustainability, earthquake durability and accessibility have increased rapidly over the recent years and the factors determine said increase has been witnessed in various case studies.

Keywords: advancement, multistory residential buildings, sustainability,earthquake, accessibility

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1. INTRODUCTION

Multistory buildings can be defined as the structures with more than 13 stories and increasingly demanded and can be found many parts of the country due to the said interest since the mid 20th century. Structures with 25 stories and over is defined as “skyscraper” therefor multistory buildings are defined by having 13-25 stories. These types of structures were examined throughout this paper. With the growth in construction field in Turkey, construction of 13-25 story buildings has been increasing exponentially. This increase in demand resulted in additional determining factors along with it. The purpose of the study is to examine these buildings with the define factors in three different time frames, 1980-1990, 1990-2000, and 2000-2012. The said factors are the earthquake durability, structure sustainability and accessibility for physically disabled persons. The examination of these buildings in their respected era is to be concluded, analyzed considering examples and resulting a base for any further research in this topic.

In this assertation, 13-25 story buildings in different area have been inspected. Six examples of these buildings were chosen and investigated throughoutly.

Figure-1.1: Classifications of Residential Structures

The figure above explains which structures would fit in the scope of this research. For the sake of length and research details, structures with 13 to 25 stories are considered to be “High Rise” buildings and these buildings will be investigated in accordance of their criterias.

The examples that will be taken into an account for this research will be Ataköy 9.-10. Etap Konutları, Halkalı Emlak Bank Konutları in 1980-1990 era, Tercüman Sitesi , Mavişehir Emlak Bank Konutları in 1990-2000 era; Folkart Mavişehir,Soyak Ekostar in 2000-2012 era. The inspection, interviews and findings on sight will create the additional part of this dissertation. In order to make paper run fluidly, tables and images were designed to explain the details in more attention drawing ways. Structure sustainability resources done fort his dissertation are focusing on material usage, energy, and resource management.

Earthquake regulations have been reviewed, appropriate institutions were contacted in order to gather the data needed. Moreover the previous reports on accessibility for physically disabled persons have been examined and detailed research was made with data from 1980. The chosen examples do not reflect on all the construction type of today’s structures; but they give the information regarding to the improvements made over the specific time frames to explain the reasoning behind these construction patterns.

In order to comprehend the topic better, a literature review was completed. The concepts related to architecture, urban development, housing estates and sustainability were undertaken through local and international sources, previous dissertations, laws and regulations. Furthermore, the literature review regarding to the historical data was obtained from architecture departments’ libraries of various universities in Turkey. Besides the explained methods above, the respected government and civil agencies provided any and necessary documentation for this dissertation. In order to find the differences in structures, Remax and Turyap Eskidji Gayrimenkul has been consulted. Again, in this dissertation the sustainability, earthquake and accessibility analysis on multistory residential buildings done comparing different time periods through 1980’s to today in Turkey. In areal reports, the maps and development plans provided from Istanbul and Izmir Metropolitan

Municipalities have been used. The floor plans and structural details of the chosen example structures have been obtained from Turkey Housing Development Administration, the Internet sources, and previous assertations done on this matter. Also, the detailed insight was gained through the information given by the manager and directors. Assertation work consists of four difeerent sections in order to analyze the topic throughoutly. The first section is the introduction part. It explains the purpose, extends, methodology and limitations. The second section is the part where throughout analysis about earthquake durability, sustainability, and disability access criterias were done both nationaly and internationally. The third section analyzes more periodical improvements in said criterias. Additionaly efficincy in the integration also examined. The fourth section examines the multi-story residential buildings in their respected time frames compared with examples given from Istanbul and Izmir. As a conclusion, the comparison between time periods, conceptual changes and structural improvements will be reanalyzed.

As any research, this one carries certain restrictions and limitations in order to come up with the most quantitative and meaningful answers. The first of all was the language barrier. When it came to research of internationally published articles about the related terms and dissertations, the language barrier put a standing limitation to progress further. Some resources had to be eliminated and some resources took time for translation and understanding the concepts fully. Second of the biggest limitation was the sample size of the residential buildings that was considered in this dissertation. There are only three examples that were considered fort he comparison while there are thousands of other residential buildings that would or could change the outcome of this dissertation. Last but not least, not every residential building were considered in this dissertation. Especially steel buildings constructed on top of reinforced concrete structures were left out of the analysis, because only reinforced concrete structures were in our targeted area. Another limitation set forth was the research regarding to accessibility for disabled does not include the inside of the house. The reason for this limitation is that the tenant/resident can redecorate the inside of the house as his/her desires and this thesis investigates the architectural requirements for the accessibility.

2. LITERATURE REVIEW

In order to create a throughout research, the previous dissertations have been read and analyzed. They are investigated in their cover and conceptual knowledge. The literature review section consists of four sub-parts. First we will evaluate the previous works about what a house is and the change in concept over the time. Then we look into the works regarding to how these houses have been sustained, what the previous thesis researchers have found or missed. Then earthquake concepts on architectural design related dissertations were analyzed to identify the key factors in durability during an earthquake and how the structural design should be. Last but not least, I look into the accessibility in said houses, how the concept of accessibility changed over time and how the previous researches viewed this change.

As stated above the concept of "house" is very important in order to understand how the investigated elements take part in the making of a house. In his dissertation, "Istanbul'daki Luks Konutlarin Incelenmesi ve Farkli Tiplerinin Karsilastirilmasi", (Ozguven, 2008) explains the concepts for luxury housing, how customers' perception of a house changed the way we live today and how the concept of house still differs depending on the needs of the customers. The dissertation reviews the criterias for luxury house, and to introduce common and different properties of the up-to-date samples. Also the concept of house is directly related to the location of the premises. "Istanbul Orneginde; Toplu Konut Gelisimi, 1980 Sonrasi Konut Uretim Sureci ve Yer Secimini Etkileyen Faktorler Baglaminda Konut Yakin Cevresinin Irdelenmesi" by Daggulu (2010) Explains the changes in multi story houses over time, especially for the time period after 1980, it limits the area of study in multi-story buildings, analyzing what are the determinants that reshape our houses and how the surrounding environment and making decisions about location of these houses.

Concept of a house includes many pieces that work in a harmony in order to create that place costumers call home. "Low-Rise Housing Development in Ankara" by Muzeyyen Anil Senyel (2006) analyzes the housing and theories of land rent in residential housing complexes. She took certain aspects such as designing decisions, housebuilders and urban development pattern, considering the theoretical basis and historical processes of the concept "house". Even though this dissertation is directly

related to city planning and urban development, the concepts explains and defined for the term “house” was very useful for my dissertation to identify what a house is. The concept of house is highly related to the customer satisfaction. “Toplu Konut Uretiminde Musteri Memnuniyetining Degerlendirilmesi: Sakarya Yenikey Ornegi” by Eken (2011) analyzes how the outside determinats help customers make decisions about their houses. The dissertation evaluates the user satisfaction by associating the invariables on the demographic, cultural and economic structures of permanent and mass housing users residing in the province of Sakarya with variables as the physical features of the housing and its environment, neighborhood, social and cultural opportunities, security, accessibility, the appearance and arrangement of the housing environment. As Eken started to explain the surrounding as a part of sustainability effort, “The Investigation of Landscaping Design in Newly Developed Housing Complexes in Ankara” by M. Sayan (2002) is a study designed to propose minimize effort for work efficiency when it comes to structuring surrounding environment with customers with disabilities in mind. He describes house as “A place where the inhabitant can provide basic needs such as food and shelter, but also provide more social connectivity through the additional services provided with the surrounding habitation and/or nature.” The dissertation is limited with the City of Ankara region. It at least gives us a perspective to understand how housing concept is seen by other researchers and how surrounding is considered a part of a house.

“Toplu Konutlarda Modulerlik ve Esneklik Kavramlari, Istanbul’daki Toplu Konutlarin Plan Tipi Uzerinden Analizi” by Onur Yucel (2008) studied the criterias such as modularity. User participation and flexibility in housing design, keeping in mind the ongoing change in the concept of what a house should be. This dissertation argues about the ongoing changes and factors that created these changes in housing concept. It does serarates the changes within differet time period, like this paper.

When discussing a plan style analysis, the concept of house differes depending on the style of verticality. Kirkan (2012) in her thesis “Cok Katli yuksek Yapilarin Tasarimina Etki Eden Faktorlerin Irdelenmesi” describes what qualifies for the houses that are between 13 and 25 stories. It furthermore explains design of the

architectural project, equipment systems, vertical circulation systems, circulation areas, facade systems, technical advanced technologies.

Harmankay ve Tuna (2010) in their article named “Turkiye’de Tunel Kalip ile Uygulanan Cok Katli Yapi Uretiminde Kat Adedi ve Beton Sinifinin Maliyete Etkiler” analyzes cost associated with residential housing buildings with respect to their structural specifications. This article define more in financial requirements to create the houses people associate themselves with and how any additional functionality would affect on the const and relatively the price of the housing.

While tunnel framework system built housing models are not just costy but they are high quality in earthquake prevention. “Tunel Kalip Sistemiyle Yapilan Yapilarin Deprem Surecince Davranislarinin Incelenmesi” by Kadir Guler (2009) indicates that Tunnel Framework System is one of the most common systems used in earthquake durability and it helps structural help of the building for a longer period. The Thesis took an example with a 15 story building to examine the effects of the said system and came up with results that are outstanding. This thesis will give us direction to what to expect when it comes to become durable against one of the mightiest natural disasters of all.

As this thesis requires, it was needs to analyze differences in regulations in 1990’s and 2000’s. “Turk Deprem Yonetmeligi- 1998 (TDY-98) ile Deprem Bolgelerinde Yapilacak Binalar Hakkinda Yonetmelik- 2007 (DBYBHY-2007) Karsilistirilmasi” by Tasan (2012) compares and analyzes the most used two earthquake prevention regulation by the Turkish government, one being prior to ’99 earthquake by using the SAP2000 program with Mode Superposition Method. This shows the changed implemented after a devistating earthquake and the constructions becomes much more regulated.

Since the regulations after and prior to Kocaeli Earthquake are known now, the behaviors and motivations of the residents in high risk areas are a very determinant factor of the delays of improvements in making. “Plansiz Yerlesmelerde 17 Agustos 1999 Kocaeli Depremi Sonrasi Konut Tercihlerinin Analizi: Resitpasa Ornegi” by Oney (2002) analyzes the backgrounds of specific residents of the

buildings in a high risk earthquake area in Istanbul. He finds out that many factors such as education and even gender affects on how people perceive earthquakes and especially the ones that built their own houses feel faith in thier, so to say “art peice”. This is a useful consumer behavioral information for this dissertation in the time periods of 1990-2000 and 2000-2013.

It is not only the exterior design that makes the earthquake less devastating but interior design of a house is as important as exterior. “Deprem Bolgesindeki Konutlar icin Ic Mekanlarin Guvenlik Analizi ve Cozum Onerileri” by Cigdem Demirbas (2008) investigates solely about the elements of interior house design to understand the effects on injuries or deaths during natural disasters such as earthquakes. She indicates that choose of furniture, application and placement of them is directly related to earthquake devastation and for the safety of the household, the manufacturer of the furnitures as well as the architectures of the houses shall give directions to tenants to make sure, they understand the concepts of earthquake damage and their house is ready for it.

Eartquake prevention is one of the most important aspects of owning a house in Turkey. Moreover, with the increasing effects of natural awareness, sustainaiblity comes into an account, when it comes to make a decision on buying a house. Furthermore, when the house exists within a residential complex, then it carries even more value for customers. “The Analysis of Bio-Climate Effects on Multi-Story Residential Buildings with Case Studies from Istanbul” by Nazire Arslanoglu (2009), Explains the effects of sustainability efforts with respect to the multi-story residential buildings, through the concepts of energy, water, and materials. It talks about what type of materials would bring the housing environment more efficient and how thew building can continue this efficiency through different channels such as water usage and energy consumption.

Sustainability is also about the consumptional levels of energy. In order to understand the sustainability levels of any buildings, more than one determinant shall be investigated. “Konut Binalarinda Tasarim Parametreleri ile Enerji Tuketimi Iliskisi” by Seval Soysal (2008) analyse and evaluate the effects of design parameters such as orientation, U value of the envelope, ratio of the exposed wall to

window area, total exposed area of the envelope, vertical zoning, enclosing balconies to act as a buffer zone and unheated flats on the heating load of residential blocks. The whole paper examines the energy consumptions and design specifications that can affect on sustainability.

Knowing that spending less or not at all of any natural resources serve purpose for the sustainability, the concept of usage of specifically designed materials is very known in Turkey. “Application of Smart Materials in Sustainabile Architecture” by Sensan (2009) indicates that the contribution of smart materials in architecture gives architects the opportunity of designing smart buildings with lightweight structures and new building elements that react to environmental conditions. The article examines how sustainability is connected with architecture and how the materials used in construction can affect on the sustainability of the buildings. Starting from the smart material to architecture, Ciravoglu (2006) explains sustainaibility in her doctorial thesis named “Surdurulebilirlik Dusuncesi-Mimarlik Etkilesimine Farkli Bir Bakis: ‘Yer’ in Cevre Bilincine Etkisi” as a term used for economic, political and environmental changes in development of buildings. She furthermore claims that equipping architecture with environmental technology does not contribute too much to the saving of the world, which was an opposite thinking compared to me.

Since the rise of the interest in multi residential high rises, Turkish government has been constructing governmentally controlled buildings, which are tied with the above research which indicated the political changes in development of buildings in regards to sustainability. “Turkiye’de Konut Sektorunun Yapisi ve Gelisimini Etkileyen Faktorler TOKI Uygulamalari Ornegi” by Oksay (2011) claims that the sustainability efforts started to be recognized after 1992 Rio meeting and since then there has been a rapid involvement in Turkey, as well. The only information gathered from this thesis was the information about the sustainability factors and the timeline of improvements implemented over time.

An international concept of sustainability has been investigated by many nations and individuals, trying to create global norms for sustainability. The article studied by Sun-Sook Kim, In-Ho Yang, Myoung-Souk Yeo, Kwang-Woo Kim,

“Development of a housing performance evaluation model formulti-family residential buildings in Korea” (2006) explains the norms for South Korean Architecture, what the expected developments in sustainability and how to achieve sustainability in constructions.It precisely gives examples of sustainability factors with their respected weighted averages on the selected case study buildings.

“Yuksek Yapi Tasariminda Surdurulebilirlik Boyutunun Irdelenmesi” by Deniz Zindade (2010) shows the sustainable building design and performance strategies and to state the sustanaibility strategies shaping the high rise buildings investigated. Zindade states that sustainability is in three steps, prior to construction, during construction, and after the completion of construction and analyzes the same aspects of sustainability as this paper does.

Even though a complex can be sustainable but, the concept of sustainability increases whilst the complex expands and grows with the residents in it. Terzi (2009) looks into stratergical challenges will be faced to increase sustainable buildings in Istanbul in his “Mekansal Buyume ve Konut Alanlarina Yonelik Gelisme Stratejileri”. He then analyzes the feasibility of proposed strategies, representing ways of becoming a sustainable urban city, in this case Istanbul; which is also a target city for my project. Furthermore, he claims that in order to achieve this developmental sustainability in Istanbul, the city planning and constructions are to be highly regulated both by government and supportive agencies.

Cok Katili Konut Yapilarinda Surdurulebilir Ic Mekan Tasarim Kriterleri” named thesis by Mutdogan (2011) explains sustainability advancements in manners of decades andproves the improvements done in the recent years explaining how the exponential growth in sustainability affect on quality, price and customer satisfaction.

Considering we had less than half of the technology we have today ten years ago, this research looks into the futuristic expectations as well. “Konut Tasarimina Yonelik Surdurulebilirlik ve Teknoloji Baglaminda Bir Gelecek Tahmin Modeli” by Seda Filiz (2010) is investigating the changes applied in sustainability through the technological advancements and trying to estimate a model that represents futuristic

sustainability efforts. Filiz explains how the smart house concept is applicable even today and how far this can go with the ongoing architectural advancements. This is a basis of where the sustainability efforts should overtake. Even though this paper investigates the historical data regarding to sustainability, it can give us an understanding of the growth pattern.

Since Turkey has been in a long term relation with European Union, it is important to meet the European expectations in architectural design which will reflect on the lifestyle of citizens. “Avrupa ve Turkiye’deki Surdurulebilir Mimarlik Anlayisina Elestirel Bir Bakis” by Ecehan Özmehmet (2007) is published in Journal of Yasar University, compares the the European sustainaibility with the Turkish one and defines the coalition between sustainability and ecology with a formula. The paper examines sustainability in three aspects, economics, ecologic and social sustainaibility. It also considered the demolition and rebuilding possibvilities as a part of sustainaibility, which I haave not considered before reading this journal.

Bekiroglu (2002) in his “Problem Identification for Physically Disabled Individuals in Landscaping Arrangements” named writing, hew claims that the disabled individuals shall be allowed to live in the same environment without being outcasted, with precautions taken into an account to improve of their current situation. He states that the best solution is the create a disability free landscaping where every individual with or without disability can access and he explains further suggestions to achieve this.

Anonym (2007-c), publishing named: “Accessibility For The Disabled – A Desing Manual For A Barrier Free Environment” is a workstudy done the first time in Lebanon in order to create a design specifications booklet, which is aimed to be given to architechs and designers for the purpose of creating norms for accessibility, and become the base for all the accessibility works in the future. What is amazing about this booklet is that, it is not only about architecture, it is also about cultural norms and expectations of the disabled individuals with respect to their culturam backgrounds. Just as said publishing, work done by Work Disability Union called “Accessible City Regulation” released in 2011 expresses the required regulations for stairs, crosswalks, disabled parking, ramps, underpasses, open spaces, the buildings – both commercial and residential, government buildings, and the public

transportation vehicles. This regulation has only been a draft and has not been approved by the government body, therefore it is accepted by this thesis and universal expectations for disability access in an urban city. Family and Social Policies Administration of Turkish Republic published booklet named, “Yerel Yonetimler Icin Ozurlulere Yonelik Fiziki ve Mimari Duzenleme Klavuzu” explains the basic regulation regarding to disabled accessibility in regards to open spaces, houses and apartments, public transportation, and traffic arrangements. The booklet is used as the core guidelines for today’s conditions in therotical accessibility by this thesis.

As the regulations go the applications of these regulations are far more important than the writings on the pieces of paper. “Ulkemizde Yayinlanan Imar Kanunu ve Imar Yonetmeliklerinin Uygulamalari” by Halim Akisin (2004) explains the regulation fluctiations between central government and metropolitan municipalities as well as how the regulatory government acts differently depending on the region and parts of the country. The thesis indicates that there is a need for one central regulation that works for every part of the country. This thesis has been used to analyze what has been done in the regulations so far based on accessibility concepts, what are their extends and what are the enforcement agencies.

Yildiz (2003), Engelliler icin Dis Mekan Tasarim Ozellikleri” explains the needs for involvment of disabled individuals in daily life and the elements that need to be considered in order to provide them such systems. It talks about the factors that represents the inability of accessibility in today’s Turkey with regards to the past and growth process of this implication.

Furthermore with the same idea, Yavas (2002), in his “Movement of Physically Disabled Individuals in Urban Environments” he identifies the issues faced by disabled individuals in urban areas, gave examples of the solutions from foreign countries and the implications to provide better and eqaul living experience for all.

Considering all the disabilities exist, the ones use wheel chair dominates the numbers. “Tekerlekli Sandalyeler Kullanan Bedensel Özürlüler İçin Uygun Konut Tasarımı ve Çevre Düzenlemesi” published by Seher Yildiz Mutluer (1997) explains

the planning of environments for the usability factors of disabvled individuals with wheelchairs. Mutluer explains the definition of the planning phase for the apartment, building and the surroinding areas, in order to allow individuals to perform all the activites that a healthy person could do.

The exterial architectural design does not only consist of arrangements of open spaces, but it includes the aspects of outside life, just like public transportation vehicles, stop and traffic arrangements. Sabahi and Aytore (1994) in their work of "Hafif Raylı Toplu Taşıma Araçlarında Bedensel Özürlüler İçin Tasar Ölçütlerinin Belirlenmesi" expresses the need for calimetry in measurements for reaching accessibility for all individuals who are taking to public transit vehicles. This also requires the needs to adjusting the distance between person's home to the bus/metro stop. They also indicate the hydrolic solutions are the best answers both for structural and equipmental development of accessibility.

"Turizm Yapilarinin Tasariminda Ozurlu Etmeninin Irdelenmesi" by Kadri Yoruk (2003) investigating the architectural design criterias for touristic places, keeping accessibility in mind. The research includes the availability of designated parking spaces, public transportation stops, sidewalks, disability ramps, hung materials and last but not limited to accessibility signs. Even though this thesis focuses on turistic premises, the same requirements shall be implemented by any residential complexes.

3. SUSTAINABILITY, EARTHQUAKES AND ACCESSIBILITY

In this section, sustainability, earthquake durability and accessibility factors will be examined in accordance of their respected time periods. The 1980-1990 period will be called as "Period-I", 1990-2000 period will be called as "Period-II", and 2000-2013 period will be called as "Period-III".

3.1 Periodical Sustainability Analysis

The multi story residential buildings have been built during the industrial reforms, considering the amount of migration occurred from rural parts of the country to the industrial cities such as Bursa, Izmir, and Istanbul. Increasing demand in these style housing had caused unhealthy construction styles that compromise

human comfort factors, relationship between the building and the environment aswell as the social relationship the residents participated in. After a period of time, due to all these negative implications of poorly designed multi residential buil dings, the need for quality from the customers were inevitable.

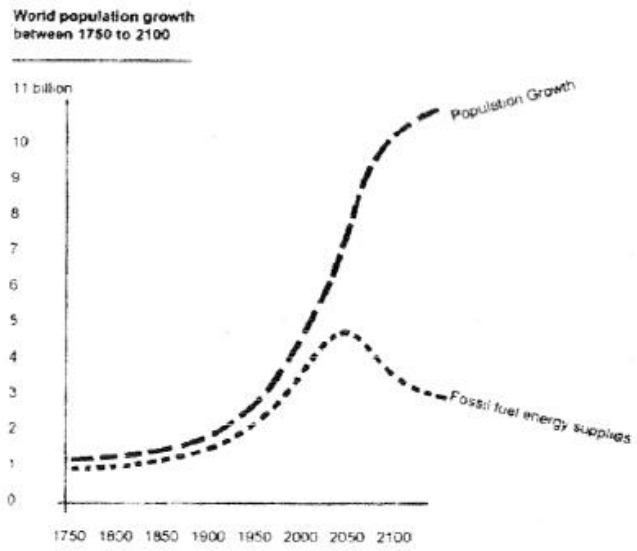


Figure 3.1 Population Growth and increase in Fossil Fuel

Certain architectural point of views such as "envionmental design" in 1970's "green design" in 1980's, and "ecological or sustainable design" in 1990's aimed to provide efficienct and quality living spaces. The purpose of all these concepts is to use less natural resources and increase renewable resource management.

3.1.1 International Steps Taken Towards Sustainable Development

The Stockholm Conference in1972, where the concept of protecting environment and improvement of energy resources, indicated that majority of the environmental problems occur due to the industrialization and the technological advancements. Though the following years after Stockholm Conference, the environmental and developmental problems have risen and the economical and social gap between the developed and underdeveloped countries have increased.

Figure 3.2 International Sustainability Conferences

"Shared Future Report" prepared by Gro Harlem Brutland was published in 1987 for the World Environment and Development Commission. The term "sustainable development" was first used in this report, and proposed development model explained in this report applied for all the countries and included following:

- Long-term and stable growth
- An economy that balances between development and natural protection
- Sustainable development phases without the destruction of the environment.

In 1992, Rio Conference aimed to put the 1992 Stockhold Conference in action, protect the environment, enforce governmental involvement and preserve the thirteen development systems. At the end of Rio Conference, Forestry Principlines, Desertation & Protection Agreement, and Biologic Diversity Agreement were signed and they all were named under "Agenda 211", an action plan that directs both government and social organizations to perform accordingly and prevent overuse of environmental sources. This plan called Agenda 211 consisted of social & economical dimensions, the protection & management of scarce sources, the roles of active parties, and the application mechanism.

In order to investigate the results and applications of the proposed regulations in 1992, Rio+5 Summitindicated that the past five years had been

unsuccessful when it comes to applying the regulations set forth in Rio conference in 1992.

Johannesburg Conference was held in 2002 with the attendance of government officials, local governments, non-governmental organizations, private sector members and the social organizations, in order to track the progress and effectiveness of 1992 Rio Conference Regulations. At the end of the conference, it was decided on the diversification of energy supply, distribution of the use of renewable energy sources, the limitation on biological diversification loss by 2005.

A new concept in environment and human affairs was introduced with Brundtland Decleration of1987: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (Goffman, 2005) We even can still be a witness to the examples of sustainaible architectural design from the 18th century. Leaders of the Polynesian civizations that settled the island erected these statues as enormous symbols of their prestige. The drive for status overrode ecological considerations, leading them to denude the island, cuttong down ever-more trees upon which to drag ever-larger boulders, in the quest to make ever-larger statues. (Goffman, 2005) Nonetheless, we will be investigating in the assigned time frames (Period-I, Period-II, and Period-III) within Turkey.

3.1.2 1980-1990 Period (Period I)

Rapid increase in population growth of the urban cities, growth of the industrial production, and the marginal loss witnessed in the environmental resources created the notion of sustainability. (Guleryuz, 2012) The sustainability works Hve recognized officially along with the publication of Our Common Future by United Nations in 1987. " Sustainable development is efforts to supplying the needs of the mankind whilst protecting scarce resources that the future generations will use to cover their needs." is the biggest claim of Bruntland Report that was explained above; hence this report was recognized by many nations.

Sustainability concept had started its first stems within this period in 1987, by ‘the Brundtland Report’ of the World Commission on Environment and Development (WCED).

Considering this movement in the host country, Turkish architectural concepts had not evolved to maintain the concepts of sustainability at that time. With the acceptance of new Turkish Constitution, the prevention of nature was described first time in Turkish history in governmental organs. However, the constitution did not specify what needs to be done and what the measurements should be in order to prevent the overuse of the natural resources. (Egeli, 1996).

In 1983, the Natural Law aimed to consider nature as a whole and not target to prevent from pollution but also prevent from over consumption of natural resources. Continuum of this, Air Quality Control Act of 1986 and Noise Decibel Control Act of 1986 as well as Water Quality Control Act of 1988 was published to gather the attention of the general public.

3.1.3 1990-2000 Period (Period II)

Within the Period-II, the many considerations regarding to becomeing an environmentally sustainable had been thrown around and started to gather a public fuzz. In earlier 1990’s, the Waste Management Act of 1991, Natural Impact Evaluation Act of 1992, Medical Waste Management of 1993, Chemical Wate Management of 1993 were published gy the government. Another improvement considered in sustainable architecture and design was implemented on 1992. Two-year series of preparatory meetings culminated in the Earth Summit in Rio de Janeiro, Brazil This marked the second meeting of world leaders to discuss environmental and development issues and was substantially larger than it's predecessor the Stockholm Conference held 20 years earlier. With this summit being the base for all international improvements in sustainability, 1997 Rio +5 Summit includes countries such as Turkey in their executable areas. Following this international agreement, Turkey participated many international and regional regulatory actions in regards to maintaining natural sustainability such as World Cultural and Natural Heritage Protection Act, The Control of Ozone Damaging

Materials Act (Montreal), Border Crossing of Hazardous Wastes Act, Disposal Management Act (Basel), Trading Regulations of extinct or to be extinct plants and animals (CITES), Biological Diversity Agreement and European Wild Life and Prevention Act. (Arat, Türkeş ve Saner, 2002).

In 1991, Nature Counselship was terminated and instead, Ministry of Environment was established. (Okumuş, 2002). Initially it was structured to have six different ministries in different cities operating under one commissioner.(Altunbaş, 2004). Also around the same time frame, the "Yerel Gundem 21" initiative was implemented to protect the natural resources and the environment. (Erim, 2000).

With the following development plan, sustainability was explained as a part of economical and social development as a syncronizing effort towards learning to live withiout damaging the enrironment and trying to prevent the further damage of this planet. (DPT, 1995). As continioum of this, Turkiey published National Environmental Strategy and Action Plan (UÇEP) in 1998. The preperation of the document was concluded with the efforts of Ministry of Environment, World Bank, universities and related private sector businesses. (İKV, 1998). The document descrtibes the hazardous materials both for people and for the environment. Also, for the nation to reach its long term goals in sustainability, what steps shall be taken are described and suggestions follow these requirements. It explains the environmental integration of urban development and how to accept environmental awareness as a part of improvement of social life. (Altunbaş, 2004).

3.1.4 2000-2013 Period (Period III)

The concept known as providing necessary for the future of mankind in the 80's has elavated and included habitable environment, natural resources, and balance of producting and consumption, in order to provide a sustainabile living environment with an economical outlook.

"Regulations on Structural Materials" that was published in 10th of July 2012 indicates that the materials that was to be used in construction must carry a

European Standards required “CE” stamp on them, as well as it restricts the reusage of certain materials in order to diminih the hazardous nature of construction. (Cati & Cephe, 2013)

Turkey published a report in 2002 for the Johannesburg Summit, regarding to the country’s sustainability goals and current situation. The report indicatesthe following govermental agencies resposable for maintainings sustainability in development of human settlements:

- State Planning Organization is responsible for the preparation of Five Year Development Plans or preparation of Regional Plans or having them prepared.
- The Ministry of Public Works and Settlement is responsible for:
    - the preparation of territorial plans or having them prepared and their approval through Planning Law No: 3194/1985;
    - the preparation of land use plans for areas subject to disaster and their approval through Disaster Law No: 7269/1051;
    - the approval of Tourism Area and Centers Master Plans through Tourism Encouragement Law No: 2634, 18.03.1982;
    - the approval of landfill in coasts or land gained through drying through Coastal Law No: 3621, 17.04.1990;
    - the approval of land-use plans related to public institutions, important for transportation, mass housing implementations through the Planning Law, No: 3194, 09.05.1985;
    - the approval of land-use plans of explosive and flammable material stores through the Regulation announced relative to the second article of the Law No: 6551 (1987);
    - the preparations and approval of land-use plans of Squatter Prevention Areas or Rehabilitation Zones through the Squatter Law

No: 775/3384;

- the approval of Implementation Plans of National Parks through the Law on National Parks No: 2873, 09.08.1993.

- The Ministry of Tourism is responsible for:

- the approval of tourist establishment implementation plans in tourism areas and centers through the Tourism Encouragement Law No: 2634, 12.03.1982;

- the approval of implementation plans of touristic uses continuing from landfill in coasts through the Coastal Law No: 3621, 17.04.1990;

- the plans in Greater Municipalities through the Law of Greater Municipalities No: 3030, 27.06.1984; the Construction and Occupancy Permits through the Planning Law No:3194, 09.05.1985 and the Law on Administration of Greater Municipalities No: 3030, 27.06.1984;

- the approval of implementation plans of municipalities in Greater Municipality boundaries through the Law on Administration of Greater Municipalities No: 3030, 27.06.1984.

- Prime Ministry- Housing Undersecretariat is responsible for:

- the approval of land-use plans in organized industry and mass housing areas through the Land Office Law No: 1164, 29.4.1969 (United Nations, 2002)

These job allocations was part of a new born idealogy that the sustainability could not be achieved with individual efforts but with the social private organs and governments rallies and enforcements. (Nemli, 2003). This movement came into existance in 1993 and many organizations such as Çevre Koruma ve Ambalaj Atıkları Değerlendirme Vakfı, Deniztemiz Derneği, İstanbul Sanayi Odası, Türkiye Kalite Derneği, Türkiye Kimya, Sanayicileri Derneği, TEMA ve TÜSİAD was founded.

Also, Regional Environment Bureau in Ankara (REC) initiated in 2004 and enforced and promoted the environmental efforts in both development and social life in the region and ease the process of European Union Initiation Period. (Serban,

2002).

All these requirements do a lot to do with social sustainbility and there are not many restrictions and enforcement todays development of buildings and livable areas. In today's market place for houses, the sustainability is a concept that is a big concern for new tennants and customers. The sustainability indicators for a building project can be selected from various lists prepared at the level of the government, sector, and community. Major concern is related to the use of natural resources such as electricity and water and construction materials. Building performance analysis reveals the needs of the complex in regards to its location, the climate it resides, and all the external factors that can affect it. The following chart represents the effects of sustainability and determinants in designing process.

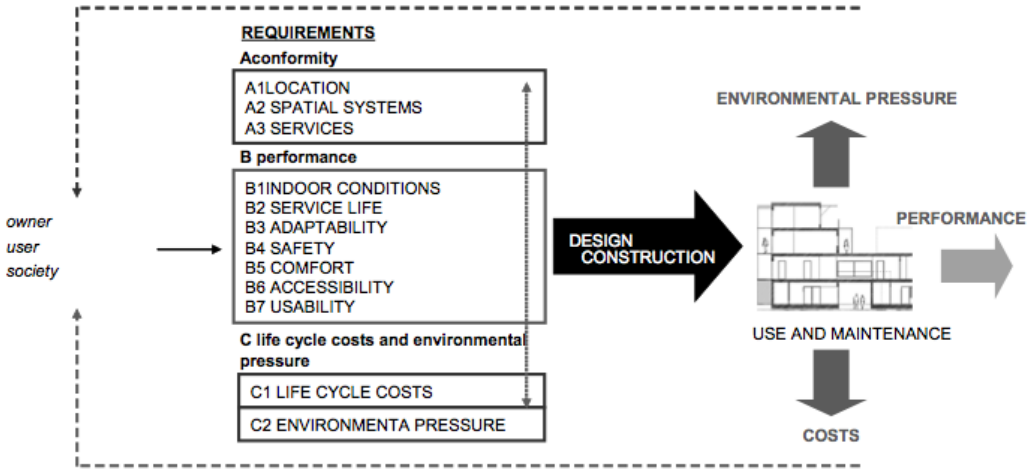


Figure 3.3 Example of a Generic Model for a Building's Performance Analysis

This kind of method provides some important benefits to both end users and other participants in the building process, since it promotes substantial improvements in the overall performance of the building, encourages the use of construction solutions that better fit the use of the building, and promotes a better understanding and communication of client and user requirements.(Luis Braganca, 2010)

Construction industry is responsible of 50% of the raw material usage, that is why this is very important for the sustainability efforts. The main reason behind the use of effective material, is to prevent the over-usage of natural resources. The

process of reaching the natural resources, shape them and use them in construction will damage eoclogical balance and waste energy. (Baysan, 2003) Fort his reasoningm it is vital to maintain effective materials in order to reduce waste and increase stability. The ways the materials can be use effectively are given below:

1. Use of renewed or recycled materials:

Wooden, steel, glass can be recycled and in order to be material effective, these materials to be used in given fucntionality. Basically, if the building is fallen a part, the pieces that resides behind is subject to be reused. In order this to be achieved, the recycling stations shall be set to promote and sell materials. (Zinzade,2010;s:20)

2. Use of local construction material:

The materials that are found locally or around surrounding vicinities will allow the construction to spend less energy and reduce the cost of production fort he construction.

The water is essential for any building for reasons such as cleanining, toilet reservation, and drinking internally and for watering purposes for externally. That is why it is very important to use water effectively and efficiently in order to maintain the required reserves, resulting in reducing the energy usage. On of the things that can be used fort his purpose is to use materials that is efficient in usage of water. Especially electronic items such as wish washer, laundry machine, and fossets can be arranged to be water efficient, in order to reduce the cost as well as usage. Also with effective watering systems, the external water needs can also be reduced to a minimum, being more water efficient.

Additionally, certain types of used water such as dish washer water can be recycled and cleaned up with simple systems that can reduce the usage of this precious natural resource. Canalization water is almost not necessary to reclean due to the high cost that would be associated with it. (Baysan, 2003) Another option to generate clean water is to collection of rain water. The rain water reservoirs can same facilities save serious amount of water and reduce the usage through city

reservoirs, saving Money and reducing the usage. This option would be very effective during fall and winter months in Turkey. This water can be used in landscaping. Thinking about landspacing, the plants that are not native to the environment will require more watering and additional cost associated with it. Therefore the decison regarding to which plant to be used and how much synthetic checmicals they require is another way to prevent overusing water resources.

The table given below explains the each criteria of sustainability and where it plays a role for the performance requirements of a structure. The models explains housing comfort in 4 groups, thermal comfort, acoustic comfort, visual comfort, and indoor air quality.

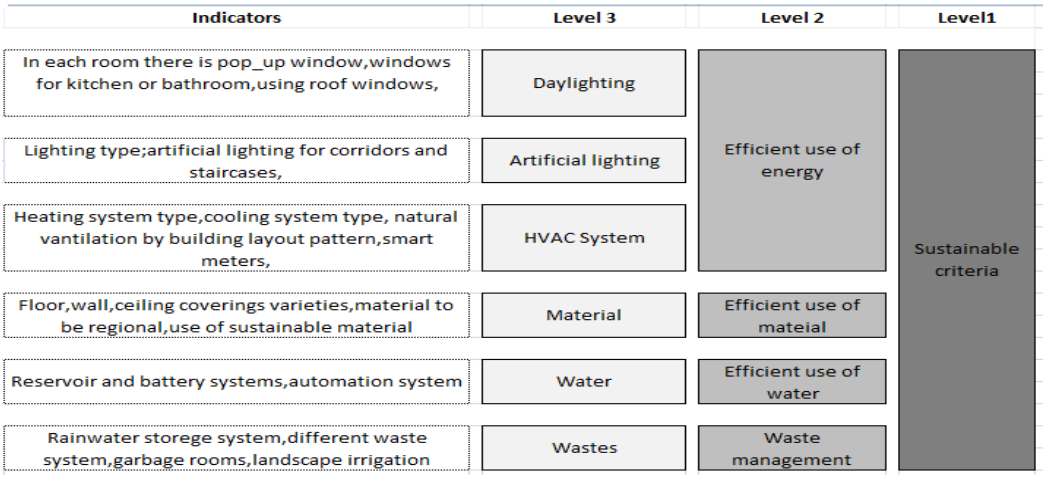


Figure 3.4: Sustainability Performance Features

Every building requires ongoing energy services such as heating/cooling, air ventilation, lighting etc. The real reason behind the prevention of excessive energy usage is to reduce the usage of fosil fuel globally. Fort his reason alone, the energy consumption carries a big importance. In the official release by Ministry of Public Work and Settlement in 2007, energy efficiency in residential buildings would be essential. (Ministry of Public Works and Settlement, 2007) The necessity to use energy efficiently is expressed in 21st century by Bruntland Report, expressing the posibilities of alternative and renewable energy implementations. (Blunden &Reddish, 1991,s:180) Some of the ways the energy efficiency can be achieved are given below:

1. Energy Effective city planning

This is more related to public Works such as transportation and external activities that incentivize water waste reduction and energy conservatism. This can be done more at the governmental level and it only has a view as infrastructural efficiency. The table below explains the amount of energy being consumed by different aspects of a "house" the table indicates that heating is the most energy consuming aspect of efficiency followed by water heating.

Residential energy use	Amount (%)
Space heating	36
Water of heating	14
Lighting	6
Space cooling	8
Cooking	3
Fridge	9
Washing &Drying	3
Other	21

Figure 3.5 Energy Consumption within a House

2. Isolation

The reduction of the interaction between the cold air outside and warm air inside vice versa, reduces the costs associated with cooling or heating the house. In order to respond to this need, the materials used in the construction must carry isolated functionalities. (Zinzade,2010,s:9)

3. Use of renewable energy sources

This carries importance in designing of the building, keeping in mind of the climative elements surrounding the building. Photovoltaic panels can turn sun into an energy source which is cost effective and reduces fossil fuels.

4. Lighting

During the design phase of the ocnstruction, the sun should taken into an account as a biggest lighting source without compromising from aesthetics and comfort. The effects and length of usa of the additional lighting options, interior design with reflections can reduce the use of energy resources for lighting. Lighting is also one of the biggest energy consumers. Therefore this is one of the biggest determinants of energy conservatism.

5. Use of energy efficient appliances

Construction sector takes a big portion of energy consumption in today's world and, energy protection and reservation concept emerged in order to bring a light to energy usage in constructional productions.

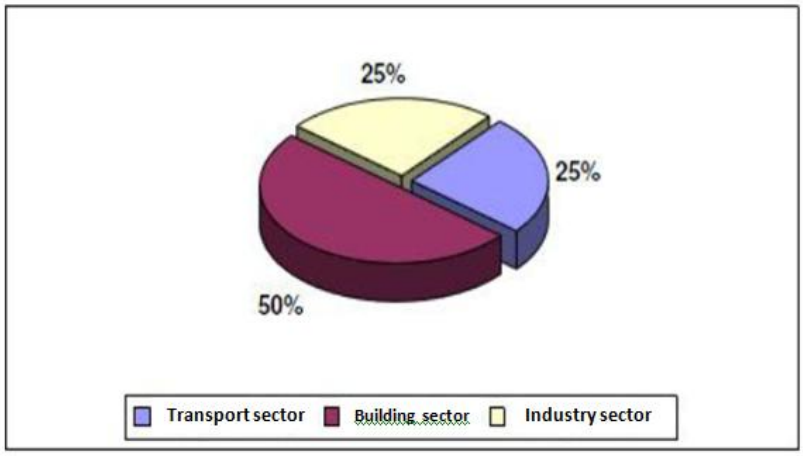


Figure 3.6 Global Energy Consumption by Sectors

In structural construction sector, there is a huge use of material and energy usage; also inflicts on forestry land use and destruction, waste of clean water reserves, destruction of ozone plate and it is indicated that 50% of all energy consumption occurs within building and complexes. (tez;irem saka;sayfa 14,İTÜ;Sürdü. Tez 2 diye geçiyo dosyada)

The use of appliances with energy efficiency will result in reduction of usage costs and energy usage. Some buildings provide thesev appliance along with the house in order to incentiveze consutmers and tennants to be energy efficient.

3.1.5 Sustainability Factors To Be Investigated

There are many ways of calculating and investigating sustainability. In order to maintain a efficient reporting system that evaluates and grades the lelves of sustainability, the criterias to be researched both in literature and in case studies are explained below:

I. Efficient Enegry Usage

Efficient energy usage is the concept of preserving thre energy waste and maintaining the energy usage over the time, if not decreasing. Smart building automation systems for energy usage, natural lighting, isolation and the energy efficient apparatus usage are the criterias that efficient energy usage will be investigated upon.

II. Effective Use of Water

Use and recycle of water sources is one of the most important elements of housing concepts; because clean water supply is the initial must for a construction to be considered a house.Usage of water efficient apparatus, water landspacing applications, deduction of water waste and recycle and reuse of water are the main elements that needs to be investigated in order to see the effectiveness of time over sustainability.

III. Efficient Material Usage

Especially regarding to energy, the materials used in construction inflicts directly on the level of sustainability in energy usage. If the housing did not build considering natural factors, than the usage of energy will be maximized. Therefore, local material supply and desing and construction with energy efficient materials will be the criterias to be investigated.

3.2 Periodical Earthquake Durability Analysis

The gradual increase in the frequency of natural disasters globally, have caused an increase in the losses and damages and effected lives of millions negatively. Similarly, the frequency and the severity of disasters in Turkey have increased.Turkey is located in a very fragile area, covering more than 92% of the territory laying on a sysmic area and more than 95% of the population resides in eartquake expected areas of the country. 98% of the endustrial areas, 92% of the water dams, 90% of all the historical artifacts lay within the eartquake zones of the country. (Selcuk Sipahioglu, 1988) The lack of extensive earthquake studies in Turkey is due to insufficient funding and lack of basic data required had been the root of the devestations occured during major earthquakes in Turkey within the last 50 years. Turkey did not have a national seismic station network up until 2000, which caused researchers to work with insufficient amount of data. With the foundation of the network and the aftermath of 1999 Marmara earthquake, the country increased their regulation and advancements on the matter and the following sections investigate in depth regarding to their respected time period.

Figure 3.7 Imagery from Marmara Earthwuake in 1999

3.2.1 International Steps Taken Towards Earthquake Durability Measures

Considering the changes in materials and styles used in different parts of the world, it is complicated to create one size fits all regulations for earthquake durability for every single country. Moreover, countries exist on areas with different earthquake conditions and it makes it more cost effective to follow local guidelines to construct structures. However there are quite few regulations and guidelines towards maintaining earthquake durable structures. The first big regulatory policy was released in 1997, "NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures". Same sort of regulations were published in 1985, 1988, 1991 and 1994, but they were not effectively followed by many countries. It includes the alternative material usage, occupancy factors and quality assurance of the buildings. The following aspects of the construction is required to be inspected by a third party company in order to get permits to continue construction, according to this report:

- Piers, piles and caissons
- Reinforcing steel quality
- Structural concrete grade
- Prestressed concrete quality
- Structural masonry
- Structural steel quality

- Structural wood type
- Cold-formed steel framing
- Mechanical and electrical components
- Seismic isolation systems (FEMA, 1997)

The same report was updated due to the techincal advancements in the following half decade, and published again by FEMA in 2003. It explains the same inspection requirements but details further in architectural design requirements. Some of the most important requirements are given below:

1. The design load for such items shall be equal to 1.4 times the operating weight acting down with a simultaneous horizontal load equal to 1.4 times the operating weight. The horizontal load shall be applied in the direction that results in the most critical loading for design.

2. Seismic interaction effects shall be considered in accordance with Sec.6.2.3.

3. The connection to the structure shall allow a 360-degree range of horizontal motion.

4. Connections and panel joints shall allow for a relative movement between stories of not less than the calculated story drift Dp or 1/2 in. (13 mm), whichever is greater.

5. Connections to permit movement in the plane of the panel for story drift shall be sliding connections using slotted or oversized holes, connections that permit movements by bending of steel, or other connections that provide equivalent sliding or ductile capacity.

6. Bodies of connectors shall have sufficient deformability and rotation capacity to preclude fracture of the concrete or low deformation failures at or near welds.

7. All fasteners in the connecting system such as bolts, inserts, welds, and dowels and the body of the connectors shall be designed for the seismic force Fp determined by Eq. 6.2-3, using values of ap and Rp taken from Table 6.3-1, applied at the center of mass of the panel.

8. Where anchorage is achieved using flat straps embedded in concrete or masonry, such straps shall be attached to or hooked around reinforcing steel or otherwise terminated so as to effectively transfer forces to the reinforcing steel.

9. For ceiling areas exceeding 2500 ft2 (230 m2), a seismic separation joint or full height partition that breaks the ceiling into areas not exceeding 2500 ft2 shall be provided unless structural analyses of the ceiling bracing system for the prescribed seismic forces demonstrate that ceiling system penetrations and closure angles provide sufficient clearance to accommodate the additional movement. Each area shall be provided with closure angles in accordance with Item 2 and horizontal restraints or bracing in accordance with Item 3.

10. Cable trays and electrical conduits shall be supported independently of the ceiling. (National Earthquake Hazards Reduction Program, 2003)

Guidelines for Earthquake Resistant Non-Engineered Construction (2004) by International Association for Earthquake Engineering takes the NEHRP report and takes it one step further invest5igating the aftermath effects of the earthquakes as well, such as ground shaking, ground failure, tsunamis and fire. The report indicates that the elements affecting damage on buildings are the foundation, ductility, rigidity distribution, opening size, building configuration and construction quality. The report also explains that the most failure elements of a building durin an earthquake are free standing masonry walls, walls enclosure without roof, roofs on two walls, roofs on wall enclosure, long building with roof trusses, and shear wall with openings. It also gives guidelines of how to repair, strengthen and rebuild the old structures. (International Association for Earthquake Engineering, 2004)

15th World Earthquake Engineering Federation Conference, that occures every four years with the involvement of 85 different nations delegates releases more than 3000 edicts in 2012. The conference aimed to call on all parties, both scientific and technical, in order to reduce the effects of earthquakes on mankind’s life, included the topins given below:

• Engineering seismology

• Tsunamies

• Jeotechical eartquake engineering

• Design of the new structures

• The evaluation of existing structure and analysis

• Infrastructure and body work systems

• Social and economical factors

• The preperation for big earthquakes and emergency regulations

• Urban risk evaluation

Last but not least, International Van Earthquake Symposium (2013) held in Van, Turkey, includes engineering, architecture, sociology, earth sciences, and medicine topics related to the recent earthquake occurred in Van, Turkey. The following topics related to architectural design and planning in regards to earthquake durability and prevention are explained throughoutly and respected individuals in their fields explained the details of thewse subtopics.

- Architectural Design
    - An Earthquake Factor in Building Design
    - Earthquake-Place-Hardware and Use the Relationship
    - High-Tech Building Systems
    - Urbanization-Settlement and Housing Policies
    - Design Defects
- Repair and Strengthening
    - Historical Buildings and Monuments
    - Enforcement of Building in Disaster-Prone Areas and Relation With Architectural Design
- Management
    - Environmental Management and Architecture Based Relations
    - The Role of Architectural Basic Field in Disaster Management
    - Pre and Post Disaster Reconstruction Policy
    - The Studies of Earthquake Loss Prediction in Scope of Architectural Basic Field
- Education
    - Architecture Course Schedules and Disaster
    - Contribution of Architecture in Earthquake and Training

3.2.2 1980-1990 Period

Even though it came to Turkey a bit late, the industrialism affected the social life rapidly and encouraged rural citizens to migrate towards west, to the industrialized cities such as Istanbul, Izmir, Ankara, and Bursa. Especially between 1980 and 1990, due to the liberal government policies, these migrations hit a peak.. (Süleyman Pampal, 2000) With these social changes and migrations in mind, many structures were constructed on unstable grounds without governmental restrictions and formal inspections as a co-op model with a very low quality, in order to house all the migrants to these metropolitan cities. The public improvement pardons allowed these architects to continue their dangerous constructions and the structures built in between 1980 and 1990 in specific parts of these cities carry a significant risk for earthquake durability and damage. Some of these structures are still standing and causing further worries regarding to their durability against a sstable earthquake. As it is inevitably shown in the image below, due to the frequency of the earthquakes occur in the various regons of Turkey, these unsteady structures would cause deaths of hundreds of people.

Figure 3.8 Earthquake and lithospheric plates. Distributions of earthquakes with magnitudes equal to or greater than 5.0 richter grade for the period of 1980-1990.

Within this second part of the decade, the use of cement in the construction was a rising start, therefore the structural strength increased dramatically for the building against earthquakes, thus the introduction of usage in steel in constructions was imminent. (Ozturan, 2001) Even this was only a improvement from the perivious state of the country's architectural earthquake durability criterias, it was still far from protecting as many people as possible from earthquakes.

3.2.3 1990-2000 Period

This period had been one of the most active time frames in earthquake happenings in Turkey. The following eartquakes had occured within the decade taking more than 100,000 lives. The table below gives the details of the earthquake happennings within this decade:

Location	**Date**	**Heavily Damaged Building**	**People Death**
Erzincan-Tunceli	**1992-03-13**	**6.702**	**653**
Dinar	**1995-10-01**	**4.909**	**94**
Çorum-Amasya	1996-08-14	707	
Çorum-Amasya	1996-08-14		
Antakya	1997-01-22		
Karlıova	1998-04-13	69	
Adana-Ceyhan	**1998-06-27**	**10.675**	
Kayseri	1998-12-14	45	
Gölcük-Kocaeli	**1999-08-17**	**66.441**	**17.408**
Gölcük-Kocaeli	1999-09-13		
Marmara Adası	1999-09-20		
Düzce-Bolu	**1999-11-12**	**15.389**	**845**

Table 3.1 : Earthquakes occured between 1990-2000 and deaths associated with them.

As the table above indicates, the 1990-2000 period (Period II) is one of the most catastrophic periods for earthquake damages in Turkey. More people died in this period due to natural disasters than any other historically. The major factor of this was the switch from wood structures to concrete and steel structures and the lack of quality of these particular buildings. Within the house itself, the most catastrophic eartquake of the west of Turkey in 1999 explains the factors taking lives the most.

Natural Council Research Department's report following the 1999 Marmara Earthquake, it is indicated that the need for a new earthquake policies through governmental agencies is imminent. Slum style housing, the forgiveness on illegal city formation and building must be reconsidered and not applied in following years. The occupations associated with the sectors dealing with designing, constructing and managing residential buildings shall be evaluated with certain criterias prior to be positioned within the sector. Chambers of architecture and construction shall have power to overturn and investigate these individuals that participate in the efforts of building and constructing.

According to the assessment done by Istanbul Technical University, all buildings including and also most importantly the schools, hospitals and government offices suggested to carry certain measures to be taken into an account in case of the possible natural disasters, such as earthquakes in accordance of city planning and emergency hotspots designed by the municipalities.

Explained that even a match that is being lit in order to create lighting in case of emergencies such as gas leakage could be deadly and all infrastructures including electricity and communication shall be redesigned considering the natural disasters. Also the need for sattelite style communication models in order to reduce the possibility of disturption during a natural disaster. Another important point that was described is the exit and emergency routes in any buildings, especially in governmental buildings designed to be considered all possible disaster theories and educate the residents regarding to these functions of the buildings.

3.2.4 2000-2013 Period

Even though the 14 years after the 1999 disaster, the same issues are being discussed and showing no improvements, due to the national memory infirmity and not learning the lessons from experienced natural disasters. Some of the regulatory changes proposed after 1999 are still in the national council being discussed and not become a policy, yet. On the other hand, there were 38 policies in both legislation and judiciary, 28 decrees, 6 regulations, 17 natifications and 9 memorandums have been published by the government following 1999 Earthquake. However, majority of these

are implied after the disasters and it does not have major role in preventing the damage.

In 2004, the housing structures in different earthquake areas are given in below table.

Earthquake Zones	total population	Total area (km²)	Total building	Carrier system				
				Frame	Masonry	Tunnel	Prefbricted	Unknown
Earthquake zone of I (Kocaeli, Sakarya, Bolu, Amasya, Tokat, Erzincan, Erzurum, Bursa, Manisa, İzmir, Aydın, Denizli, Isparta, Burdur, Hatay, Yalova, Düzce	13 207 434	149 865	2 142 402	1 183 623	939 695	1 856	9 234	3 994
Earthquake zone of II (Afyon, Tekirdağ, İstanbul, Bilecik, Çankırı, Çorum, Bingöl, Muş, Uşak, Van, Elazığ, Malatya, Karabük, Kahramanmaraş, Kars, Kayseri, Çanakkale, Muğla, Osmaniye, Bayburt, Ardahan, Bartın, Kırıkkale, Iğdır	15 695 580	370 091	2131 028	1 113 141	1 004 825	3 385	5 489	4 138
Earthquake zone of III (Edirne, Balıkesir, Batman, Kütahya, Eskişehir, Kırşehir, Yozgat, Tunceli, Adana, Bitlis, Siirt, Ağrı, Gümüşhane, Samsun, Kastamonu, Zonguldak, Şanlıurfa)	9 336 641	171 779	1 265 111	608 026	651 920	31	2 640	1 876
Earthquake zone of IV (Kırklareli, Antalya, Ankara, Nevşehir, Niğde, Sivas, İçel, Gaziantep, Adıyaman, Diyarbakır, Hakkari, Artvin, Rize, Trabzon, Giresun, Ordu, Sinop, Kilis)	12 916 045	182 537	1 686 137	712 206	964 689	1 097	4 525	3 620
Hazardous area (Konya, Mardin, Karaman, Aksaray, Şırnak)	2 525 566	63 937	484 458	94 337	388 206	8	722	1 172

Table 3.2 Population Affected by Eartquakes in different danger zones

"Deprem Bolgelerinde Yapilacak Binalar Hakkinda Yonetmelik" published in 6th of March,2006 was removed from regulation om 2007 and renamed and updated as "Deprem Bolgelerinde Yapilacak Binalar Hakkinda Yonetmelikte Yapilacak Degisiklik Yapilmasina Iliskin Yonetmelik". Further, the same regulation was updated numerous times between 2010 and 2013.

Regarding to earthquake, the regulatory charts used to determine the required engineering values and ratios were vaguely used and mixed up with more rural environments. Therefore one of the biggest challenge after 1999 earthquake was to identify which building was investigated with which criterias.Respectingly

associated ministeries determined that "...majority of the structure stock in Turkey was not constructed fully on consideration with science and art. The biggest indication of this is the results of the previous earthquakes and other natural disasters. That is why it is inevitable to indicate that majority of the structures in Turkey are not safe against natural disasters."

However, when it comes to considered a to-do list, the Ministry of Environment and City Planning makes distinguished mistakes in their 2010-2014 "Strategical Management Project Progress Report". Even though it points out the need for structured engineerical buildings, the next passage indicates that there is no enough human or monetary resource to accomplish this. Therefore it requires an alternative solution, rather than pointing out what the solutions should be. The regulation published on March 2007 regarding to Earthquake Regulation put related restrictions. In Turkey, the $3 Billion worth building renovation is required, and this alone proves the needs for urgent measures to be taken into an account.

3.2.5 Earthquake Durability Factors to be Investigated

When evaluating the durability of a structure against a natural disaster such as earthquake, four major elements shall be investigated in order to comprehend the capacity of structural strength and effectiveness of the earthquake damage prevention efforts; material, flooring ground, structure and the post-earthquake facilitation. The materials shall be seperated in two sub sections such as structure parts and structure details. Flooring ground shall be investigated by looking at the type of the flooring as well as the ground formation. The structure itself shall be investigated through the form of the structures and the support systems of the structures. Last but not least, the post-earthquake facilitation shall be investigated by looking at transportation ease and the hot spot meeting spaces for the residents.

3.3 Periodical Accessibility Analysis

The other element of quality of life is to provide the equal opportunities and living conditions for everyone within a structure. The accessibility is one of the most important aspect of living for the disabled individuals and their lloved ones. The rule to provide equality to disabled individuals is one of the biggest requirement to be

modern civilization. Acconrding to accomplish this, the local governments and architectural parties shall take full responsibility.

Figure 3.10 Disability

According to the 2002 National Statistical Institution Disability Research, approximately 12.29% of the population consist of disabled individuals. (Turk Istatistik Kurumu, 2010)

3.3.1 International Steps Taken Towards Accessibility Durability Measures

Selwyn Goldsmith, author of Designing for the Disabled (1963), who really pioneered the concept of free access for disabled people internationally. Therefore the efforts and regulatory end of accesibility were not present up until early 80's.

Article 13 of the E.U. Treaties provides the legal basis for Community action 'to combat discrimination based on sex, racial or ethnic origin, religion or belief, disability, age or sexual orientation' (8). Directive 2000/78/EC addresses non-discrimination in employment and occupation (9) and the Commission proposal from 2 July 2008 when adopted will extend the protection against discrimi nation on the basis of religion or belief, disability, age or sexual orientation outside the field of work in particular in social protection, including social security and healthcare, social benefits, education and access to goods and services including housing. (Comission, 2009)

3.3.2 1980-1990 Period

In the 1980s, the economic fluctuations in term of economic crises of disadvantaged segments of society, together with the Union for the development of policies that were formed due to the level of your negativity. This new approach not as a passive and helpless disabled individuals have equal rights with other individuals and in society in accordance with these rights as active citizens who are struggling to integrate with the community. Basis of this approach, the social and economic processes, all the people will be configured into a life of human dignity that individuals with continuity leads to production.

The European Union member countries until the 1990s, with related policies in the case of a non-binding documents have remained mostly base. Disability policies at first, and then replace the social model with a medical approach to benimsenmekle. As a result of this transformation is disabled individuals, benefits and equal rights equal to other individuals that comprise society treated as individuals, has been embraced.

In parallel with the global changes, including all of the policies related to the policy areas of the handicapped individuals EU policies has become one of the main focus of the Amsterdam Treaty 13, strengthening the rights of the disabled, along with the acceptance of the European level has gained speed. Create policies for disabled individuals in order to determine the main hatlarıno prepared several framework document. This understanding first showed that the EU Disability Strategy document in 1996, the Employment Strategy and the directive on Equal Treatment and equal opportunities. Then, through the integration of disabled individuals in the labour market aimed at preventing Member States marginitation cope has been the adoption of the European social inclusion Strategy that will help them.

3.3.3 1990-2000 Period

In this period within Turkey, the general concept of house described by the Public Works Law (PWL) and regulations was not acceptable. According to the PWL 39th amendment, the minimum dimensions of the described house was not enough for the specific group of people.

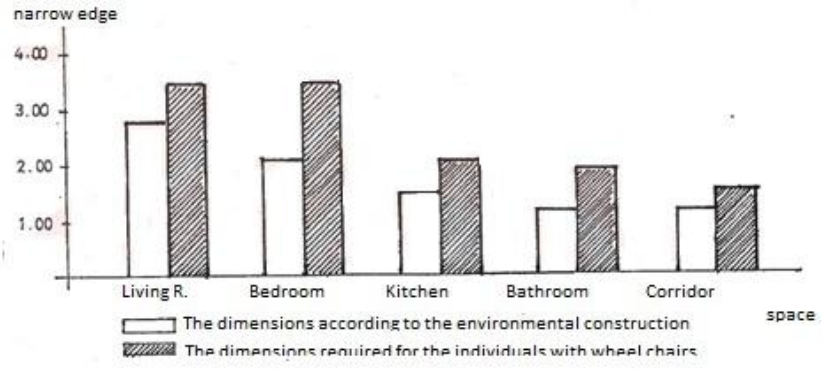


Table 3.3: The required dimensions for people with dissability (black) vs dimensions given as minimum by the PWL.

	The dimensions required by the contractual regulations		The dimensions required for whell chaired individuals	
	minumun size	area	area	narrow edge
Living room	2.80x4.00	11m²	20m²	3.50
Bedroom	2.10x2.80	6m²	15m²	3.50
Kitchen	1.50x2.00	3m²	6m²	2.00
Bathroom	1.20x2.00	2.4m²	4.5m²	1.80
Corridor	1.20x1.00	1.2m²	3m²	1.40

Table 3.4: Dimensions required and given by law depending on the parts of the house

The new law passed in December 3rd 1996, as an upgrade on the law passed in 1991 states that if a building may contain a resident that will need to use wheelchair in order to access their unit, the whole building must be designed and constructed that person(s) in mind. This regulation made major changes in the design and construction portion of the conceptualizing a house, changing the widths of the corridors, doors, entrances and so forth.

The second regulatory publication regarding to the accessibility in this time frame is signed in 1998 by the Housing Development Administration called “Second Collective Housing Framework” indicated that each apartment shall reserve 2% of the residential units to people with disabilities and therefore the design phase must be altered accordingly. This was the first time, there was a regulatory enforcement towards accessible architectural design in Turkey.

3.3.4 2000-2013 Period

Considering the periods analyzed, this period takes the most amount of advancements through both European Union and the national government involvements. The first and only survey carried out nationally is the “Turkish Disability Survey (2002).” Then, The 2010 published European Union Support of the Implementation of the European Disability Strategy 2010-2020 encourages for the incorporation of accessibility and universal design in educational curricula and training for all relevant professions and occupations, in particular in the fields of engineering and architecture; putting requirements during education and active duty in field. (Union, 2012)

Part of the improvements occured in this period is due to the recognition of the percentage of disabled individuals in the nation and their requirements for equal living opportunity.

E-Accessibility "-Improving access to information-based Society for disabled Individuals (4 February 2000) notification was posted. The European Employment Strategy and the employment of disabled people in the e-Europe initiative, see this message that supports outlines and information society controlled manufacturers to develop user friendly tools is required. Access information for disabled citizens in Europe about other European citizens have equal rights. Failure to provide appropriate information for disabled people's access to information in many formats. Commission to include more in terms of number of people access to information and reduce the cost of access to Internet information. Thus, in this way, the information provided will allow the disabled to access information in formats suitable for the handicapped, and easier. However, in the documents on the Internet alone does not guarantee accessibility. Language and in terms of access to the documents which are written with the operating system. To be effective, holistic communication thus curtailing the diversification of differences should be taken into consideration.

The Disabled and Elderly Affairs Directorate General under the Ministry of Family and Social Policies, which was established in June 2011. Before that the

Administration for Persons with Disabilities affiliated with the Prime Ministry coordinated disability policy at the national level.

Today, in architectural designs, the architects and constructors must follow the TS 9111 Regulations regarding to accessibility. Entrance, usage of the facilities and the evacuation shall be made simple and easy for all the residents, whether or not with disabilities. The moajor concepts in achieving accessibility in buildings that are in this regulation are given below:

- Parking facilities closer to building entrance
- Path to reach directly to the entrance
- Shorter distances
- Entrances and exits without stairs
- Paths without stairs in each level of the building
- Ease of access to information booth, elevators and disabled bathrooms
- Recognizable exit routes without stairs during an emergency evacuation
- Emergency elevators
- Non-slippery walking paths
- Ease of entering for a door and reach out to the door.
- Enough maneveur space
- Height of control buttons and key entrances
- Good ellucidation
- Good signage
- Information provided to be recognized with at least two senses (touchable, hearable, or seeable)
- Good acustic

In multi story residential buildings, there are parts of structure that disabled individuals needs to use in order to accomodate their needs and get in and out of their houses. This paper specifies that as entrance, ramps, elevator and parking structures.

Entrances:

Area of the entrance, lighting and security equipment is important for the disabled users. The entrance of the structures must be covered and protected from

rain. In front of the entrance door, there ought to be at least 92 cm space for disabled person to maneuver, close up and open the door. (TS 9111)

With the automated lighting options, the lighting of the staircases and hallways can be managed to used without reaching a button on the wall. Especially for disabled individuals, the search and reach for a button creates one of the biggestv challenges in the part of the structure.

Especially for disabled individuals to reach out to their apartments, the widths of the corridoors are as important. The corridoors should not be narrower than 180 cm in order for disabled person to manuever. If there are passages that the doors open inwards, then this width can be dropped down as much as 150 cm. (Mutluer,1997,s:210)

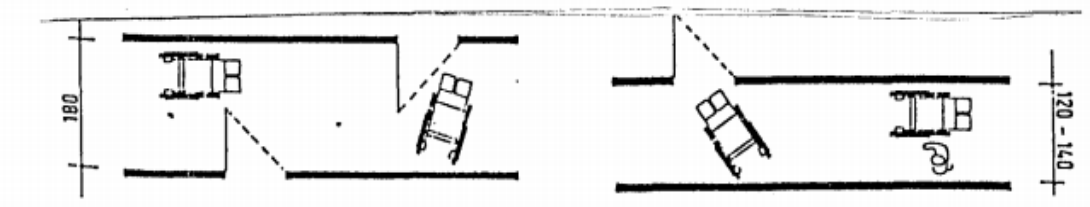


Figure 3.13 Corridors within the building

Ramps:

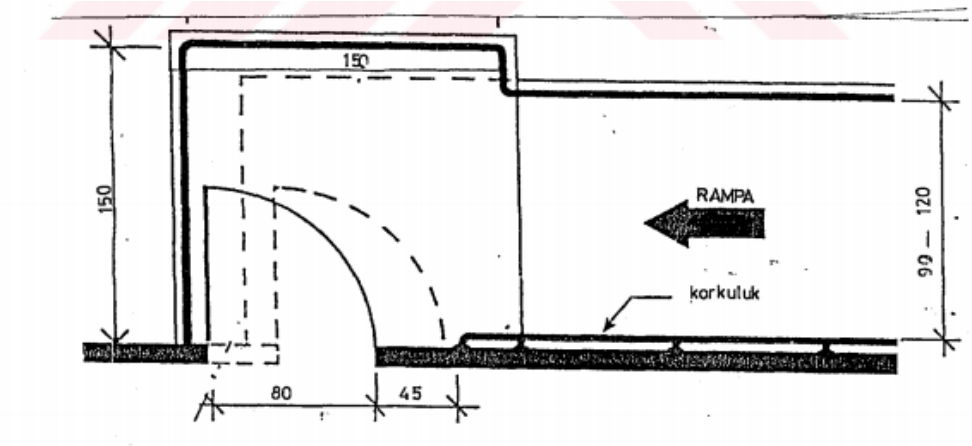


Figure 3.14 Slope and Width of Ramps

The stairs in front of the entrances causes issues for disabled individuals. In order for disabled individuals to bypass the stairs, the ramps should be utilized. The slope of these ramps shall be between 5% and 8% in order to allow transportation with ease. (TS 9111) Besides the slope of the ramps, the width and the stairhead that leads to are very important. The minimum width should be approximately 120cm.

(mutluer,1997,s:201) The stairhead area not less than 150cm by 150 cm is necessary in order for the person to maneuver after the ramp.

Elevators:

Main connection between floors in multi story residential building is the elevators. If the residance of the disabled individuals happen to be in the upper floors, they would need to use the elevators as well. Therefore, the design and structure of the elevators shall be done accordingly. The railing in the cabin shall not be higher than 90cm from the floor.The minimum acceptable size of an existing elevator cab, allowing for a single wheelchair passenger, is 0.95 m x 1.25 m.For ease of reach, the control panel should be mounted 0.90 m to 1.20 m from the floor. The door opening should not be less than 0.80 m. Control buttons should be in an accessible location and illuminated. Their diameter should be no smaller than 20 mm. (Mutluer,1997,s:192)

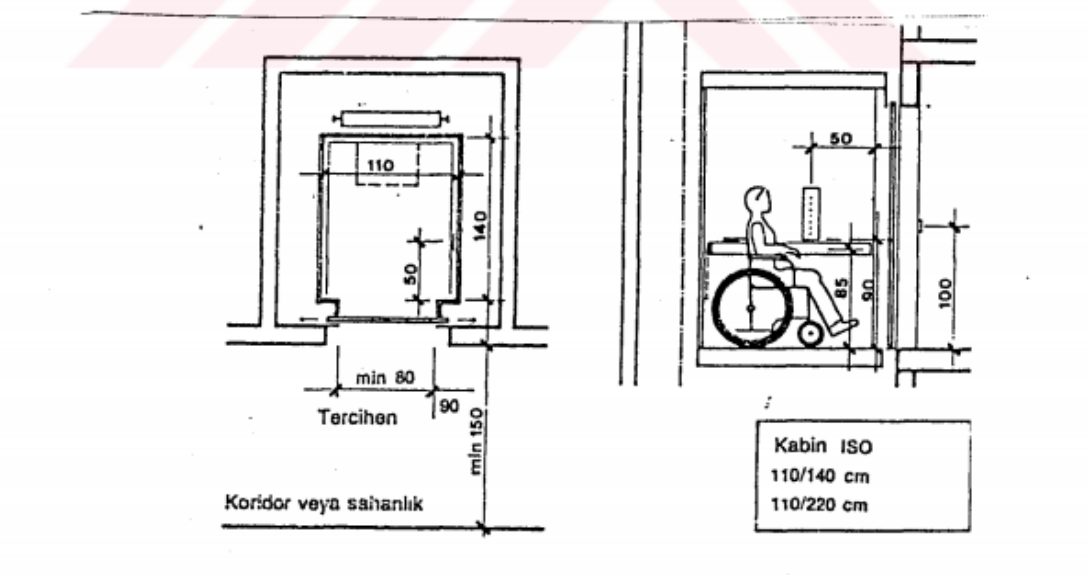
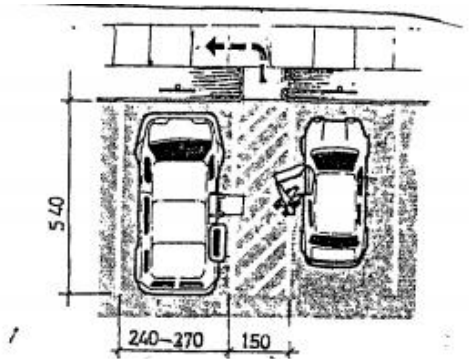


Figure 3.15 Elevator cabin dimentions



Parking Structures:

Figure 3.16 Use of entrance corridor for two disa

Majority of the cars that disabled individuals operate are hand driven vehicles. In order to obtain a vehicle in this statue, one would need a disabled driver's license. For these individuals, the disabled parking arrangements must be made to accomodate their needs. The approximate area required for a disabled person to park shall be 350cm by 500cm. (renhold, 1991) Istanbul Parking Regulations requires structures to maintain 1 in 20 (5%) disabled parking spaces whilst it is required 2% by the national regulations. (TS 12576) According to the research done by Leeds University, orthopedically disabled individual would go as far as 60 to 70 meters without taking any break. Therefore, the distance between parking spots and the building entrance shall not pass this distance.

3.4.5 Accessibility Factors to be Investigated

The accessbility showed a rapid increase through the last two decades and in order to track the progress, certain aspects must be evaluated. The most appropriate factors for this paper are parking spaces, ramps, entrances, and elavators. The parking spaces are scrutinized by looking at distance of the parking spaces to the entrances, percentage of the reserves disabled parking spaces, and the vehicle parking lot as a whole. The ramps shall be evaluated considering the minimum width of the ramps, the maximum slope of the ramps, stairhead availability of the ramps, and the height of the ramp railing. Entrances shall be examined through the minimim width of the entrances, minimum stairhead measurements at the entrances, automated lighting, and height of the door handle from the ground. Last but not least, in order to investigate asseccibility factors in this paper, elevators shall be look into through minimum measurements required for accessible elevators, minimum automated door spaces available in elevators, and cabin rail height from the flooring.

3.5 **Section Summary**

This section went over the probable changes and advancements in accessbility, sustainability and earthquake durability in their respected time frames. The section looks into the published articles, laws and regulations that affect on the development of structures in their own style and type. This section prepares the factos to be investigated throughout the case studies and creates the infrastructure of

proving the ongoing improvements in sustainability, accessibility and earthquake durability.

According to the findings of this section, it is found that there was little to no accessible advancements between 1980-1990, considering even the international progress, Turkey did not have many regulations and requirements that enhance the lives of disabled individuals. For the next decade, the awareness of disability access has increased subtantially with the international involvements of the country. Second Collective Housing Framework published in 1998 indicated requirement occupany availability for disabled individuals first time in Turkish history. However, the hosuing built in the last decade has been improving in the concepts of accessibility, offering much more comfort for the individuals with wheel chair

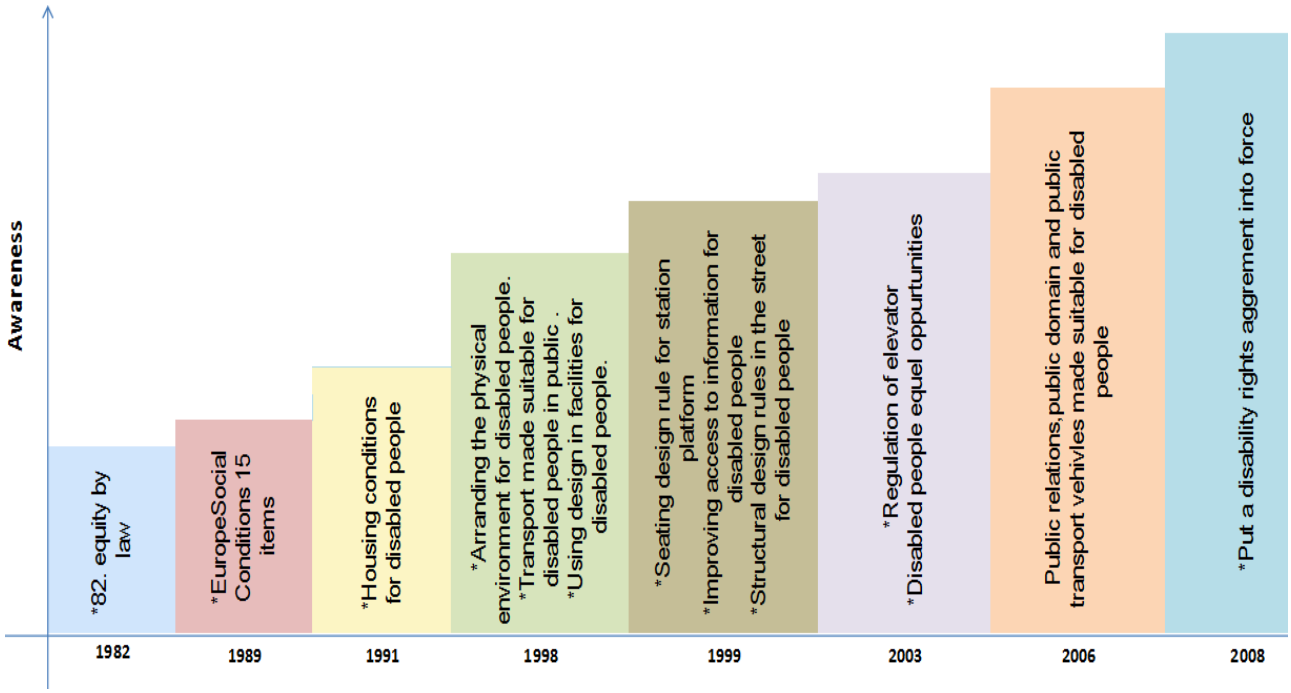


Table 3.6 Development for people with disabilities by year chart

The same sort of increase is witnessed in earthquake durability research, where the amount of awareness towards the dangers of earthquake in underprepared structures gained importance over the recent years.In period I, Turkey showed almost no regulatory body for the earthquake durability quality management. Therefore many structures built in this era has been suspecable to earthquake damage. Within the period II, Turkey slowly got involved in international actions and started to pass laws accoring to certain criterias of materials being used in building in specifi parts of the country.Moreover, especially after 1999 Marmara Earthquake, the amount of

regulatory laws and perception of individuals' expectancy on earthquake durability of the buildings have increase rapidly reached its highest level in history. Even then, due to the lack of funding and the governmental involvement, the efforts are coming short and metropolitan cities like Istanbul and Izmir is still in the danger zone when you investigate the housing that were built within last 3 decades. The table below shows that since 1998, there are more and more regulations towards constructing a earthquake durable structures.

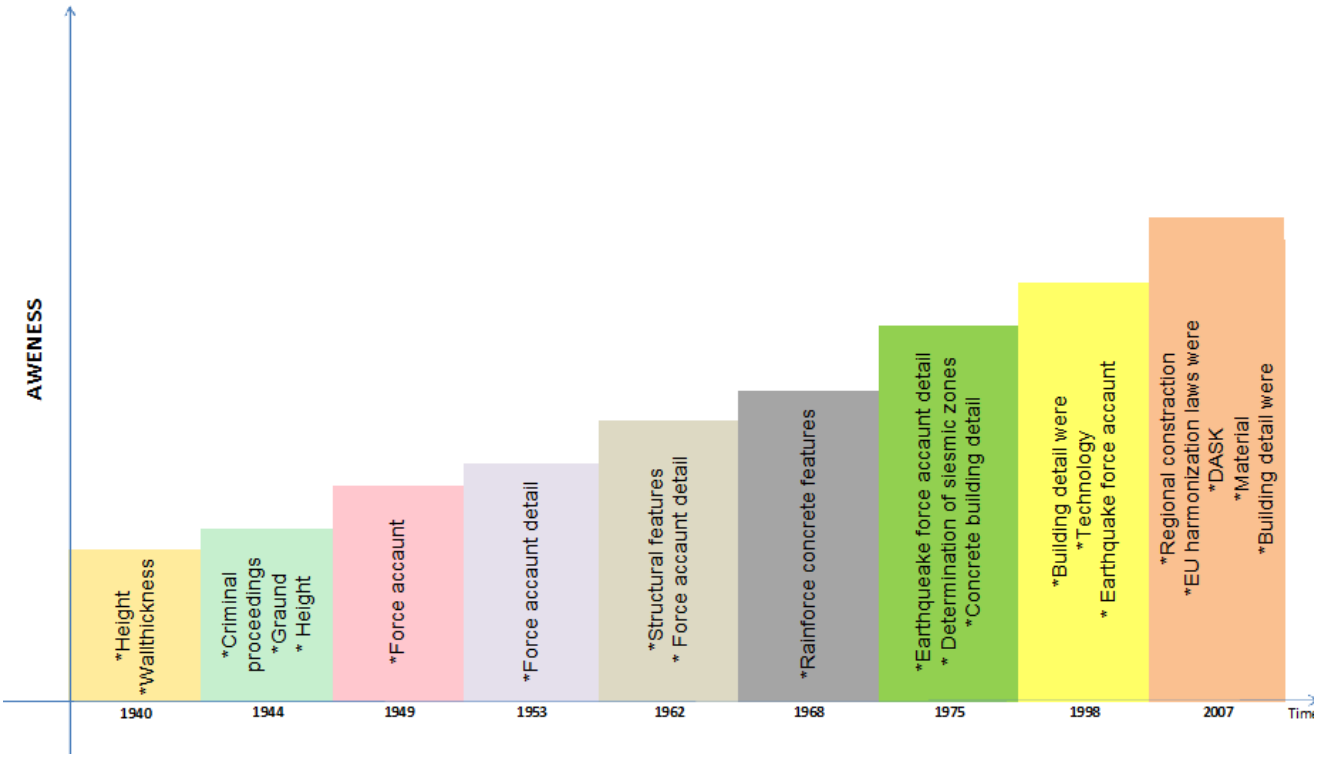


Table 3.7 Development of earrthquake regulationsby year chart

Sustainability became a concept for international venue and for Turkey it became a realistic idealogy by the beginning of 21st century. Till then, the efforts of sustainaibility in Turkey involved in increasing the quality of living, not concerining much about the future of the living itself. However with the beginning of 21st century, after participating and redesignings its conceptual sustainability analysis for the international conferences, Turkey has developed a system of regulatory bodies for respected to type of structures, in order to provide a sustainable buildings and preserving as much natural resources As possible. Considering the country imports many of its natura resource needs, the sustainability does seem to effect national

economy as well as the environment. The table below explains the awareness factors introduced to the concept of sustqainability over the studied time period.

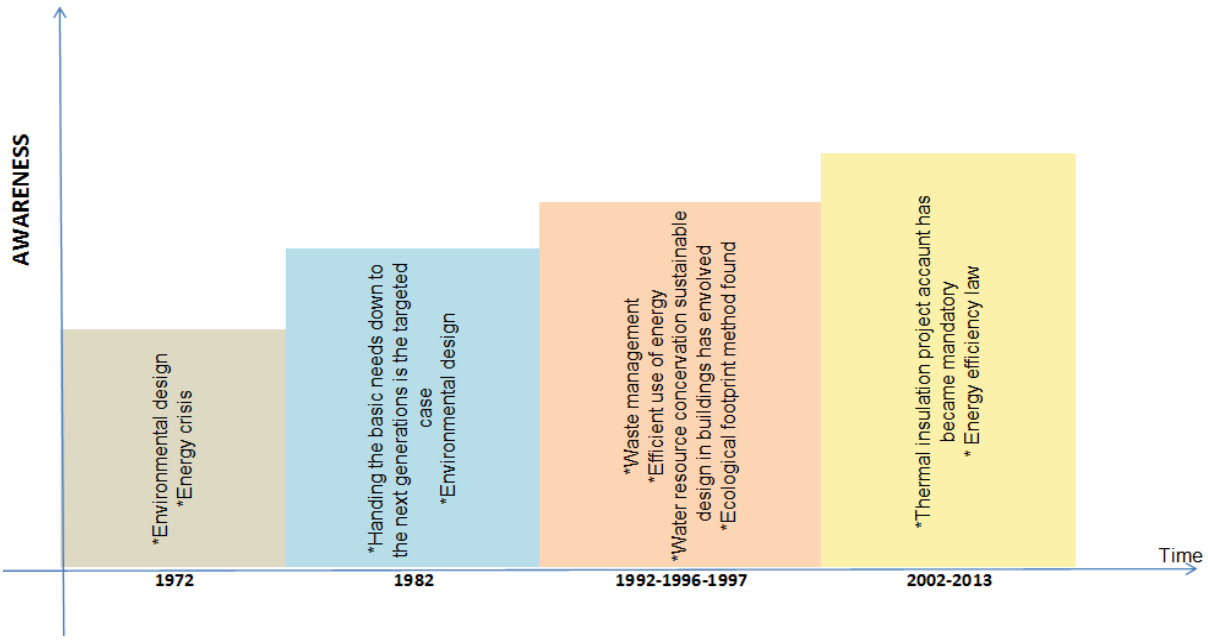


Table 3.8 Development of sustainability by year chart

	ACCESSIBILITY CRITERIAS	SUSTAINABILITY CRITERIAS	EARTHQUAKE DURABILITY FACTORS
I.	*PARKING STRUCTURE* Distance of Disabled Parking Disabled Parking Percentage Total parking facilities	*EFFICIENT USE OF ENERGY* Smart Building Automation Natural Lighting Energy Efficient Material Usage Isolation	*MATERIALS* Structure Parts Structure Details
II.	*RAMPS* Minimum Width Maximum Slope Stairhead Availability Height of the Ramp Railing	*EFFICIENT USE OF WATER* Use of Water Efficient Apparatus Reduction of Water Usage Water Landscaping Applications Recycling and Reuse of Water Sources	*GROUND* Flooring Formation
III.	*ENTRANCES* Entrance Stairhead Minimum Stairhead Dimensions Automated Lighting Height of the Door Knob	*EFFICIENT USE OF MATERIAL* Local Material Preference Material Efficient Design	*STRUCTURE* From of Structure Support Systems
IV.	*ELEVATORS* Dimensions of the Cabin Minimum door width Minimum railing height	*WASTE MANAGEMENT* Waste Center for Recyclable Materials Recyclable Material Usage	*POST EARTHQUAKE* Meeting Area Transportation for Search & Rescue

Table – : Case Study Analyze Factors to Evaluate Buildings in Necessary Aspects

4 CASE STUDIES ON THE SUSTAINABILITY, DISABILITY ACCESS, AND EARTHQUAKES PREVENTION DESIGNS OF MULTI-STORY RESIDENTIAL BUILDINGS

This section of the thesis represents the peculiar part of the work as a whole, elaborating multi-story residential buildings (13-25 stories) examples chosen by the author, inveastigating the factors affecting on the improvements on sustainability, earthquake durability and disabled accessibility iwth their respected time periods. The case study properties have been chosen within the cities of Istanbul and Izmir, each property representing their associated time frame and showing the signs of the progress of said factors. The information has been sustained by visiting the premises personally, acquiring the architectural plan from the ministeries and opinions of property management and personnel.

4.1.1 Perıod 1(1980-1990) Era: Ataköy 9.-10. Etap Konutları

Atakoy9-10. Etap Konutlari is built in 1985 by Turkiye Emlak Bankasi A.S. in Atakoy vicinity of Istanbul. It consists of 19 stories and it was designed to be built mainly by concrete structures.

Figure 4.1 Etap Konutlari View From Yard.

4.1.1.1Sustainability

Atakoy uses central heating systems in order to distirubute heating energy for each unit. The building still uses the initial heating system installed during construction. There is no technological energy preserving tools used in heating, therefore units are not energy efficient in heating. Considering that there is no thermometer system being part of the unit heating fixtures, every unit pays for the heating equally.

Figure 4.2 Heating Fixtures at Ataköy Etap Konutlari

As AC system, the building is not equipped with any central cooling or ventilation system. The outside units has been witnessed from outside of the building randomly at in use units. This indicates that the building is not energy efficient in its cooling and ventilation systems. Considering that the ACs are chosen by the residents, it is unknown if the A+ energy efficient fixtures has been cho sen.

Figure 4.3 Outside AC units at Ataköy Etap Konutlari

Atakoy Etap Konutlari has no types of outdoor isolation that are in today's standards. Moreover the property manager indicated that there is no plans for installing at the moment. There is no automated system active for heat preservation or energy efficiency. Being in use.

Figure 4.4 Hall view of Etap Konutlari

The building uses switch style lighting systems in the corridors and stairs.There is no photocelled lighting fixtures in use. There are quite a few number of spot light bulbs in use, which uses high levels of energy and should not be used in apartment lighting.

Figure 4.5 Common Apartment Lighting at Etap Konutlari

All utility fixtures such as dishwasher and washing machines were not installed during construction and were chosen by preference by tennants. Therefore it is unknown the amount of efficiency existing in the building in energy usage; it is inavitable to accept it as the building is lacking energy efficiency in units.

There is no water waste control system existing in the building. Majority unit owners installed their own foccet, shower and stall in their in their unit depending on their preferences. The originally installed fixtures are the most basic ones even available that the time of install. Therefore it si noted that an improvement in necessary for the control of waste water.

Figure 4.6 Foccets and showers installed in Etap Konutlari

There is no rain water reservation available in the premises. The watering is done through the hoses available in the garden at the times assigned by the property management. It is noted that there is a significant water waste exist in the current system.

Figure 4.7 Garden View of Etap Konutlari

Mainly local materials used in the construction of Etap Konutlari. The ceramics used in stairs and units, hardwood flooring, and door fixtures have been supplied locally. The local products have been preferred because of being const efficetive not because of their efficiancy.

Figure 4.8 Stairs and Hardwood Floors at Etap Konutlari

Some flooring was done using traverten stones from 1980's. Afyon marble was used in stairs, wood was used for stair railings. The PVC material was used in windows and it is indicated that the materials for windows were not chosen locally. The conuntertops are also witnessed to be made of local marble.

Figure 4.9 Different Kitchen Fixtures in Etap Konutlari

There is no indicated waste management available in premises. The recycling was not a common case in 1980's and no further action has been taken towards it. There is no designated area for waste. The residents know the garbage collection times daily and bring their own waste to the asigned garbage bags outside of the premises. There is no food disposal available in units.

Figure 4.10 Available Garbage Containers Outside of Etap Konutlari

4.1.1.2Earthquake

Etap Konutlari resides in Atakoy, Istanbul, area accepted as high eartquake risk portion of the city. Geologically, Bakirkoy-Atakoy is classified as young ground; therefore the the foundation of the constructions are expected to be a specific level. The 66% of the houses available in Bakirkoy is existing upon an old stream bed. The buildings existing on stream beds are known for being weak towards carriage and stress towards earthquake activities. Considering that majority of the buildings in the neighborhood is built prior to 99 eartquake, and were not inspected through newer regulations during construction.

According to the shocking report published by Istanbul Technical University and Istanbul University, 35% of the buildings in the area are in high risk, while 23% lies in low risk parts of the city. The report further indicates that 6,000 buildings including schools, hospitals and general publish premises ought to be demolished and rebuilt if necessary. Considering the facts about vicinity, it is indicated that the building resides in high risk area and

Figure 4.11 View of Stories from Outside at Etap Konutlari

It is indicated that the building was designed to be symetrical, the occupancy level considering the weight distribution of the building is to be proportioned accordingly. There was an inpection done in 1980's sanctioned by Emlak Bankasi A.S but no further inspection has been done since then.

There is no available work done towards exiting and emergency meeting are or planning. The building is on a dead end street, desceasing the transportation options in case of emergency search and rescue need.

4.1.1.3Design for Disabilities

When investigating at Etap Konutlari, it was noted that there was no recognition of disabled ramps in the premises. This creates huge complications for the disabled individuals visiting or residing at the building. On the other hand, the space between stairs and door was found to be more than enough for any maneuveur of the individuals with wheel chairs. Thus, the lack of existing ramp creates the biggest complication. Furthermore, the railing height was not considered since there is no ramp existing.

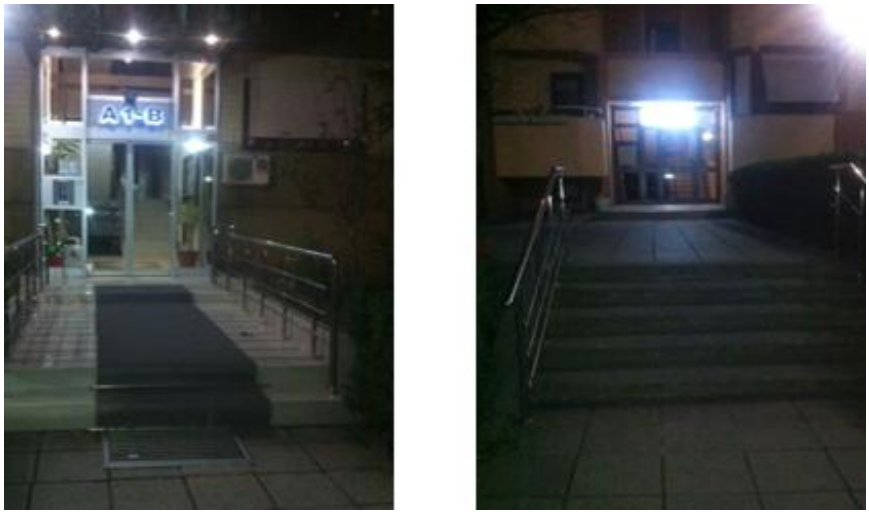


Figure 4.12 Building Entrances at Etap Konutlari

It is indicated that the building structure is not compatible with disabled living requirements. The door has been replaced with automated door functionality. The lighting is manual, able to turn up with a switch.

Figure 4.13 Lighting Switches at Etap Konutlari

Ataköy Etap Konutlari, there is only one elevator existing in each building. The dimensions of the elevators are 110 cm by 130 cm, which are below the required specifications for disabled elevator dimensions. Therefore this creates big issues for disability living experience.

Figure 4.14 Elevators at Etap Konutlari

Considering that the elevators had been upgraded, the railing height within the elevator is 90 cm, which is acceptable, nonetheless.

There is existing reservation done for disabled parking. So it can be a difficult ride from the area where car is parked to the entrance of the buildings. This is a big complication for individuals with disabilities.

Figure 4.15 Image From Parking Lot of Etap Konutlari

4.1.2 Period I (1980-1990) Era: Mert Kule

Mertkule Apartments was built in 1982 by Mert Insaat in Istanbul. There were 23 stories in the building. The building was constructed with concrete

reinforcements.

Figure 4.16 View From Outside of Mert Kule

4.1.2.1 Sustainability

Mert Kule Building is equipped with central heating center that distributes the same amount of heating to all units. There has not been any upgrades and the building still uses the system. There could not be any equipment creating energy efficiency for heat was found.

Figure 4.17 Heating Control Room at Mert Kule

When investigating the Heating Control Room, all the equipment used for heat distribution was found be dated back to 1980-1990 era.

Figure 4.18 Unit Heating Equipment at Mert Kule

The AC amd ventilation systems have been used randomly by the tennants, even though there is no central planning or infrastructure existing. The outside units of AC equipments have been spoted randomly out of windows. Since the equipment was purchased by the tennant depending on their preferences, the energy efficiency is no existing in the building.

Figure 4.19 Outside AC units at Mert Kule

There is no heat isolation on the building and according to the property manager Merih Ruacan, there is no such expectations existing for an upgrade. The windows are use for natural lighting in every single room in the building allowing ventilation also to be done through windows. There is no evidence of technology that automates the AC and ventilation in the building.

Figure 4.20 Natural Lighting at Mert Kule

The lighting in the building carries the glimpses of the era. There are still light switches and there is no work towards automation. Incandecents bulbs are in use, which uses high levels of energy.

Figure 4.21 Lighting Equipment and Bulb at Mert Kule

The kitchen fixtures such as refrigirator, oven, stove and diswasher is installed by the resident, therefore there is no common energy preservation is existed in the building.

There is no systematic water waste management and the fixtures appear to carry the glimpses of 1980-1990 era. Property manager indicated that many residents are still using the initially installed foccets, shower systems, and toilet seats.

Figure 4.22 Shower Heading in the Batroom at Mert Kule

The leakage is evident in the building at foccet joints and the waste of water is creating an insufficient environment. It is inevitable to conclude that the fixutres needs upgrading in order to be caught up by todays standards. There is no central watering for the garden in premises. The garden is watered by the gardener. There is no existing preperation and work towards automated garden watering. There is no efficiancy existing at Mert Kule.

Figure 4.23 Garden Space at Mert Kule

There are local materials used in the construction phase. The non local materials such as PVC windows and the wood used in door gates are imported from a different region. The ceramics and stones used throughout the building and it is indicated that the apartment is sustainable in material usage.

Figure 4.24 The Materials Used at Mert Kule

There is not use of recycled materials in the building; furthermore there is no ongoing work regarding to the recycled product usage in the facilities.

The only waste recycling system existing is garbage container outside; no existing indoor recycle or garbage room is found. There is no seperation of waste and recyclable materials. The garbage is collected by the municipality at the specific times of the day and the residents are obligated to take out their trash. There is no existing food disposals installed in the units.

Figure 4.25 Waste Containers on the street at Mert Kule

4.1.2.2 Eartquake

Mert Kule apartment is located in Caddebostan Neighborhood of Istanbul. Caddebostan in considered to be in low earthquake risk zone. The base is consists of undisturbed rock and thick sediment layers. The project of the building is compatible with the ground stability requirements. However the building was constructed using 325 degree concrete while in today's standards required C30-C35 level concrete.

The building strcutures symetrically, the occupancy levels are also in allowed levels considering weight distribution. The building was not investigated during the consturction but the building was inspected by a third party company after 1999 earthquake.

There is no area specified in the architectural plans regarding to any emergency exists and serach and rescue efforts. The building is located in a central location and the transportation options varries and would bring many alternatives for search and rescue teams.

4.1.2.3 Design for Disabilities

When inspecting Mert Kule, it is indicated that the building is not equipped well for movement of the individuals with wheel chairs. The ramp was not existed in the original design but added later on to the premises. The open area between the ramp and the door is to be limited for an individual with wheel chair to move and monueveur. Though, the entrance measured to the compatible with disability standards.

Figure 4.28 Entrance of Mert Kule

The spinning door at the entrance creates difficulty for disabled transportation. The slope of the ramp was found to be much higher than the stardard levels but the width of the ramp measured to be acceptable. The railing height was acceptable with today's standards considering it was added recently to the ramp.

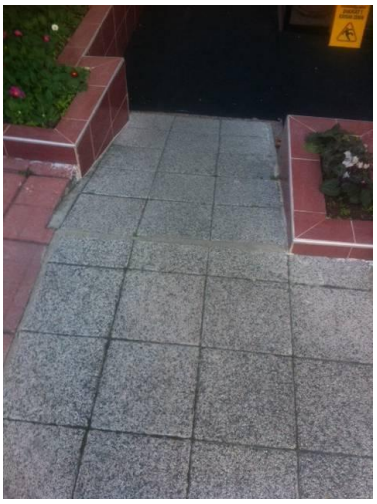


Figure 4.29 Slope at the Entrance of Mert Kule

After entering the building it is visable to conclude that their is no automated lighting is available for disabled individuals and they have to find and reach to the switches to turn on the lights. But the switches found to he in acceptable height for the individuals with wheel chair.

Figure 4.30 Swithes at the Entrance of Mert Kule

There is only one elevator in operation at Mert Kule. The dimesions of the cabin is 150 cm by 130 cm, which are below the required dimensions for wheeled individuals. It is indicated that the doors open manually and this creates difficulties for individuals with wheel chairs.

Figure 4.31 Elevators at Mert Kule

The elevators have been replaced and therefore the railing heights are not in expected height, 90 cm. The doors of the elevators are automated, which also eases disabled individuals travel experience within the building.

Figure 4.32 Elevator Inside View at Mert Kule

It is indicated that there is no available reserved parking spaces for individuals with disabilities. The parking structure is outside and there is no planning work towards creating designated spaces.

Figure 4.33 Outside Parking Structure at Mert Kule

There is not enough parkin g space for individuals with disabilities; according to TS 12576 regulations, the 2% allowance has not been met.

4.1.3 Period I (1980-1990) Era: Atakent Bostanli

Bostanli Atakent is constructed in 1988 by Emlak Bank A.S. in Izmir. The building consists of 13 stories. The building was constrcuted with concrete supporting systems.

Figure 4.34 Bostanli Atakent Building View

4.1.3.1 Sustainability

There is a central heating system available at the building. The type of fuel uesd on premises are coal. There is no available technological equipment to measure energy efficiency.

Figure 4.35 Heating Fixtures at Atakent Bostanli

Since the AC cooling and ventilation systems were not installed during constrcution and since then, there has not been any improvement done. The units that carries cooling systems were located randomly outside of the units. Since the equipment was chosen by the tennants, the energy efficiancy was not concluded.

Figure 4.36 View from Outside of Atakent Bostanli

Since the building was constructed in ‘90’s, there has been no indication towards any existing isolation. There is window existing in every single room in the building, therefore the air circulation can be achieved manually. Though, there is no available automated air conditioning and/or ventilation existing.

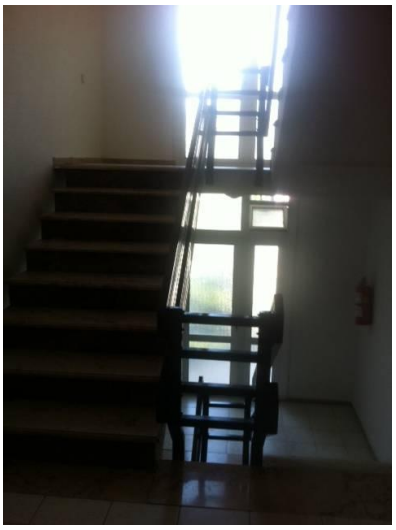


Figure 4.37 Windows at the Stairs in Atakent Bostanli

There is no energy efficiency in lighting of the building; there are quite a few LED lighting bulbs in use as well as florecent lighting. There is no photocell centered lighting, therefore there is no energy savings system are in use.

Figure 4.38 LED Lighting at Atakent Bostanli

There is no fixture use for water waste reduction. The old style flushing systems were found in the premises, as well as old style foccets.

Figure 4.39 Bathroom Fixtures at Atakent Bostanli

There is no work done towards preserving rain water for usage. The garden watering is done through the hose available at the garden. The gardener does the watering and hence there is an ongoing water waste in the process.

Figure 4.40 Garden at Atakent Bostanli

The local materials have been chosen in the processes and same materials are mainly in use right now. The ceramics were used in stairs and bathrooms and wood flooring was used in units.

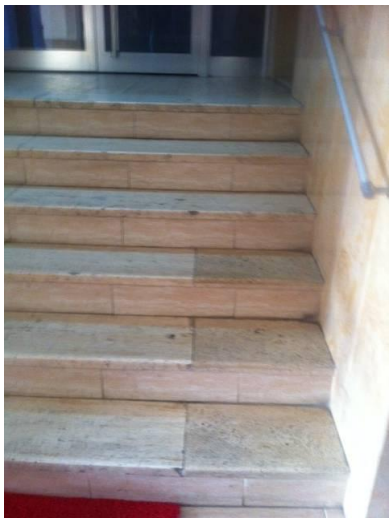


Figure 4.41 Marble Stairs at Atakent Bostanli

At the premises, there is no work has been done towards waste management. The garbage has been collected daily by the municipality garbage trucks by the designated times each day. There is no seperation of the waste as well as food disposal in units are not existing.

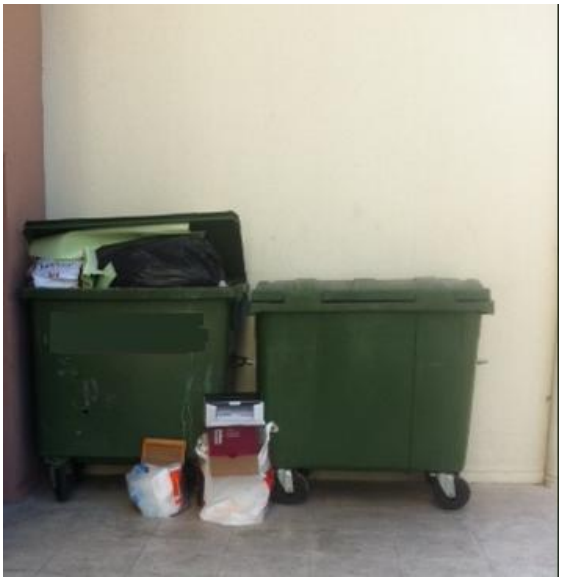


Figure 4.42 The Waste Containers

4.1.3.2 Earthquake Durability

Atakent Bostanli was located in Bostanli vicinity of Istanbul. The ground is suspected to be weak towards sysmic vibration. Majority of the buildings in the

region was not suspected any regulatory inspections after 1999 Earthquake. The ground sliding has been witnessed in the neighborhood.

There is no indication whether the ground situation has been considered during the construction. The building though is partially symetric and there is evenly weight distribution. The building has not been damaged during 1999 Earthquake.

Figure 4.43 Symetric Design of the Building at Atakent Bostanli

There is no arranged meeting point and search and rescue teams effectively put in use. The additional roads have not been designed for ease of transportation. But the building is located centrally and the transportation seems to be simple.

4.1.3.3 Disabled Accesibility

When looking at Atakent Bostanli, there is no existing ramping available at the building. There is a small ramp available off site from the door but even that one lacks the dimensional requirements.

Figure 4.44 Entrance and the ramp on site at Atakent Bostanli

It is indicated that the entering and exiting the building for individuals with wheel chairs is complicated. The entrance doors at the building is not automated therefore complicates it further. On top of that, the lighting is not automated, hence complicates the process for disability access.

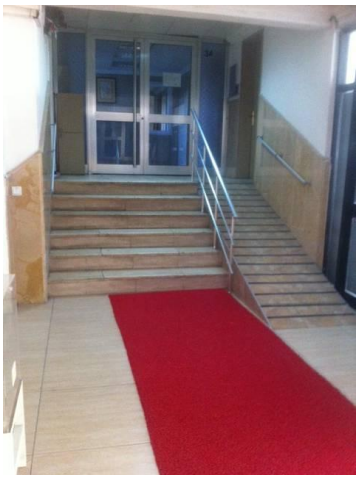


Figure 4.45 Entrance of the Building at Atakent Bostanli

Also the ramp in the building for the unit access is not complied with requirements, the width is only 80 cm, and the railing is not proper for disability access.

There are two elevators at Atakent Bostanli. The entrances are 75 cm wide, which is not enough for individuals with wheel chairs.

Figure 4.46 Elevator at Atakent Bostanli

The doors of the elevators are found to be manually operated. Therefore the entranceand exist is complicated for individuals with wheel chairs. The railing height was found to be 100 cm which is partially aligned with regulations

Figure 4.47 Elevator Doors at Atakent Bostanli

There are designated spaces for disabled individuals to park on premises. There is a parking structure within the complex and the designated spaces were found in the closes proximity. However the transportation to and from the parking lot is lacking disability consideration.

Figure 4.48 Parking Lot at Atakent Bostanli

There is not enough parking space available on site. The regulation TS 12576 is not applied on the building.

4.2.1 **Perıod II (1990-2000) Tercüman Sitesi,**

This particular buildings, Tercuman Sitesi was built in 1993, hence representing the time era of 1993 to 2000 and located in Istanbul. The construction firm that was responsible for the construction was Kastel Construction.

Figure 4.49 Tercuman Sitesi Front View

It is located in the Zeytinburnu region of the city. The community consists of 12 buildings, each one maintaining 20 stories and 80 apartments.

4.2.1.1 Sustainability

In this facility certain sustainability factors have been implicated. The heating is provided both with central heating system and the self-contained heating

systems. With the self-contained systems, each unit can decide the amount of heat and energy usage and pay for the heating as they use. The common areas of the apartments have not been heated and they did not use any heat measurement tools thruogh out the buildings.

Figure 4.50 Heating System in the units at Tercuman Sitesi

There is no central cooling system to be found in the facilities. Tenats use personal cooling systems if they desire. Since the option is left to the tennants, energy consumption was not in consideration for the building management. The cooling systems are allowed to be located in balconies only, due to the aesthetics requirements of the management.

Figure 4.51 cooling system at Tercuman Sitesi

Since the buildings have been constructed in the Period II, they do not possess an isolation systems. Though, the property manager Kader Aybay indicated

that currently 6 of the buildings are going through isolation improvements and the rest of the buildings will go through the same procedure in the near future.

Maintaining a window in every room in the complex allows a decent air circulation model. However there is no technological automated system to control air ventilation. In order to take advantage of the sunlight, windows with dimensions of 110cm x 115 cm have been used. It is seen that the windows allow enough daylight for the corridors and units throughout the day.

Figure 4.52 Corridor Windows System at Tercuman Sitesi

Though, they tried using natural lighting throughout the building, with the lighting systems, it is indicated that they did not consider energy consumption while constructing; in the entrace hall and such locations, heat lamps and old class light bulbs have been spotted.

Figure 4.53 Lighting Fixtures in common areas of the building

It is indicated that the buildings did not have any restrictions or material usage eliminating waste of water. The use of old class reservoir systems and the materials used in fossets and bathtubs are not efficient.

Figure 4.54 Water Fixtures of units

There is no work associated with the use of rain water or water refinement. Moreover, there is no restrictions on water usage on green areas surrounding the buildings, the sprinkler systems water the surrounding habitation.

Considering the material usage at Tercuman Sitesi, local materials have been used in entrances and ceramics on the stairs and in the bathrooms, hardwood floorings and door woodworkings. It is indicated that when it came to material choices, the near local product have been chosen in order to eliminate the transportation and logistic needs.

Figure 4.55 Use of local materials in selected parts of the building

Besides the said materials above, it is hard to witness or investigate the sustainability levels of the materials used in the construction. Also, it is witnessed that certain parts of the units such as floorings have been replaced with newer models in order to keep the apartment up to date.

The waste management in the properties are managed by collecting the garbages on selected days. There is no sign of seperation or granulation systems' existance. The building attendant is mainly responsible of thr waste management services, where he collects the waste of each unit and delivers them to the bins assigned to each building. Then the bins are emptied out by the municipality waste management services once a week.

Figure 4.56 Waste management within the buildings

Considering the levels of sustainaiblity witnessed in the properties, the sustainability efforts can be described as minimal. The lack of sustainaiblity efforts are being reduced with additional improvements according to today's standards but due to the nature of the structure, sustainaiblity efforts can only be increased at a certain level and we can indicate that the building is not environmentally sustainable.

4.2.1.2 Earthquake Durability

Tercuman Sitesi reside in the Zeytinburnu vicinity of the City of Istanbul. According to Environment and Urban Development Ministry's 2198 numberd legislation dated 17/12/2012, Zeytinburnu is considered to be within the earthquake affected zone. According to the research of Prof. Doctor Ahmet Ercan of Istanbul Technical University, the base of the vicinity consists of sediment and closed to the geological faults; therefore it is weak to carry heavy weight on.

The information regarding to the base testing and use of materials according to the earthquake durability factors could not be found regarding to the apartment complex. According to the complex management, the grade of the cement and steel used in the construction of the apartment complex is capable of earthquake durability factors. Considering the symetric design of the buildings, it is noted that, each property is capable of distributing the weight evenly.

Figure:4.57 Symetric design of the frontal view

During the construction phase of the buildings, the construction started with Kastel Construction, but then the contract has been cancelled. The rest of the construction done by third party companies hired by the tennants. Considering that there was no regulatory inspection required at the time, this did not constitute any trouble for the building. İt is witnessed that there is no common space for after natural disaster meeting area, hence no rescue organization in place. However, it is possible to use the green spaces surrounding the properties. Considering the location of the complex, it carries many major roads allowing ease of transportation in times of disstress.

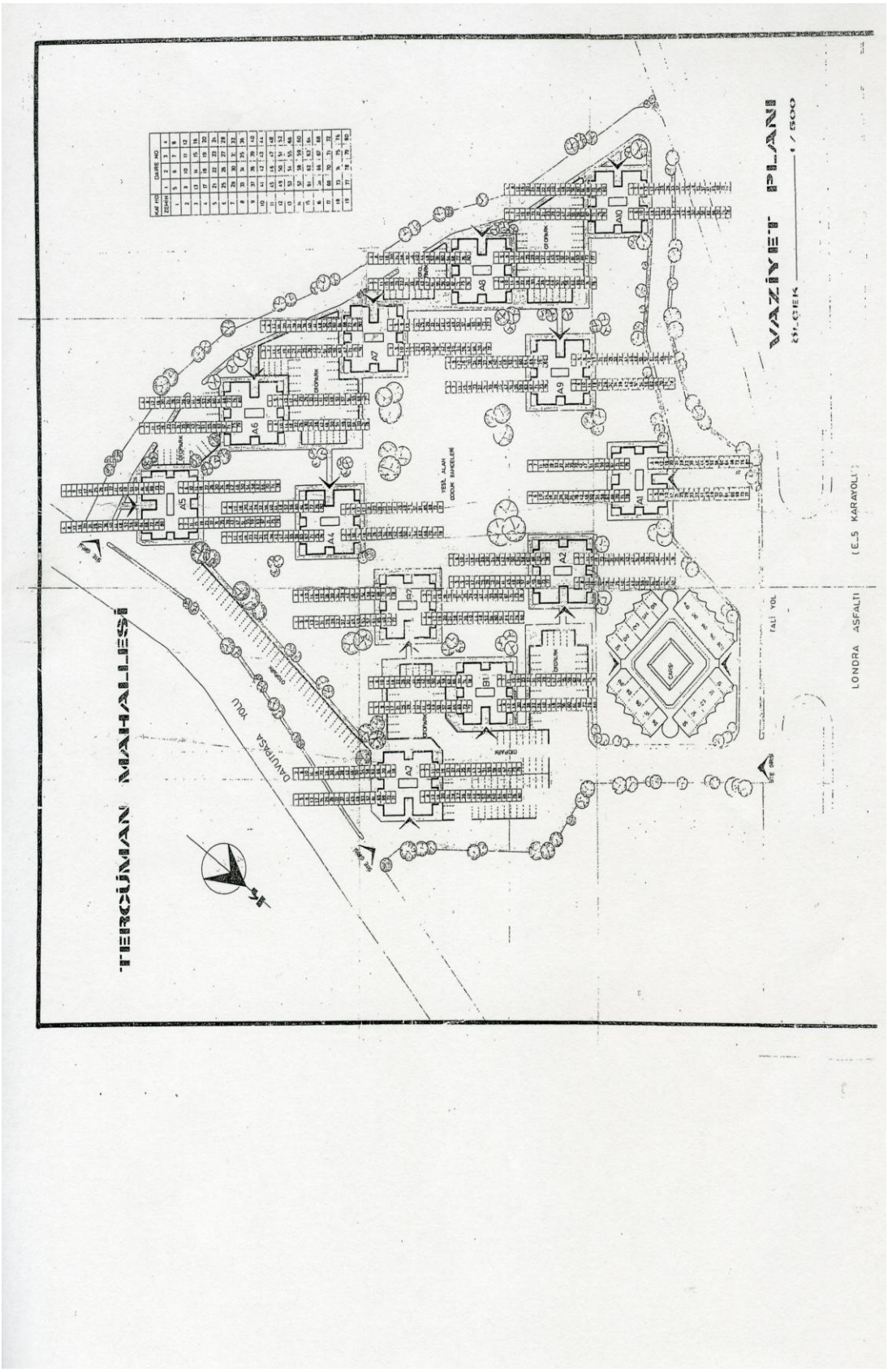


Figure 4.26 Tercuman Mah. Situational Report

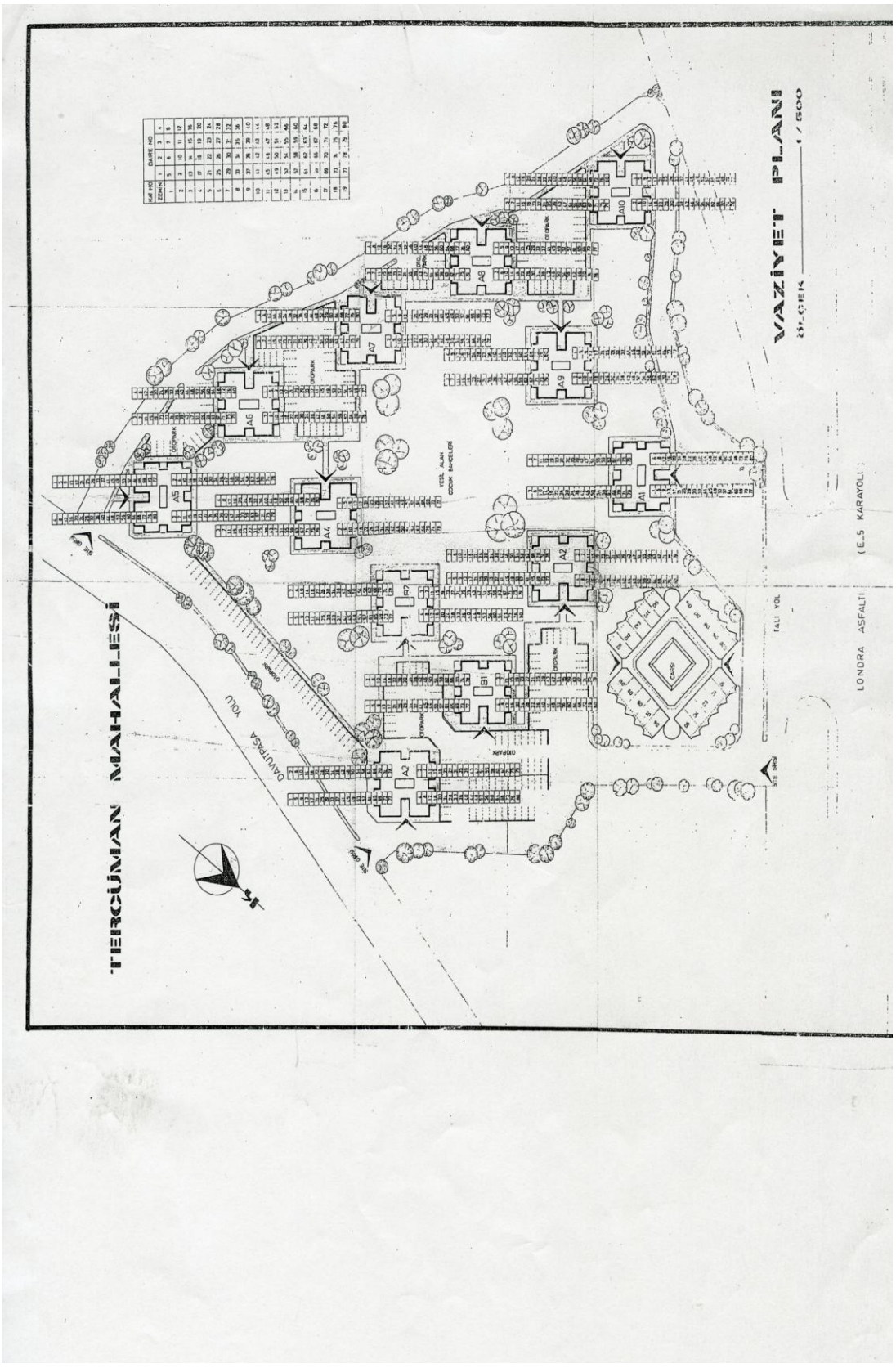


Figure 4.27 Tercuman Mah. Situational Report II

Furthermore, the properties were not affected by the big Marmara Earthquake in 1999; considering that the buildings were fairly newly constructed and materials used were at least in accordance with the standards. Hence, this resulted in the increase of the property values and demand for the complex.

4.2.1.3 Design for Disabilities

When investigating the Tercuman Sitesi, it can be witnessed that requirements for disability accessibility is accomplished somewhat partially. The ramping at the entrances were designed accordingly. The ramp landings are measured to be 160 cm to 280 cm, which are ideal for any wheeled chair users.

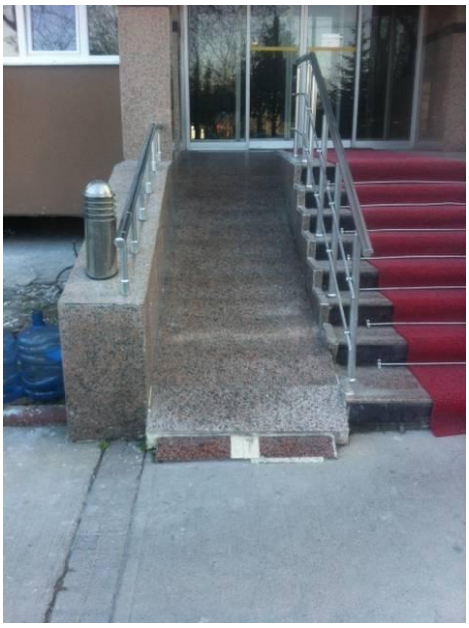


Figure 4.58 Ramp at the entrance of Blok A of Tercuman Sitesi

The entrance doors at the buildings have been replaced with automated doors which enable the accessibility for disabled individuals with ease. The width of the doors are 210 cm, which is also suitable for wheel chair access.

Figure 4.59 Entrance of Blok A of Tercuman Sitesi

Considering that there is no automated lighting in the entrance halls, the disabled individuals are required to navigate around to find the light swich, which complicates the accessibility of the individuals.

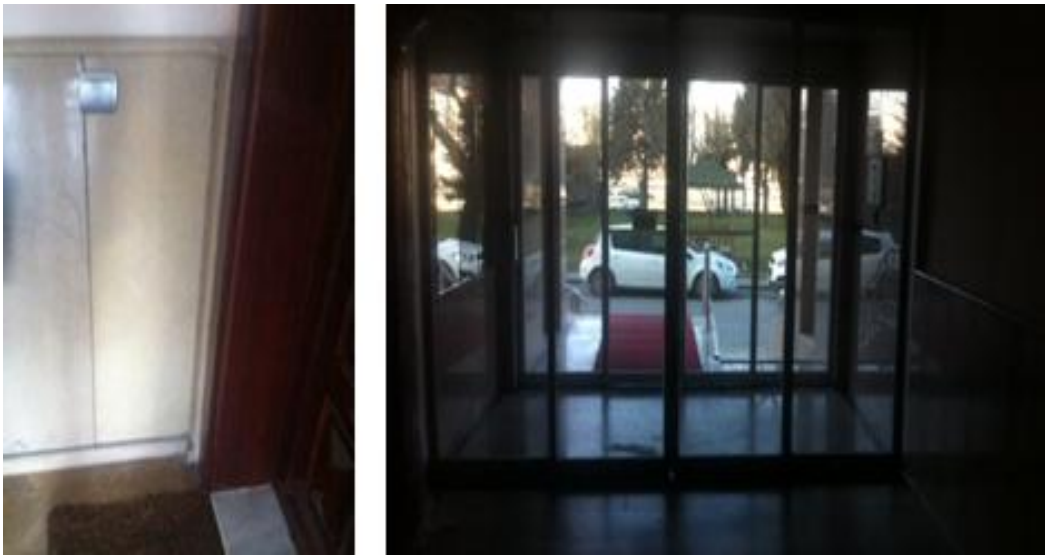


Figure 4.60 Entrance Lighting of Blok A Tercuman Sitesi

The width of the ramps used in Tercuman Sitesi are 96 cm, accordinace with the regulations regarding to the width and the slope of assigned ramps. The handles located on the side of the ramps are 88 cm high, which is also equevalent to the required heights.

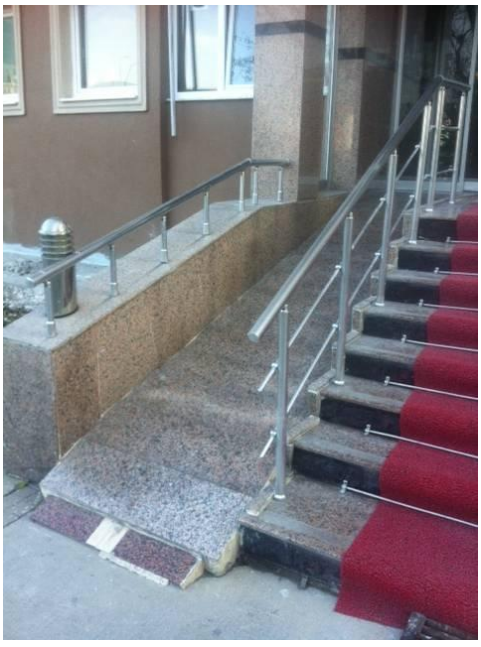


Figure 4.61 Ramping on Blok A Tercuman Sitesi

Each building in Tercuman Sitesi consists of two elevators. The dimensions of the cabins are 93 cm by 95 cm, which is partially aligned with the requirements for disabled accessibility. The doors of the elevators on the other hand are not automated, which is a burden for wheel chaired individuals, who needs to adjust the move around in order to open the doors of the elevators.

Figure 4.62 Elevator entrance from the lobby of Blok A Tercuman Sitesi

There is an assigned parking space for disabled individuals in Tercuman Sitesi. Though, the spaces are open parking spaces which are not protected by weather conditions. The property manager Kader indicated that one of the closed parking lots will soon be converted into disabled parking in order to accomodate disabled residents.

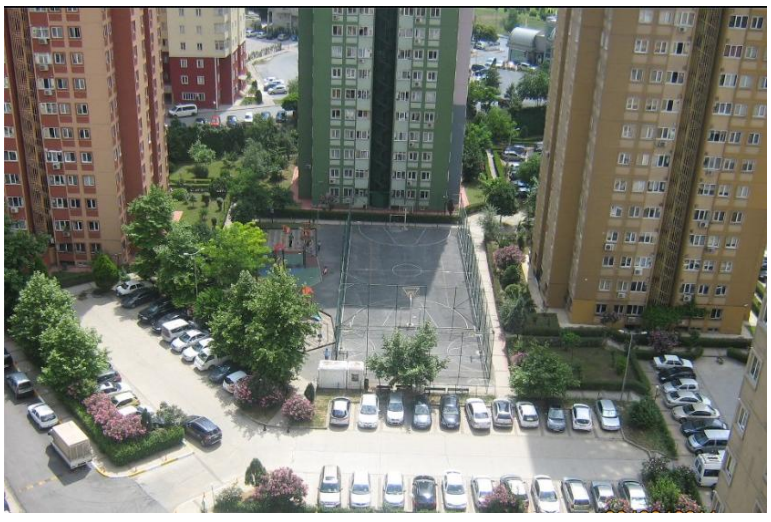


Figure 4.63 Parking Lot Tercuman Sitesi

It is noted that there are enough parking spaces for the amount of disabled individuals residing in the properties. According to TS 12576, the 2% ratio has been met and currently there are more disabled parking spaces than the number of disabled individuals residing.

Furthmore, I consulted with one of the disabled residents of the properties and asked him about the availablility of the services for his needs. He indicated that he is capable of living with decent standards and is promised for the further improvements.

Figure 4.64 Disabled Resident of Tercuman Sitesi

4.2.2 **Perıod II (1990-2000) Sepas Sitesi**

Sepas sitesi is a residential complex located on Kadikoy, Feneryolu, Istanbul. The buildings have 14 stories and totaling 80 residentials apartments. The buildings were constructed in 1990 with a concrete modeling.

Figure 4.65 Sepas Sitesi Outlook

4.2.2.1 **Sustainability**

At Sepas Sitesi, there is a central heating in order to control effective energy usage. The type of fuel used for heating is natural gas. In the building, it is indicated that there was no technological energy preservation module. There is no specific heat measurement tools, and the heating bills are evenly distrubuted to the residents, according to the property manager Murat Hizarci. Therefore saving money on heating is not an option for residents.

Figure 4.66 Heating Instrument in units at Sepas Sitesi

Considering that the building was not equipped with central cooling system, the AC systems are individually operated and purchased. The outside AC units are randomly located under the windows throughout the building. There is no sign of A+ energy waste prevention in the equipment.

Figure 4.67 Wall Style Split AC Models

Considering that the building represents the 1990, there is no existing isolation model or equipment to be found. According to the property manager Mr Hizarci, there is no ongoing work towards isolation work to be done on the premises.

Windows being in every designed room was seemd to be enough for the ventilation needs of the apartment units and the buildings. Moreover, there is no automated ventilation system existing in the facilities.

The windows designed to be 70 cm to 120 cm wide, in order to use day light. The same windows were found in the stair halls as well.

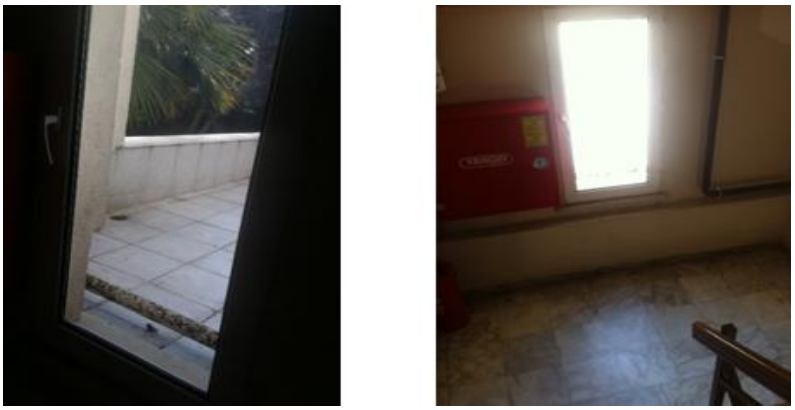


Figure 4.68 Windows for day light usage

It is indicated that energy waste was not considered while designing lighting systems. There is no sign of photocell lighting and still witnessed to the existance of heat lamps in the halls and entrances.

Figure 4.69 Fixtures affecting energy consumption at Sepas Sitesi

There is no selective materials such as fossets and reservoirs in place, in order to use of water efficiently at Sepas Sitesi. It is noted that old style fixtures have been in use, which reflects negatively on the use of clean water. However, it is also noteds that the fixtures used were the best quality and branded materials of their time, though they did not see any improvement.

Figure 4.70 Toilet Pan found in Sepas Sitesi

There is no existing system regarding to the use of rain water. Furthermore, there is no sifgnificant effort towards using clean water for the surrounding green space. There is a gardener who deals directly with watering the green spaces around the properties. Therefore the amount of water used is not automated and totally depend on the gardeners hand proportion.

Figure 4.71 Gardener at work at Sepas Sitesi

At Sepas Sitesi, the local materials used for entrance and stair marble, bathroom ceramics and wood flooring. The certain marbles were imported from Afyon by a local supplier. The material decisions made depending on the suppliers' distance from the construction zone. The materials used from 1990 are still in use in the premises.

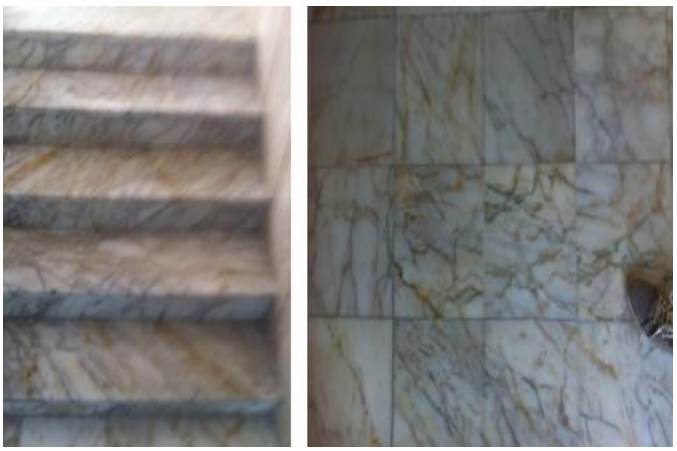


Figure 4.72 Afyon Marbels Used in the Premises

Especially within the units, the improvements made over time has been witnessed. The improvements mainly completed by the individual residents therefore is not included as property improvements.

The waste management is done through the property assistants by collecting unit waste regularly and daily. The waste collected is put together in the garbage containers outside of the properties, which is then picked up by governing vicinity bodies. There is no spepration of waste and recyle, nor the waste disposal mechanisms.

Figure 4.73 Waste Disposal Area

4.2.2.2. Earthquake Durability

Sapas Sitesi is located on Feneryolu/ Kadikoy Vicinity of the City of Istanbul. According to the Environment and Urban Planning Ministry's 2198

numbers and 17/12/2012 dated legislation, it is considered to be in an earthquake zone defined in 6306 number legislation. According to the ministry, the area is defined to be level 3 earthquake zone. The flooring is defined to have enginnering level difficulties in constructing a building. The level 3 earthquake zone is defined to be an area where is filled with soft and partially watered ground; shows high levels fo sediment. Considering the time that passed since the construction, it is not indicated that if there were any regulatory difficulties regarding to building permits and construction process.

Figure 4.74 Symetric view of Sepas Sitesi

According to the property management, the grade of cement and steel is appropriate of the time's construction process. Even then, this does not constitute a guarantee of earthquake durability. One of the positive elements of the architecture is that thew buildings were somewhat symetric and eliminates the possibility of uneven weight distribution. The building did not get any damages during or after 1999 Marmara Earthquake. Even then, considering today's factors, the complex is aiming to make reinforcing in order to prevent any future damages may occur through earthquake foces.

Considering that there were no existing and effective earthquake legislation at the time, there is no designated disaster meeting, evacuation and/or rescue planning and strategy or area exists. However considering the location of the

premises, the roads allow for any search and rescue teams to arrive and evacuate the residents from the premises.

4.2.2.3 Disabled Accessibility

When you look at the Sepas Sitesi generally, it is indicated that there are no efforts towards accessibility for wheel chaired individuals. There is no existing ramp at the entrance of the building, even though the entrance does not also consist stairs. It is noted that accessing the building with wheel chair is difficult and accessing the unit within the building is even harder. Furthermore the door is not automated which creates further complications for individuals with wheel chairs.

Figure 4.75 Entrance of Blok A Sepas Sitesi

Considering that there is no photocelled lighting or any sort of automated lighting system at the hallways, the individuals with wheel chair must work their way around to find the light switch which is not designed for the apprpriate height or at location.

There are two sets of elevators in each building at Sepas Sitesi. The measurements of the elevator cabins are 90 cm to 90 cm, which are below the required dimensions for the individuals with wheel chairs.

Figure 4.76 Elevators at Sepas Sitesi

The doors of the elevators are not automated, which makes difficulties for individuals with wheel chair. The height of the cabins, on the other hand, is 106 cm, which is accepted level for elevators designed for disabled individuals.

Figure 4.77 Parking Structure at Sepas Sitesi

At Sepas Sitesi, there is not a designated parking spot for disabled individuals. There is a 90-vehicle parking lot for the residents but there is not one for specifically designated for disabled individuals to be found. 2% requirement enforced by TS12576 cannot be witnessed in these premises.

4.2.3 Period II (1990-2000) Era: Mavisehir Pamukkale Konutlari

Mavisehir Pamukkale Konutlari is built in 1992 by Turkiye Emlak Bankasi in Izmir, Turkey. The buildings consist of 21 stories each, with concrete support systems.

Figure 4.78 General View of Pamukkale Konutlari

4.2.3.1 Sustainability

At Mavisehir Pamukkale, the central heating that was installed during construction is still being in use with the fuel being coal. There is no existing technological temperature measurement for heating in the units, therefore the residents open windows when they feel it is too hot inside. Therefore the energy efficiency in heating is not even existing.

Figure 4.79 Heating Fixtures at Pamukkale Konutlari

As there is no central air conditioning system, air conditioning system at Pamukkale Konutlari, it has been observed in the building that facades has been observed externally in units. Due to the lack of central air conditioning system in the building, and each user's individual preferred like air conditioning energy savings is understood to be ignored.

There is designated spaces for outside facades and therefore the outlook of the building at least had been preserved.

Figure 4.80 Outside Facades of AC Systems at Pamukkale Konutlari

For the natural lighting the fire escape doors and windows has been used. The doors were built half transparent, thus it brings light indoors. There is no automated hgeating or cooling system is available in the building.

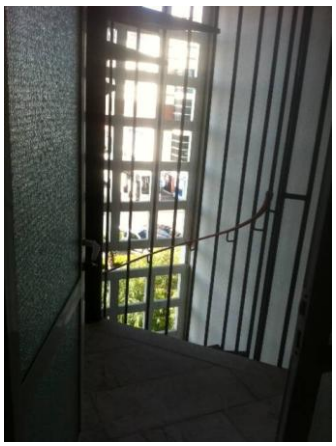


Figure 4.81 Fire Escape Lighting at Mavisehir Pamukkale Konutlari

Considering that there is not enough natural lighthing available in the building, there is continuous need for additional lighting, therefore energy consumption. It is noted that there is photocell lighting fixtures installed in the building. However the spot lights used in premises use high levels of energy and are against the initial efforts done towards energy preservation.

Figure 4.82 Sport Lights at the entrance of Pamukkale Konutlari

There are few built in equipment in the units but there do not necessarily represent A+ energy preservancy. According to the interviews done with residents, many resident upgraded the equipment with their own preference.

Figure 4.83 Kitchen View of Pamukkale Konutlari

For the use of water efficiently, the foccets installed do the most work, and it shall be considered as only water preservancy effort found in the units.

Figure 4.84 Bathroom Foccet at Pamukkale Konutlari

Even though majority of the residents upgraded to more up to date eqipment in their units, it was observed that some still use the initially installed equipments. Therefore the water waste management is not existing in the premises.

Figure 4.85 Bathroom View at Mavisehir

There is no use of rain water in the premises. The garden watering is done through the gardener at the specified hours of everyday. Therefore there is an

ongoing waste of water in watering processes. Moreover, the management does not have any plans to automate the watering system.

Figure 4.86 Garden View at Pamukkale Konutlari

There is quite a few materials that have been chosen during the construction locally. However the decision making did not happen considering sustainability but it was made due to cost effectiveness.

Figure 4.87 Marble and Ceramic use at Pamukkale Konutlari

The marble was used for the stair and the flooring was done with ceremics. The railings were made out of wood and all these materials were supplied locally.

There is no waste management system in effect at the buildings. The tubes used for garbage disposal was installed and the garbage is collected in the garbage rooms, then collected garbage is disposed by the municipality garbage trucks.

Figure 4.88 Garbage Shutes at Mavisehir Pamukkale

4.2.3.2 Earthquake Durability

The building was designed symetrically and the occupancy levels were aligned with the necessary distribution model. Therefore this does not indicate any risk for earthquake durability. Pamukkale Mavisehir Konutlari was built Emlak Bank A.S and the inspection was done in 90's by the third party companies, therefore there is no recent inspection regarding to earthquake durability in the buildings.

Figure 4.89 Outview of the Apartment Complex at Mavisehir

Considering the search and rescue efforts during and after an incidents, there is no work done towards meeting points, or designated roads for evacuation. The available roads around the apartments should be sufficient but more access could have been necessary.

There has been no inspection done after ’99 Earthquake, due to the ground of the area, fore structural supports have been used to maintain the durability of the building.

4.2.3.3 Disabled Accessibility

At the premises, there is partial consideration towards disabled accessibility. The ramp can be found at the entrance doors and path to the entrance is designed with 2 meters wide, which should allow any wheel chaired individual to travel through. The opening at the end of the ramp, by the door is big enough for individuals with disabilities to maneuver.

However there is no use of railing in the ramps. The width of the ramp as well as the slope is not acceptable considering the minimal requirements for disability access standards. The slope was found to be more than 10% and the width is less than it should be (70 cm.)

Figure 4.90 Entrance Ramps at Pamukkale Mavisehir

The entrance doors were found to operate automatically which enables individuals with wheel chairs to use facilities more efficiently.

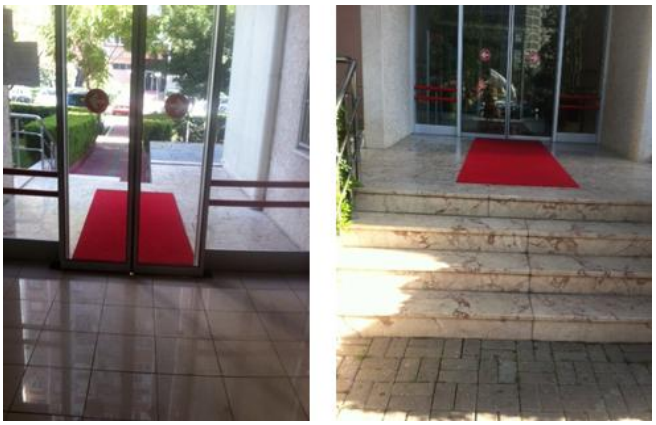


Figure:4.91 Entrance Doors at Pamukkale Mavisehir

The lighting in the building was done through photocells and it eases the process of finding the light switch for individuals with disabilities.

Pamukkale Konutlari has 2 elevators. The dimensions of the elevator cabins are 150 cm by 130 cm, which are in standards for disability accessibility. The elevators of the building does not have automated doors therefore it creates difficultiers for wheel chaired individuals.

Figure 4.92 Elevators at the Building at Mavisehir Konutlari

It was indicated that the designated parking spaces at the Pamukkale Konutlari is not existing. Furthermore there is not ongoing plans towards

designating some spaces. On top of that, the dimensions of the parking spaces are not enough for disability parking space.

Figure 4.93 Parking Spaces and Ramps Connecting to Building

There is not enough designated for individuals with wheel chairs. TS 12576 requires 2% parking space designated for individuals with disabilities but the building does not support the legislation.

4.3.1 Period III (2000-2013) Era: Elysium Fantastic Bomonti

Elysium Fantastic Bomonti is a brand new apartment complex located in Sisli, Istanbul, one of the most populated and central areas of the city. The construction was completed in 2008. The building consists of 15 stories housing 339 units. The resposbility construction firm is Ofton Construction from Istanbul, Turkey. The building is constructed with concrete.

Figure 4.94 Elysium Fantastic Bomonti

4.3.1.1 Sustainability

At Elysium, the efficient energy usage for heating is dealth with individual heating systems. Each unit is resposible for their heating needs and the amount of heating they use. The residents would pay according to their usage. The type of fuel used is natural gas. There is an automation systems in place for the tempperature levels which allows the building itself to auto control the amount of energy being used for heating, cooling and ventilation.

Figure 4.95 Automation and Smart Heating

There is a systematic cooling systems in place for each unit; the outside units are prelocated and designed according to the building architecture. Since the cooling systems were placed during construction, they were all placed with A+ energy preserving electronics.

Figure 4.96 Cooling System is designed aesthetically

In the building, there is a window in every room. This gives possibility of controling the air ventilation and natural airing options. Besides this, there is a ventilation system in the bathrooms. The back draw of this situation is that usage of tobacco in one bathroom can be felt and smelt from another unit. This is one of the biggest concern for the tennants.

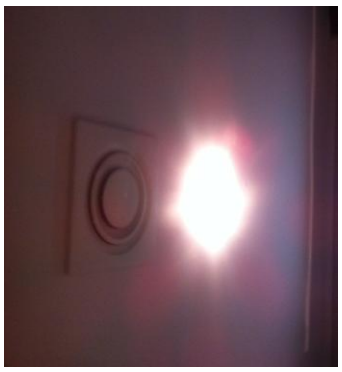


Figure 4.97 Bathroom ventilation Unit

Moreover, there is an automated blinds systems existing. Thus, they can use to block sun during the summer months and maintain the heat of the room and save energy relatively. Within the building, there is no designed natural lighting options. Though there is still designed indoor ventilation systems existing in the hallways and entrances.

Figure 4.98 Blind System's outlook and hallways ventilation

There are energy conserving lighting fixtures are in use in Elysium Fantastic Bomonti. The entrance of the building has automated lighting fixtures in order to eliminate waste of energy consumption. The fixtures used in the building are all top brands in their fields and all are up to date.

Figure 4.99 Lighting and LED Bulbs

Within the units, built-in kitchen fixtures, oven and fridge were placed during construction therefore the A+ energy saving modules were chosen. The fixtures found in the units are up to date and the most modern and efficient ones found in todays market place.

Figure 4.100 Built-in Kitchen Fixtures

The isolation agreement was pubvlished even before the construction was completed. In my interviews with the management, there were even a fine clause, if the construction company did not complete exterior thermal sheathing.

In order to use water effectively and eliminate the waste, the fixtures used in units are all top of their line and certified efficient ones. In the units, staged watering toilets have been placed. While normal flushes would come with one option and use of 4 lt. Of water at once, at Elysium, two stage flushing was initialized, depending on the waste 2 lt or 4 lt water can be flushed down. This would automatically eliminate the waste of water. In the units, the faccets and the showers were designed to preserve waste of water. The Blanco brand fixtures are currently known to be the most efficient in their field.

Figure: 4.101 Reservoir, flush system, faccets

There is project related to save of rain water at the facilities. The watering of the green spaces are done automatically, at designated hours. This would save the amount of water used in operations. Furthermore, the watering is done with dripping technique.

Figure :4.102 Dripping Watering system of the green space

The effective use of materials have been accomplished by using national materials in stairs and bathroom ceramics, wood flooring and building entrances. But for the rest international materials have been used.

Figure :4.103 Room Material usage

Use of wood is witnessed in living room and bedrooms. The wood used for flooring is described as 1st class flooring. Turkish natural stones are known to be world famous and Elysium Fantastic Bomonti used some of these stones in their mazaic and ceremic designings. The entrance is designed with using granite stones.

Figure 4.104 Use of stones and tiles in the premises

The waste management started from inside of the units and carried out to the property as a whole. In the kitchen and bathrooms, the recycled material have been used, the acrilic counters were visible.

Figure 4.105 Acrylic Countertops in Kitchen and Bathroom

The waste of units are being collected in the waste rooms located in each floor. The attendants will then deliver these wastes to the vicinity waste management truck in designated days of the week. Moreover, there are seperation of waste in certain designated rooms within the premises. The importance of waste management can be witnessed in the premises.

Figure 4.106 Waste Management Rooms and Seperation Bins

There are food disposal units installed in each unit. This would reduce the amount of waste and decrease the amount of food being disposed, relatively reduce the amount of pest management.

Figure 4.107 In Unit Food Disposals

4.3.1.2 Earthquake Durability

The building is constructed complying with the earthquake regulations and the construction approve to perform with a static cement structurization. The area the building is located carries a mild level of earthquake risk. The area does not

consist any earthquake fault line. Though, the flooring is close t owet land and therefore it still carries some traits of earthquake zone. The flooring feasibility was done by IBEGE Group and the city urban development found no issues with the constructing in the area with the given specifications.

The carrier system colons must have consisted of steel enforced concrete beams that are at least C30/40 quality measurement is indicated in the construction technical spcifications. The story level of the building is chosen depending on the development level and flooring capabilites for the foundation needs.

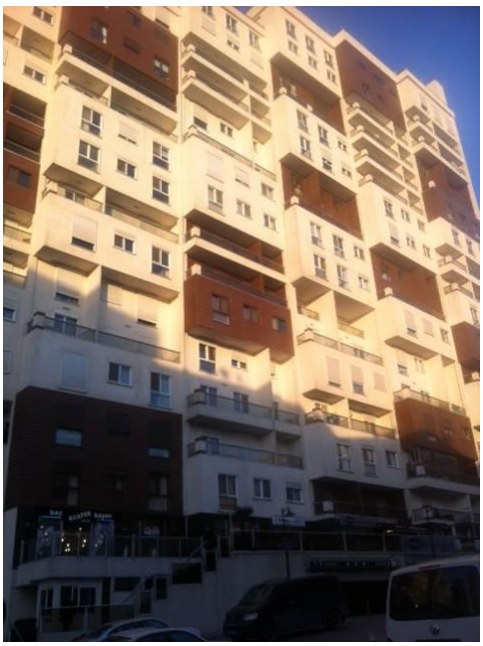


Figure :4.108 Elysium Story level Outside View

During the construction phase, the project was aided by the engineering firms and the it carries positive signs of structural harmony. The area building exists is redeveloped in order to allow transportation in a smoother manner in case of catastrophic eartquake.

4.3.1.3 Disabled Accessibility

When investigating Elysium Fantastic with terms of accessibility, the building is suitable for individuals with wheel chairs. There is a ramp in the entrance for these individuals to access to building with ease. The open space in front of the building is optimal for individuals with wheel chairs (250 cm. Also, this measurement will allow the individuals to make necessary maneuveurs. The doors

are not automated doors but can open easilty with a button for disabled individuals. Also the door handles are designed to be 90 cm high from the ground in order to allow these individuals to reach out easily.

Figure 4.109 Elysium Fantastic Building Entrance

Once entered in the building, the lighting in automated with photocell systems, therefore the individuals do not have to push a button to turn lighting on.

There are two elevators in the building. The dimensions of the cabins are 170 cm to 170 cm, which is optimal for the needs of individuals with wheel chair. The doors of the elevators are autromated with make accessing easy. The height of the handle bar in the elevator is 97 cm, which is aligned with disability standards.

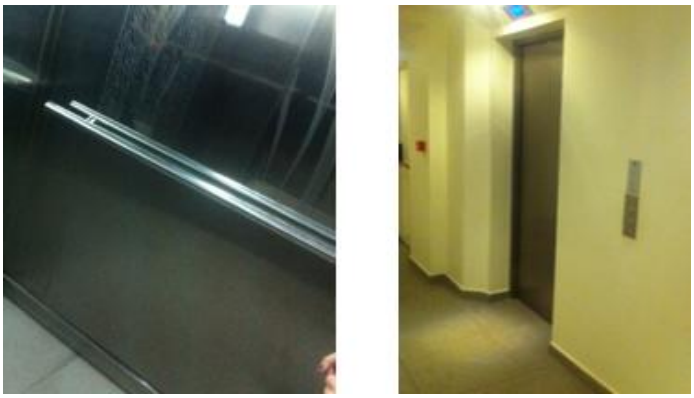


Figure 4.110 Elevators at Elysium Fantastic

The parking structure is designed to be aligned with the needs of disabled individuals. There are quite a few disabled parking spots available for use. The disabled parking spots are designated to be closer to the building entrances in order to accomodate the needs of these tennants and guests. The parking spaces for disabled individuals are designed to be 350 cm by 500 cm, which is within the standards of disability accessibility.

Figure 4.111 Parking structure for disabled individuals at Elysium

The 2% quota required by TS12576 can be found in this premise, actually carrying more than 4% of the parking spots being reserved for disabled individuals.

4.3.2 Period III (2000-2013) Era: Metrokent Istanbul

Metrokent Basaksehir is built in 2002 by Kiptas A.S. in one of the most desirable outskirts of Istanbul. The buildings consists of 20 stories with 1492 units. The complex offers housing opportunities from 1+1 to 5+1 for all ages and backgrounds. It is one of the most desirable outskirt residential complexes on the European side of the city.

Figure 4.112 Metrokent Basaksehir

4.3.2.1 Sustainability

The buildings are designed to have non-central heating system. The type of fule used in heating is natural gas. With this type of heating system, every unit can heat up as desire, and pay as much as they spend on heating. There is an automation system used for heating controlling the degrees of heating in order to maintain over use of energy. The same automation system is used for ventilation and cooling systems as well.

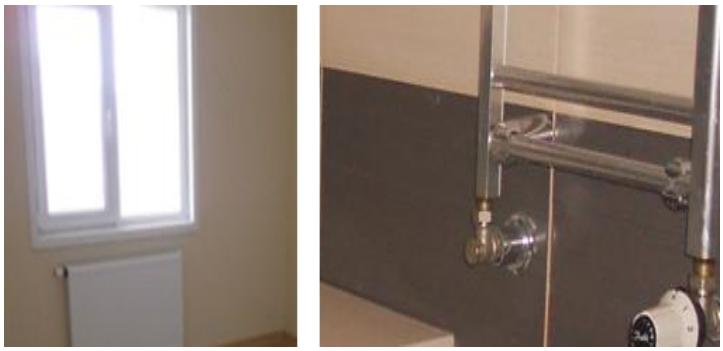


Figure 4.113 Heating Fixtures and Smart Valves at Metrokent

The buildings use AC for cooling. The cooling fixtures were through in construction phase, and placed in places that are architectually correct. The AC fixtures are A+ Samsung energy preserving equipments, that also goes with the outer design of the buildings.

Every room has a window that can be opened. With this, the natural airing and ventilation can be achieved in the buildings. Furthermore, the hidden ventilation systems can be found in the bathrooms.

There is no automated blind system at Metrokent, but the windows are two sided and there is the exterior thermal sheathing existing, according to Kadem Egemen, the property manager.

Inside the building, there is no natural lighting and air ventilation, therefore there is an automated ventilation and AC system intact. There are energy conservant lighting and bulbs are in use. At the entrance of the building, photocell sensored lighting is being used to eliminate the waste of energy.

Figure 4.114 LED Lighting at the entrance at Metrokent

In the units, there are built-in paddle box, oven, and stove in place, the A+ grade energy preserving equipments. With this way, the building aims to reduce the energy usage within the units as well as the commonly used apartment spaces.

Figure 4.115 Built-in Kitchen Fixtures at Metrokent

In order to use water efficiently, the building is equipped with luxury class fixtures and branded equipment. The two staged reservoir system can be witnessed in the premises. The stage one uses 4 lt. of water while the stage two reservoir uses 6 lt. of water. The showerheads and foccets placed in the units are aiming to save water and reduce the waste as well.

Figure 4.116 Bathroom Equipments to save water at Metrokent

There is no existing work towards saving rain water. The use of retained rain water explained to be very explansive system to set up and therefore even many new properties do not maintain a rain water circulation systems just yet. In the premises the garden watering is done automatically, at the hours predesignated. The sprinkler system is used to water the green spaces.

Figure 4.117 Water Sprinkle System at Metrokent

The materials used in the permises are mainly up to date foreing luxurious materials. Only at the entrance hall, stairs and bathroom ceramics, wood flooring, and the door structures are supplied locally.

Figure 4.118 Wood Flooring and the Wood door structures at Metrokent

Use of wood is only withnessed within the units. The woods used in construction are defined to be first class local wood and the classes of wood is decribed prior to sales agreement of the properties. At the entrance of the building the flooring is done with tiles and marble stones. This will serve the sustainability efforts for the property management.

Figure 4.119 Common are flooring marbles and tiles at Metrokent

The waste management is done not only through reducing the waste of consumed goods, but it is also done by using recycled materials in the construction. In kitchen and bathrooms, recycled materials have been used such as acrylic countertops.

Figure 4.120 Acrylic Countertops at Metrokent

The waste management in the building done by collecting unit waste at specified hours of every day by the building attendants. Attendants then deliver these to designated waste areas. The waste then collected by the municipality garbage trucks. The municipality also provided recycling bins for the residents to save recyclable waste but the building does not enforce on recycling.

Figure 4.121 Waste Management at Metrokent Basaksehir

Even though it is one of the newer properties for residents, the units does not contain a food disposal systems in them. Therefore the food waste is also terminated through regular waste management services.

4.3.2.2 Earthquake Durability

The building is designed to supported by concrete reinforcement. Though, the region the building was constructed, Zeytinburnu is considered to be the mild eartquake affected zone. The flooring does not consists of any geological fault lines but the ground is wetland and suspicable to breakable and movable rocks. Furthermore, the construction company was given certification by the Public Works Ministry for their eligibility to build a earthquake durable premises.

Figure 4.122 Metrokent Outview of Aesthetical harmony

Furthermore, the building was designed both aesthetically and considerably for the level of stories in respect to the earthquake durability.

The designing and constructing phases was aided through various engineering consulting firms, thus the buildings carry significant relevance with the environment surrounding them. According to the property manager Kadem Egemen, the earthquake durability analysis has been done thorugh Property Analysis Kiptas A.S.

Figure 4.123 Designated Emergency Meeting Space

The transportation around the housing complex allows any search and rescue efforts to be completed accordingly. Also, the building consists of necessary emergency exits and emergency meeting areas in open spaces.

4.3.2.3 Disabled Accessibility

When analyzing the Metrokent buildings, it is noted that the all necessary steps for disability access has been taken into an account. According to the measurements done on sight, there is a ramp available at the entrances and the open space on top of the ramp is 220 cm and it allows the individuals with wheel chair to operate and maneuveur with ease. The entrance doors are designed to push through and open inside. This allows the individuals to access in easily.

Figure 4.124 Building Entranceat Metrokent

The ramps are designed to be 110 cm width and the slopes are calculated to be not more than 8%, which both are aligned with the standards. The height of the handlebars are calculated to be 87 cm high and they are designed with suggested standards.

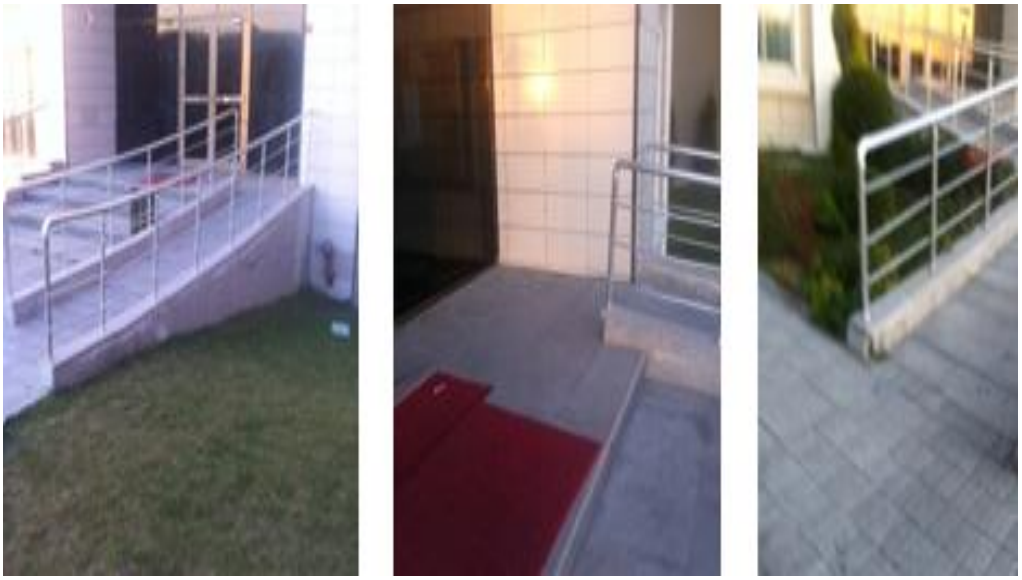


Figure 4.125 Building ramp and and handlebars at Metrokent

There are two elevators in the each building. The dimensions of the elevators are 150 cm to 150 cm and the doors are automated, which are both suggested elements of disability access. The width of the elevator doors are calculated to be 100 cm and the handlebars inside are 95 cm high.

Figure 4.126 Elevators at Metrokent

The parking area in the facility is designed to allow individuals with disbilities to operate vehicles easier and it makes transportation to and from the parking lot with the least efforts. The dimensions of the parking spaces are designed to be 350 cm by 350 cm, which are the recommended space dimensions.

Figure: 4.127 :Designed parking space for disabled residents at Metrokent

There are enough number of designated parking spaces witnessed on premises; therefore it does not occur to be more than 1 designated parking space for each building aty the moment.

4.3.3. Period III (2000-2013) Era: Soyak Mavisehir

Soyak Mavisehir is located in a newly built apartment complex in Izmir central area. It contains 15 stories in each building with 295 units total. The building was constructed by Soyak Construction and it was completed in 2008. The main carriage structure was designed to be concrete.

Figure 4.128 Soyak Mavisehir Outside View

4.3.3.1. Sustainability

The building uses central heating systems with natural gas. The control room is located in the ground floor of each building. Each unit is equipped with control valves that can be controlled depending on the heating needs. Therefore the resident only pays as much as they spend on energy.

Figure 4.128 The Heating Fixtures at Mavisehir Units

There is preinstalled AC systems in units for AC cooling. Therefore the outside units of the AC equipments are also pre located in the balconies. The AC equipment installed by SOYAK was chosen as R410A type A+ energy efficient; that does not damage the Ozone plate.

Figure 4.129 The AC Systems from Inside and Outside of the Units at Mavisehir

In the building, there is a window in every room, which allows natural air circulation and ventilation. Besides this, there is not any existing technological ventilation system.

The building uses energy efficient light bulbs and fixtures. There are dimmers installed in the units and the residents can control the level of light they use as well as the energy they waste.

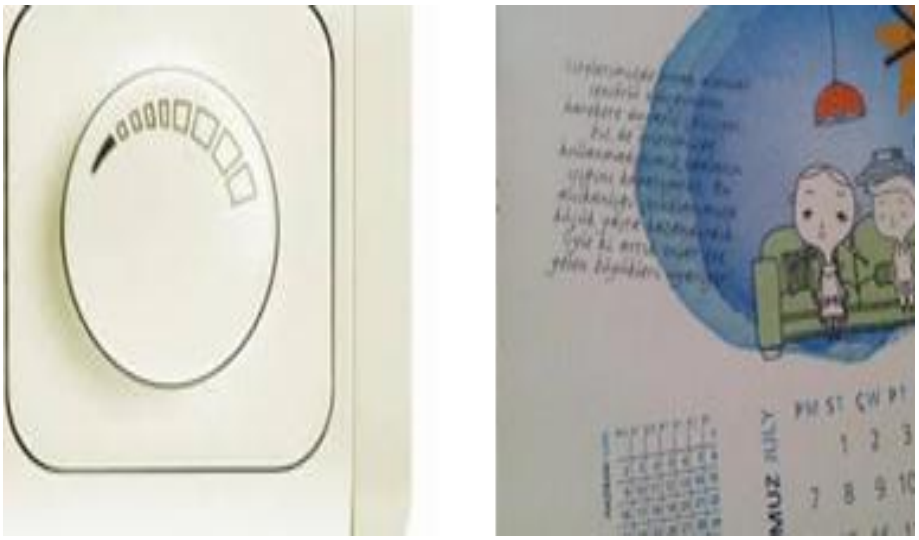


Figure 4.130 Dimmer and Lighting Directions at Mavisehir

The construction company takes efficiency as a big concern for themselves and apply necesaary tools in their constructions in order to achieve the energy efficiency. The building gives out bulletins about efficiency and how to save energy at the premises.

In units, the pre installed equipments such as ventilation hood, oven, stove were chosen to be A+ energy efficient.

Figure 4.131 Pre Installed Kitchen Equipment at MAvisehir

The effective use of water is supplied by the choice of water saving kitchen and bathroom fixtures such as shower equipment and foccets. The kitchen and bathroom fixtures were installed by the construction firm and the waste management was considered when making equipment decisions. The fixtures used in the units were identified to be Vitra brand, which is considered to be the highest quality available for their water waste control options. There is two state flush systems installed in the units with elements of 3 liters or 6 liters of water used depending on waste. With this way, the tennants also can save water from waste.

Figure 4.132 Showers in Mavisehir

Moreover, the construction and management firm, SOYAK is introducing efficiency and sustainaibility measures to the residents, by providing them small notes on calendars, corporate notes and such, also by using recycled papers in any written communications.

Figure 4.133 Calendar Page provided to the residents at Mavisehir

There is an airing system available for the water reservoirs, in order to eliminate any odor occurs at the watering reservoirs. The waste water reservoirs also are connected to the same airing system, where all the waste water from units collected.

There is no available rain water collection facilities existing in the facilities due to the cost associaited with the project. The garden watering is done through automated system at pre designated hours of the day. SOYAK Construction is kind of a firm that chooses water preserving equipment and fixtures in order to reduce their environmental damage.

Figure 4.134 Soyak Water Preserving Promotional Flyer

The local use of material has been witness in entrances of the buildings, stairs, ceramics used in bathrooms, wood flooring and doors. The use of wood was found in living room and the rooms in units. However there is no indication of certification of the wood flooring used.



Figure 4.135 The local material used at kitchens and bathrooms at Mavisehir

It is well known that the natural stones found in Turkey are precious and they were heavily used in the buildings both for sustainability factors and aesthetics.

Figure 4.136 Stones used in the Building at Mavisehir

There has been use of recycled materials in the premises. Especially in the kitchen and bathroom countertops are made of arclyric material. Since the local governments are encouraging for recycling, the management company also encourages the residents with recycling. There are various recycling facilities found in the buildings and the residents seem to take their part in process.

The seperated waste then be delivered to garbage trucks and then taken by the municipality garbage trucks.

4.3.3.2. Earthquake Durability

The area the community was built was not necesarrily suitable for construction, though all the projedct was approved and permited by the government. The building regulation indicates that “the construction was completed accrodance of the regulatory responsibilities regarding to earthquake durability and after math prevention. According to the information provided by the assistant propoerty manager Nezih Altin, all necessary earthquake requirements were completed and the documentation was signed by local government.

Figure 4.137 Outlook of the buildings at Mavisehir

The ground consists of 6 to 7 meters of dirt and deeper than 7 meters is consisted with swamps and partially rocks. Therefore during the construction, the stability was achieved by using concrete support systems horizontally aligned at the base of the construction. Considering that the ground is suspectable for moisture, 80 fore collons have been placed as well.

The structural design and the amount and degree of steel quality and concrete level is accordance with the requirements. The amount of stories available on premises is allowed by the government and considered safe for the structure. The symetric design and the weight distribution allows buildings to be stable in case of sysmic movements.

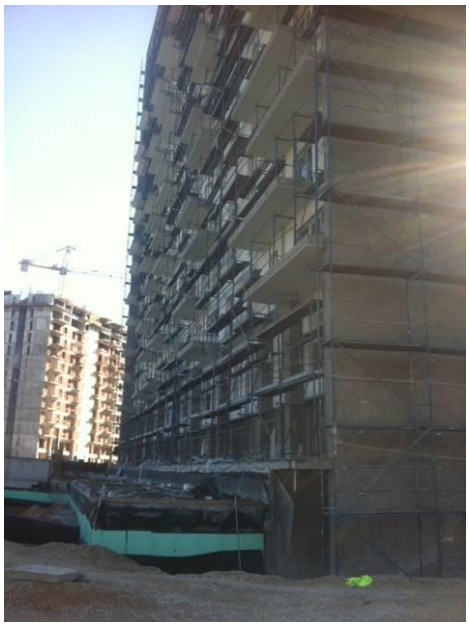


Figure 4.138 Concrete Support System at Mavisehir

During the construction phase, the engineering firm PMD has consulted SOYAK to make sure all the compenents are earthquake safe. Last but not least, the earthquake evacuation and meeting areas have been designated and all the necessary transportation areas are present for any serach and rescue team that might be in need.

Figure 4.139 Meeting Area for Emerngecy Situations at Mavisehir

4.3.3.3. Disabled Accessibility

When investigating the building, the availability of the necessary tools for disability access is found to be present. There is a ramp existing at the entrances, the open space at the end of the ramp is suitable for individuals with wheel chairs to make maneuvers. The entrance doors are found to be automated and sliding which enables accessing with ease for wheel chaired individuals.

Figure 4.140 Building Entrance at Mavisehir

After entering the building it was indicated that there is an automated lignting fixutres in use. The ramps used in the premises are 110 cm wide and that are aligned with the standards, same as the slope of the ramps which were found to be 6%.The railings used on the sides of the ramp to be found effective for disability use. Width of the entrance door is 180 cm which is enough for any wheel chair to get in and out.

Figure 4.141 Entrance of the building and Railings at Mavisehir

There are two elevators in each building. The dimensions of the elevators are found to be 160 cm to 140 cm with 10 person capacity. The dimensions are

found to be acceptable for disability access. The elevator entrance is 100 cm wide and the railing exists at 87 cm high from the floor, which are both acceptable for the disability access as well.

Figure 4.143 Elevators at Mavisehir

There are enough and appropriate parking spaces reserved for disability uses. The reserved disabled parking spaces can be found at the closest locations to the entrances and the 2% allowance requirement has been met by the building.

Figure 4.144 Disability Parking Spaces

4.4 Section Summary

In this section, the pre selected apartment complexed has been investigated and researched considering the pre determined factors regarding to their effectiveness on sustainability, earthquake durability and disability access. It was inevitable found that the sustainability has been improved over the selected time frames with the growing awareness of sustainable living within Turkey.

The biggest challenge was to identify the earthquake durability of the buildings. Many management company was not aware of the construction period and how durable the building was structured. Therefore, the knowledge gained from the case study only reflects on the found information. The information provided by the municipality and the property management indicate that the durability efforts increased exponentially after 1999 earthquake. This can be visibly found in the Period III buildings. The weakes buildings inspected were the ones in Period I. Therefore this proves the exponential growth in awareness in earthquake durability.

The accessiblity on the other hand was investigating keeping the TSE 12576 in mind. The advancements have been compared with the regulations and the missing and lcaking parts have been tried to be identified. According to the legislative requirements, the Period I buildings lacked the most amount of requirements. The amount of lacking portions have gotten less and less each period, improving substentially. Even then, it was noted that disabled accessibility efforts have still been below the necessary levels, even though the lelve of improvement from Period I to Period III, further improvements and adjustments are necessary for the compliance with legislation in use.

5. CONCLUSION AND SUGGESTIONS

With the completed site research, the nine pre destined building have been evaluated to determine the improvements in sustainability, earthquake durability, and disabled accessibility in period I (1980-1990), period II (1990-2000) and period III (2000-2013). When investigating the sustainability efforts, the third section identifies the values established in the research with a chart to ease the understanding. Efficient energy usage, efficient water usage, material usage and waste management in period I was seen to be insufficient. The period II showed improvements compared to the previous period but still lacked the necessary fixtures. However it was witnessed that the period II has the majority of the factors put in action in the buildings such as use of efficient heating with thermometers, A+ energy efficient cooling and AC systems. The newer buildings tend to use more efficient LED lighting and photocell central lighting systems. These buildings preferred to use kitchen and bathroom fixtures that are up to date, with efficiency considered equipment. Use of materials could have been tricky due to the preference of imported goods, however these new buildings found the perfect alternatives to create one of a kind buildings that also used recyclable materials. I can only explain the improvement in earthquake durability factors as below:

- In order to build safe buildings in respect to earthquakes, it was witnessed that the preliminary research was done properly, especially the cement and steel grade was considered accordingly. Also considering a possible earthquake situation, the majority of the damage seemed to be done with the ineffective planning for evacuation and search and rescue efforts.

- On the investigated buildings in respect to their appropriate time periods, Period I seemed to lack the most, without any feasibility reports or preliminary research. During

Period II the Marmara Earthquake seemed to build awareness towards earthquake durability efforts and buildings seemed to start organizing or strengthening their premises in order to comply with the new legislation. Period III on the otherhand is the period where the legislation took the biggest effect on the buildings and the properties built in this era seemed to cover majority of the problems raised with the earthquake durability. When it comes to disabled accessibility there are 8 million disabled individuals living in Turkey today and more than 1.25% of this number is orthographically disabled. This number seemed to me considerably high. Therefore the buildings have to comply with certain regulations in order to accommodate this percentage of population in Turkey.

The Period I lacks any proper regulation towards increasing the live standards of these individuals. Accordance with European Union Regulations, Turkey was introduced the accessibility requirements in 1996. There are only partial improvement in this era which do not represent any improvements in livability for disabled individuals. Considering the increase in enforcement of these regulations in Period III, more buildings seemed to comply with these. Therefore the buildings inspected was found to be respectively enough. The ramps, were found to be built not only accordance with the regulations but also allows non-disabled residents to use as well. The door handles, lighting fixtures and all other equipment in the buildings were found to be accessibility improved.

It was witnessed that thew advancements put in place for disabled individuals not only improve the quality of life for specific residents but they serve for the general resident population as well as it increases the attractiveness of these buildings. In this thesis, purpose is not to point out the tools to be used in design and development of the premises in order to improve the quality of the buildings, it serves as a guidelines for the upcoming architectural project to meet the necessary criteria in their respected era.

5.1 Findings

Criterias	Sustainability Strategies	Merk Kule	Bostanlı Atakent Sitesi	Ataköy 9-10. etap
Effective Energy Usage				
Smart Building Concept		N/A	N/A	N/A
LED Lighting Fixtures		N/A	N/A	N/A
Natural Lighting Availability		N/A	N/A	N/A
Energy Efficient HVAC		N/A	N/A	N/A
Effective Use of Water				
The Water Efficient Fixtures		N/A	N/A	N/A
Preservation on Garden Watering		N/A	Partially	N/A
Reuse of Rainn Water		N/A	N/A	N/A
Effective Material Usage				
The recycled Material Usage		N/A	Partially	Available
Local Material Preference		Partially	Available	Available
Low Emission Materials		N/A	N/A	N/A
Waste Management				
Seperation of Waste		N/A	N/A	N/A
Recycled Material Usage		N/A	N/A	N/A
The Garbage Shute		N/A	N/A	N/A

Table 5.1 Period I Sustainability Findings on Case Studies

Criterias	Sustainability Strategies	Sepas Sitesi	Mavişehir Emlak Bank Konutları	Tercüman Sitesi
Effective Energy Usage				
Smart Building Concept		N/A	N/A	N/A
LED Lighting Fixtures		N/A	N/A	N/A
Natural Lighting Availability		Available	Available	Available
Energy Efficient HVAC		N/A	Partially	N/A
Effective Use of Water				
The Water Efficient Fixtures		Partially	Partially	Partially
Preservation on Garden Watering		Partially	N/A	Partially
Reuse of Rainn Water		N/A	N/A	N/A
Effective Material Usage				
The recycled Material Usage		Partially	N/A	Partially
Local Material Preference		Available	Available	Available
Low Emission Materials		N/A	N/A	N/A
Waste Management				
Seperation of Waste		N/A	N/A	Partially
Recycled Material Usage		N/A	N/A	N/A
The Garbage Shute		N/A	Available	N/A

Table 5.2 Period II Sustainability Findings on Case Studies

Criterias	Sustainability Strategies	Metrokent	Soyak Mavişehir	Elysum Fantastik
Effective Energy Usage				
Smart Building Concept		N/A	N/A	Available
LED Lighting Fixtures		Available	Available	Available
Natural Lighting Availability		Partially	Partially	N/A
Energy Efficient HVAC		Available	Available	Available
Effective Use of Water				
The Water Efficient Fixtures		Available	Available	Available
Preservation on Garden Watering		Available	Available	Available
Reuse of Rainn Water		N/A	N/A	N/A
Effective Material Usage				
The recycled Material Usage		Partially	Available	Available
Local Material Preference		Available	Available	Available
Low Emission Materials		Partially	Available	Partially
Waste Management				
Seperation of Waste		Available	Available	Available
Recycled Material Usage		Available	Partially	Available
The Garbage Shute		Available	Available	Available

Table 5.3 Period III Sustainability Findings on Case Studies

Criterias	'12 Earthquake Legislation	Mert Kule Apartmanı	Bostanlı Atakent	Ataköy 9-10. etap
Material				
Structural Support		Partially	Partially	Partially
Earthquake Recognition Equipment		N/A	N/A	N/A
Ground				
Ground Conditions		Partially	Partially	Available
Active Fault Line		Available	Available	Available
Structure				
Form of Structure		Available	Partially	Available
Inspection before and after Construction		N/A	N/A	Partically
After Earthquake				
Meeting Point Availability	N/A	N/A		N/A
Search And Rescue Transportation	Partially	Available		N/A

Table 5.4 Period I Earthquake Durability Findings on Case Studies

Criterias	**'12 Earthquake Legislation**	**Sepas Sitesi**	**Mavişehir Emlak Bank Konutları**	**Tercüman Sitesi**
Material				
Structural Support		Partically	Partically	Avaliable
Earthquake Recognition Equipment		N/A	N/A	N/A
Ground				
Ground Conditions		Avaliable	Partically	Partically
Active Fault Line		Avaliable	Avaliable	Avaliable
Structure				
Form of Structure		Avaliable	Avaliable	Avaliable
Inspection before and after Construction		N/A	Partically	N/A
After Earthquake				
Meeting Point Availability		N/A	N/A	Partically
Search And Rescue Transportation		Partically	Avaliable	Avaliable

Table 5.5 Period II Earthquake Durability Findings on Case Studies

Criterias	2012 Earthquake Legislation	Metrokent	Soyak Mavişehir	Elysum Fantastic
Material				
Structural Support		Avaliable	Avaliable	Avalaible
Earthquake Recognition Equipment		N/A	N/A	N/A
Ground				
Ground Conditions		Avaliable	Avaliable	Avaliable
Active Fault Line		Avaliable	Avaliable	Avaliable
Structure				
Form of Structure		Avaliable	Avaliable	Avaliable
Inspection before and after Construction		N/A	Avaliable	N/A
After Earthquake				
Meeting Point Availability		Avaliable	N/A	Partically
Search And Rescue Transportation		N/A	Avaliable	Avaliable

Table 5.6 Period III Earthquake Durability Findings on Case Studies

Criterias	TSE 12576 Standards	Mert Kule Apartmanı	Bostanlı Atakent	Ataköy 9-10. etap
Parking				
Distance of parking Space to the Entrance	2500 cm	Inadequate	Inadequate	Inadequate
Percentage of Designated Parking Space	%2	Inadequate	Inadequate	Inadequate
Dimensions of Parking Spaces	350x500cm	Inadequate	Partially	Inadequate
Ramps				
Width of Ramps	90cm	Inadequate	Inadequate	Inadequate
Slopes of Ramps	% 8	Inadequate	Inadequate	Inadequate
Open Area Dimensions	250 cm	Inadequate	Inadequate	Inadequate
Railing Height	80 - 90 cm	Inadequate	Inadequate	Inadequate
Building Entrances				
Entrance Space	150cm	Inadequate	Available	Available
The Space at the Door Openings	150cmx150 cm	Inadequate	Partially	Available
Automated Lighting Fixture		Inadequate	Inadequate	Inadequate
The Height of the Door Handles	90-110cm	Partially	Partially	Available
Elevators				
Minimum Dimension of Elevator Cabinets	110cmx140cm	Inadequate	Inadequate	Inadequate
Automated Elevator Doors	80cm	Inadequate	Inadequate	Inadequate
The railing Height in the Elevators	85cm-90cm	Available	Available	Available

Table 5.7 Period I Disabled Accessibility Findings on Case Studies

Criterias	TSE 12576 Standards	Sepas Sitesi	Mavişehir Emlak Bank Konutları	Tercüman Sitesi
Parking				
Distance of parking Space to the Entrance	2500 cm	Inadequate	Inadequate	Inadequate
Percentage of Designated Parking Space	%2	Inadequate	Inadequate	Inadequate
Dimensions of Parking Spaces	350x500cm	Inadequate	Partially	Inadequate
Ramps				
Width of Ramps	90cm	Inadequate	Inadequate	Inadequate
Slopes of Ramps	% 8	Inadequate	Inadequate	Inadequate
Open Area Dimensions	250 cm	Inadequate	Inadequate	Inadequate
Railing Height	80 - 90 cm	Inadequate	Inadequate	Inadequate
Building Entrances				
Entrance Space	150cm	Inadequate	Available	Available
The Space at the Door Openings	150cmx150 cm	Inadequate	Partially	Available
Automated Lighting Fixture		Inadequate	Inadequate	Inadequate
The Height of the Door Handles	90-110cm	Partially	Partially	Available
Elevators				
Minimum Dimension of Elevator Cabinets	110cmx140cm	Inadequate	Inadequate	Inadequate
Automated Elevator Doors	80cm	Inadequate	Inadequate	Inadequate
The railing Height in the Elevators	85cm-90cm	Available	Available	Available

Table 5.8 Period II Disabled Accessibility Findings on Case Studies

Criterias	TSE 12576 Standards	Metrokent	Soyak Mavişehir	Elysum Fantastik
Parking				
Distance of parking Space to the Entrance	2500 cm	Inadequate	Inadequate	Inadequate
Percentage of Designated Parking Space	%2	Inadequate	Inadequate	Inadequate
Dimensions of Parking Spaces	350x500cm	Inadequate	Partially	Inadequate
Ramps				
Width of Ramps	90cm	Inadequate	Inadequate	Inadequate
Slopes of Ramps	% 8	Inadequate	Inadequate	Inadequate
Open Area Dimensions	250 cm	Inadequate	Inadequate	Inadequate
Railing Height	80 - 90 cm	Inadequate	Inadequate	Inadequate
Building Entrances				
Entrance Space	150cm	Inadequate	Available	Available
The Space at the Door Openings	150cmx150 cm	Inadequate	Partially	Available
Automated Lighting Fixture		Inadequate	Inadequate	Inadequate
The Height of the Door Handles	90-110cm	Partially	Partially	Available
Elevators				
Minimum Dimension of Elevator Cabinets	110cmx140cm	Inadequate	Inadequate	Inadequate
Automated Elevator Doors	80cm	Inadequate	Inadequate	Inadequate
The railing Height in the Elevators	85cm-90cm	Available	Available	Available

Table 5.9 Period III Disabled Accessibility Findings on Case Studies

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7. BIOGRAPHY OF THE AUTHOR

Name-Surname: Seda Şahin

Place of birth and Date: Trabzon, 1984

License: Yasar University Architecture Department of Faculty of Architecture(2009),(The Third Section)

High School: Trabzon Anatolian High School , 2004