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CONTENTS

USE OF BORON WASTES AS AN ADDITIVE IN BLEND BRICKS

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I am submitting a research paper titled "**Use of boron wastes as an additive in blend bricks**." This study's aim is to help understand the effects of the boron's physical, mechanical and SEM in high Kastamonu Houses. This study is a unique experiment in that it seeks to improve boron waste. In this article, the recycling of the wastes of the boron mines has been replaced with the blast brick used in the Katsamon houses. Physical, mechanical and SEM views have been taken. The results have been positive contributions. I think that the literatüre would contribute.I declare that the manuscript has not been published or offered for publication elsewhere in substantially the same or abbreviated form, either in print or electronically. Materials contained in the manuscript represent the opinion of the authors alone and should not be construed as the opinion of the editors and/or the publisher. I declare that all authors mutually agree that the manuscript is suitable for submission. I also declare that the manuscript contains the original work of the authors. I declare the novelty in results/findings or the significance of the results.

1. INTRODUCTION

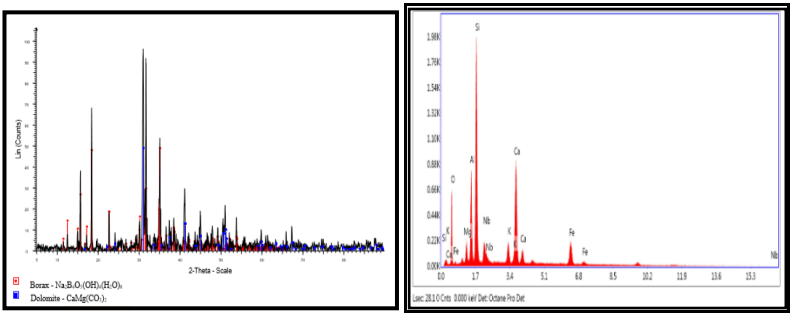
Boron deposits are found in significant amount in Asia [1]. Turkey and the USA are the leading boron producing countries [2]. They produce about 90% of the total boron minerals [3, 4]. In west Turkey, 803 million tons of boron reserves of the total known boron mineral deposits in the world are located [5, 6]. Tincal, colemanite, and ulexite are commercially the most important boron minerals [7]. The largest boron reserves in the world with 72% share in terms of B_2O_3 content are controlled by the Eti Mine Works, a state mining company [8].

Kırka Boron Operation Directorate, Kırka-Sarıkaya Borax deposit located in the south of Eskişehir province is one of the biggest boron reserves in the world [9]. The wastes generated as a result of the treatment in the ore bed are collected in waste reservoirs. The storage place of these wastes causes environmental problems, such as destruction caused in nature, air, water, and soil pollution. These problems can only be overcome by recycling the wastes [10, 11]. The wastes are used in ceramic, glass, cement, and brick sectors [12]. Elbeyli et al. [13], and Uslu and Arol [12] reported that the specific gravity of the blended brick sample with 10% boron waste additive has decreased in comparison with the reference sample. Akyıldız [13] determined that in boron additive concrete production with boron waste additive, an addition of 6% of boron waste decreased the weight per unit of volume. Abalı et al. [14] found that water absorption was reduced by increasing the ratios of additive at the rates of 1%, 3%, and 5% boron wastes and a boron waste additive of 10% increased the water absorption. Özkan [15] used 5%, 10%, 15%, and 20% of boron wastes and found that there was a decrease in water absorption between 0% and 10% but an increase after 10%. Kavas and Emrullahoğlu [16] stated that adding boron wastes decreased the water absorption amount in brick material. Kurama et al. [17] found that an increase in the amount of addition of boron wastes in samples with boron additive reduced the water absorption rates. Olgun et al. [18]

concluded that using 2%, 4%, 6%, 8%, and 10% boron waste as an additive in wall tile production decreased the water absorption rate up to 8% but increased at 10%. Topçu and Boğa [19] and Akyıldız [13] reported that usage of boron wastes at 3% and smaller percentages would be more useful. Yaman [20] reported that up to 6% boron waste can be added as an additive to floor brick, floor tile, and tile pug.

2. MATERIAL AND METHOD

The boron waste used as additive material in this study was obtained from Eti Mine Works Kırka Boron Operation Directorate and clayey soil, which is used as the main material, was obtained from a clayey soil mound in Taşköprü district of Kastamonu province. Figure 1 (a) shows the mineralogical structure of tincal wastes and Figure 1 (b) shows the mineralogical structure of clayey soil used. When the mineralogical structure of the clayey soil is inspected, high density of Silicon (Si) element can be seen.



(a) (b)

Figure 1. (a) Mineralogical structure of tincal wastes. (b) Mineralogical structure of clayey soil.

The sample, which was taken with the help of the quartering method, was grinded with a laboratory-type roller-crusher, and 1 mm undersize material was obtained. The boron waste to be used as additive in the test was subjected to the same process. The recipe prepared for the mixture is given in Table 1. Kneading water for the prepared samples was added to each mixture at 20% of the total material weight.

Table 1. Mixing Ratios Recipe

Recipe	Clayey Soil (%)	Boron Waste Additive (%)
Reference Sample	100	0
2% Boron Waste Additive	98	2
4% Boron Waste Additive	96	4
6% Boron Waste Additive	94	6
8% Boron Waste Additive	92	8
10% Boron Waste Additive	90	10

After the ingredients were dry mixed, water was added and mixed by hand several times and then the pug formed was left to rest. The prepared pug was allowed to rest for 24 hours without letting it lose its moisture, and then it was kneaded (5 minutes) with a mixer until plastic consistency was achieved and no air bubbles were left. After the kneading process was completed, the mixture in plastic consistency was poured into steel molds with dimension 4 × 4 × 16 cm. The test samples were removed from the molds after being left under normal atmospheric conditions for 24 hours. The samples were then left to dry for 7 days in a semi-open area. After 7 days, the blend bricks were fired at 900°C for 8 hours in a time-controlled electric muffle furnace. Then the samples were cooled to room temperature (+ 21°C). The fired samples were subjected to required tests to determine their mechanical, physical, and structural characterization according to Turkish Standards.

3. EVALUATION AND DISCUSSION

The study was conducted in three phases. First, the quality of the produced blend bricks was determined by subjecting them to tests, such as specific gravity, saturated weight per unit of volume, capillarity, porosity, freezing–thawing effect, abrasion, compressive strength, and tensile strength in bending. Then, SEM images were obtained to determine the structural characteristics of the blend brick samples. Finally, the data obtained were compared with the reference samples. The values for specific gravity, saturated weight per unit of volume, capillarity, porosity, freezing–thawing effect, and abrasion are given in Table 2, and the values for compressive strength and tensile strength in bending are given in Table 3.

Table 2. Averages of results of physical tests of samples containing boron waste additive

	Specific Weight (g/cm^3)	Saturated Weight Per Unit Of Volume (g/cm^3)	Capillarity (gr)	Porosity (%)	Freezing-Thawing Effect (%)	Abrasion (cm^3)
Reference Sample	3.11	2.15	99.16	22.1	15.45	11.31
Sample with 2% Boron Waste Additive	3.10	2.12	98.5	21.9	16.26	11.0
Sample with 4% Boron Waste Additive	3.07	2.08	97	21.7	17.78	10.7
Sample with 6% Boron Waste Additive	3.03	2.06	95.8	21.2	19.23	10.3
Sample with 8% Boron Waste Additive	3.01	2.0	94	20.8	19.18	9.6
Sample with 10% Boron Waste Additive	2.98	1.8	96.2	22.0	29.01	10.1

The specific weight of the samples containing 2% boron waste additive is found to be higher in comparison with the other samples containing additives. Therefore, an increase in the ratio of boron wastes additive causes a drop in the specific weight of blend bricks. As the percentage of boron wastes additive increases in the samples with boron wastes additive, saturated weight per unit of volume decreases inversely proportional to this increase. The best results are obtained from the blend brick sample containing 10% boron waste as additive. This shows that the blend bricks samples, which will be used as external wall filling material subject to atmospheric conditions, will be more durable. The samples, which were prepared by 8% of boron wastes as additive, are observed to be having the least amount of capillary water absorption. As the ratio of capillarity decreases in the samples that have boron wastes between 2% and 8% as additive, the amount of capillary water absorption ratio starts to increase in the samples, which are prepared with 10% of boron wastes as additive. In other words, it was determined that the optimum rate of substitution of boron wastes was 8% according to capillary water absorption test result. When the samples which contain boron wastes as additive are fired at 900°C, the boron wastes form a glassy structure in the sample. It was determined that this glass mass fills or blocks the pores and thus decreases the ratio of water absorption. In other words, the increase or decrease that occurs in porosity similarly affects the amount of water absorption. The boron wastes

as an additive have a positive effect on blend bricks that are to be used as external wall filling material. By reducing the amount of capillary water absorption of samples exposed to atmospheric conditions, such as rain and snow, the indoor comfort conditions of the building will be improved. The samples, which are prepared with 8% boron wastes substitution, are observed to have the lowest porosity ratio. The blend bricks, which have boron wastes substitution ratio of 2%, received values close to those of reference samples at the end of the freezing–thawing cycle. The samples with boron wastes substitution ratio of 10% are observed to have lower compressive strength against freezing–thawing effect in comparison to the other samples. As a result of the freezing–thawing test, it has been seen that when boron materials are used as additive at low addition rates, positive results can be obtained. It has been found that, with a 10% increase in the amount of boron wastes used as additive (between 2% and 8%), the amount of abrasion decreases but it shows an increase again at the amount of 10% boron wastes as additive.

Table 3. Results of mechanical tests conducted on samples

		Values of Samples (MPa)					
		REF	**BWA 2%**	**BWA 4%**	**BWA 6%**	**BWA 8%**	**BWA 10%**
Mechanical Tests	**Compressive Strength**	4.45	4.55	4.61	4.68	5.94	4.86
	Tensile Strength in Bending	0.64	0.60	0.52	0.48	0.44	0.50

It has been observed the compressive strength of the samples containing additives increases with an increase in the amount of boron waste. While the highest compressive strength ratio belongs to the samples containing 8% boron wastes as additive, it has been observed that the ratio of compressive strength decreases when 10% of boron wastes are used. The tensile strength has decreased with an increase in the amount of added boron wastes.

Figure 2 shows the SEM images obtained to determine the structural characterization of reference sample, sample with 2% boron wastes, sample with 4% boron wastes, sample with 6% boron wastes, sample with 8% boron wastes, and sample with 10% boron wastes.

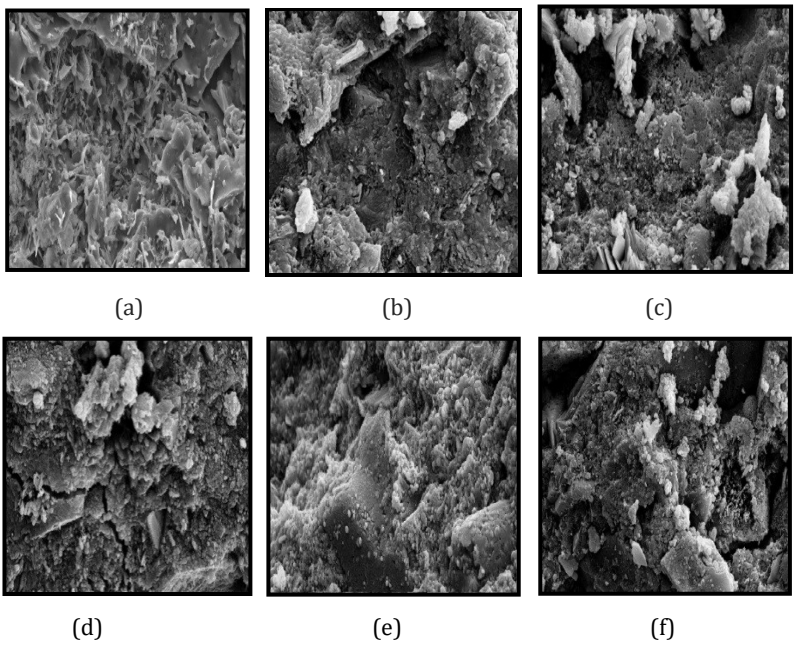


Figure 2. SEM images of (a) reference sample, (b) sample with 2% boron wastes added, (c) sample with 4% boron wastes added, (d) sample with 6% boron wastes added, (e) sample with 8% boron wastes added, (f) sample with 10% boron wastes added sample

In the SEM images of the reference samples, the crystal structure is rarely seen and the density of the amorphous structures is abundantly observed. The existence of abundant amorphous structures can accelerate the conversion of crystalline structures into amorphous structures over time. It has been determined that the crystalline structures increased as the addition of boron increased in the samples that contain boron as additive. However, this increase took place in the samples with additive ratios between 2% and 8%, and when the amount of boron addition was raised from 8% to 10%, partly amorphous structures have been noticed. In any case, the addition of boron provides support to the crystal structure up to a certain amount of additive, after a certain amount of additive is added, it turns the material into amorphous. Therefore, in this study, the optimum working amount of boron as an additive has been determined as 8%. In addition, more than one crystal structure example, which occurred because boron was used as an additive, has turned into a single crystal structure in the sample with 8% boron additive. While crystalline structures with beads exist along with the layer-like crystalline structures, especially in the samples with 2% and 4% boron additive, these structures turn into solely structures with beads due to boron increase. Thus, it has been observed that addition of boron stabilizes of the

material. As it is seen, the indication of the sample with 8% boron additive showing superior properties than the other samples is stated in the structural features of the material and also is supported by the SEM images.

4. CONCLUSIONS

In this study, it has been determined that the wastes released from Kırka Boron facility, which are rich in boron oxide, can improve the properties of blend bricks and can be used if substituted at appropriate ratios. In this study, the optimum ratio of the additive has been determined as 8%. Since blend bricks are used as an external wall filling material and are subjected to atmospheric conditions, the blend bricks produced with boron additive can easily be used if properties, such as abrasion, capillary water absorption, and resistance to freezing–thawing effect, are improved.

The use of boron wastes in the production of blend bricks will not only protect the environment by eliminating hazardous wastes but will also reduce the costs associated with waste storage. Buildings that are built using blend bricks produced with boron waste will be more durable in terms of strength. Particularly, its use in seismic belts will provide positive effect when additional strength is needed in cases such as an earthquake. The findings of this study should be investigated further for using boron waste as an additive in blend brick production and for using them in industrial sector.

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THE USE OF THE VIRTUAL REALITY IN INTERIOR ARCHITECTURE

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Introduction

The human being, who is constantly questioning from the past and searching for solutions to these questions, has to live with the technological developments where a new one is added every day and keep up with these developments. Modern societies are in constant development and change with new information brought by information age. This development is living rapidly in the field of social, cultural, political, economic, health, science and art. Modern societies first perform change in the field of education. Because people of this age are well aware that development begins with education and all other disciplines follow. One of the most important disciplines affected by education is design. One of the design disciplines is Interior design. Interior design discipline has developed different presentation techniques throughout history. In recent years, a technically evolving concept of virtual reality has emerged. Virtual reality technology, which finds itself in design disciplines and used in many different areas, also finds its place in interior design space design process and its usage fields are expanding on this area.

Virtual Reality

Technological applications are very important in the acquisition of cognitive, emotional and deviant behaviors in education. In the disciplines of architecture, engineering and design, new methods and techniques should be developed in order to acquire these behaviors, which will contribute much more to learning and teaching, instead of the traditional methods of teaching so far. These searches have brought about the concept of "virtual reality", one of the most effective methods of learning and teaching. The concept of virtual reality was first introduced by Jaron Lenier in 1980. According to Coates (1992), virtual reality is "electronic simulations that enable users to experience realistic 3D situations through headlines, glasses and cables". According to Gaddis (1998), virtual reality is defined as a "real or imaginary environment, or a computer-generated simulation of the world" (Oppenheim, C., 1993: 217).

In short, virtual reality is defined as technology that enables three dimensional animations and shapes created using computers to interact with these objects in addition to giving them the feeling of being in a real environment in the mind of the individual by using technological tools.

Especially in most design disciplines, the use of virtual reality applications that are not included in the curriculum of the students; Provides students with the opportunity to learn by doing, living and experiencing at an upper level, increasing their confidence in their first experience, improving their decision-making skills, reducing their anxiety level, and increasing their level of achievement and motivation. In addition, when students ask for it, they will have the opportunity to experience it in a safe environment. Thanks to virtual reality technologies, students will be able to communicate the theme they want to convey in an easier and more understandable way. It is

difficult to transfer the ladder systems in the curriculum of architecture and other design disciplines in 2D paper plane, but the transfer and understanding of these systems is much easier with the concept of virtual reality.

Types of Virtual Reality

Blended Reality

This type of virtual reality is known as a mixed reality environment where physical and virtual environments combine and influence each other. While virtual environments do not connect with the real world, blended reality is connected. Neither the virtual world nor the real world dominate each other in blended reality. Thus, the two worlds are separated from each other in the blended reality (Orhan Özen, S., 2011).

Augment Reality

In this kind of virtual reality, reality is completed with virtuality. Users have the possibility to see virtual objects in the real world. The goal in the expanded reality is to improve the user's perception. To achieve this, all senses (vision, touch, hearing, etc.) must be applied. With these senses, virtual objects added to the real world are felt.

It is reported that virtual reality, blended and extended reality applications are based on various levels of interaction and different learning levels. It is stated that the practices provide a rich learning environment to far more than the individuals who can be reached. It is reported that it will be used as a solution to educational problems in terms of considering individual differences.

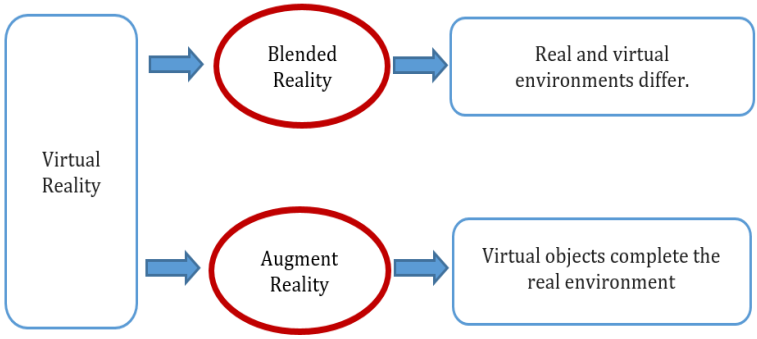

Figure 1. Types of Virtual reality

Virtual reality environment

Sherman et al. (2009) defined the virtual reality environment as interactive computer simulations that allowed the observer to move into motion by giving the impression of being in the simulation environment by entering the observer mentally (Sherman, WR et al., 2009). Porter (1997) stated that the virtual reality environment is to navigate in a three-dimensional artificial environment and experience it with others (Porter, T., 1997).

As understood from the definitions, the virtual reality environment is the environment in which the observer breaks mentally from the real environment and enters into the virtual world, has various interactions such as changing the places and properties of the objects, and these interactions are the sensory responses as in the real world.

The effects of the environment of virtual reality on the participants

- The environment encompasses participation,
- The participant is a feeling that you are there,
- Interacts with the participating environment,
- Examine the participant environment and be active in the environment,
- It is free to examine the participatory environment and to be active in the environment,
- Multiple users can interact simultaneously in the same environment.

Virtual reality equipment

Presentation systems

Virtual reality presentation systems are ranked according to their advantages and disadvantages considering factors such as accuracy, scanning speed and economic suitability.

Desktop Systems

The simplest applications of virtual reality presentation systems are simple hardware and software that require images from desktop systems.

Leading Presentation Systems

Thanks to the helmet attached to the head of the user, the head is kept under control and the computer provides the image and sound. The user hears the sounds coming from the headphones.

Boom

In the All-Way Directional Binoculars (BOOM) presentation system, a monitor is placed on an arm with mechanical trackers. A weight is placed on the opposite side of the strut so that the balance can be maintained. In order for this presentation system to work, the user should look at the binocular with his / her eyes. Any subsequent movements are perceived and visualized by mechanical monitors placed in the arm (Beier, KP 2004).

Cave

In the CAVE presentation system created by many users, the user enters a room by attaching followers to his body. After the user enters the room, the presentation is reflected on the walls of the room.

Virtual Globe

A spherical projection presentation system was developed by Julien Eyre in 1998, with a new presentation of the virtual reality system and a transparent sphere that allows light to pass through the main mechanism. Thanks to the translucent sphere that provides the passage of the light, the user in the sphere reaches the image (Tokman, LY., 1999) There is a low-pressure airbag in the glove which provides free rotation in any direction. As the observer moves, it revolves on the sphere, thus circulating within the virtual space.

Interaction Devices

Gloves

In the virtual environment, special gloves have been developed in order to provide the convenience of being able to use the hand and the sense of virtuality. One of these gloves is data gloves made from Lycra material.

Force (Space)

A force applied to a force ball, but not exactly displaced. The force is detected by the receiver located at the center of the ball and sent to the computer. Even the first user will be in the system within 15-20 minutes. It also takes up little space because there is no movement in the force fields.

3D Mice and Maneuver Arms

The mouse and maneuvering arms are particularly efficient devices for performing simple operations in two-dimensional environments. There are also mice developed for three-dimensional environments. These devices are also equipped with monitoring devices to detect positions and orientations (Perry LDS.ve et al., 2006).

Uses of virtual reality

- Use of Virtual Reality in E-Commerce
- Manufacturing Virtual Reality Use
- Use of Virtual Reality in the Entertainment Industry
- Use of Virtual Reality in the Art Space
- Using Virtual Reality in Simulated Training Workshops
- Use of Virtual Reality in Health
- Use of Virtual Reality in Education

Use of Virtual Reality Applications in Interior Design

The concept of virtual reality was first used in interior architecture in the 1960s. 20 y.y. In the studies done up to the end, the virtual necessity in general is the presentation of the interior design and its use in the drawing process (Çağdaş, 1994: 9).

In the first years of interior architecture education, basic design education is given in the space which deals with issues such as color, texture, mass, fullness-space. In the first years, the theoretical courses continue to become studio lessons in the following years. As the interior architecture education curriculum progresses, designers must acquire the skills needed to achieve the level of performance desired by them. One of these skills is to be able to express the design of the person in his mind in the most appropriate way and to reveal his / her design. In this case, the designer uses the virtual reality method which is one of the methods used in recent years.

İmage 1. Virtual reality environment

The effects of the use of virtual reality technologies on the designer in the space design;

- Provides faster results in the space design process and allows evaluation of different alternatives.
- Give the designer a sense of reality, giving the designer the feeling that he is in control.
- Provides mutual interaction.
- Allows the designer to examine places that exist in reality but where the designer cannot find exploration and inspection possibilities.
- It facilitates the creation of designs that cannot be brought to the square.
- Allows the designer to visualize and analyze in depth to the smallest parts of the design.
- Allows designers from different locations to come together and create common projects.
- It provides faster and better-quality learning by providing different designs to abstract designs (Çavaş, Huyugüzel Çavaş, Taşkın, 2004: 114).

Conclusion

In this work, information about virtual reality is given, information about the mechanical systems and usage areas of virtual reality technology is given. Finally, it has been mentioned the use in interior design.

With the use of virtual reality technology in interior design, the motivation of the designer increases, creativity develops, new design ideas can be generated and these ideas can be applied. The designer is able to express the space that he designed more comfortably by utilizing virtual reality technologies. The designed space also provides ease of production in the application phase and reduces the error rate to the minimum. Virtual reality technologies are expected to be used more and more in interior design space design over time, and developments related to this technology should be kept open and followed closely.

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REFLECTION OF BIOMIMICRY ON BUILDINGS

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1. Introduction

The needs of human beings are changing and increasing day by day. Nature is by the richest source of inspiration and knowledge that we have. It has various design patterns that provides to create durable, sustainable and elegant designs for human technologies. This condition is a result of 3.8 billion years of evolution [1]. Inspiration from nature has been observed in various of architectural building elements such as roof, facade, structural system etc. In different periods of the history of architecture, many famous architects such as Gaudi, Otto, Candela, Calatrava, Peter Cook, Norman Foster, Toyo Ito, Nicholas Grimshaw etc. inspired from nature in their architectural designs.

Biomimicry is a sustainable innovation inspired by the diversity of organisms in the Earth [2]. The word of biomimicry comes from Greek words 'bios' which means life 'mimesis' which means imitation. It is not only imitating nature's products, but also nature's materials and processes [3]. A more sustainable future can be created through considering nature as a model and examining biological models [4]. Architects are interested in biomimicry not only to discover new ways of building, but also to find new resources of inspiration for aesthetic concern. In many examples, it is observed that the buildings which are called as energy efficient, ecological or environmentally friendly buildings are more durable and require less energy or fewer materials. The issues related to the sustainability structures in architecture are among the problems that can be addressed by integrating the biomimicry understanding to an architectural design. Benefiting from an integrated design process can help developing facilities to determine energy oriented solutions to building problems. Biomimicry is considering as a significant approach for more sustainable and durable designs. However, it is still in the development stage and is not well detected. Therefore, it is not largely applied to the architectural designs [5]. In this context, the relation between energy efficient building design and the reflection of designs inspired by nature energy-oriented solutions are examined in detail in this study. Nature will be a more effective inspiration source to architects, engineers and many other disciplines as it is in the past. The design of ecological environmentally friendly buildings must be increased. Nature and architectural design must be intertwined for durability and sustainability. Architects and engineers have to make buildings that do more and using less. Nature is always using limited resources at its maximum level. Environmentally nature inspired understanding will contribute to new architectural designs and production of new technologies which are environmentally friendly and sustainable. Architects need to integrate nature's tremendous solution resources into building designs to reach more with less energy for an especially sustainable environment. Nature is the richest resource of inspiration and information and for zero and net zero energy buildings. It might have a solution to any problem with its different comprehensive solution resources. A sustainable world already exists. Nature is always an inspiration resource to many architects and engineers with its

durability, rigidity, lightness structures. There is a strong relationship between energy efficient, durable buildings and nature-inspired buildings.

2. Biomimicry in Different Study Field

The inspiration from nature is not something new in any discipline. Scientists for decades have looked to natural organisms as suggesting incredible models of that harmonious balance and proportion between the parts of a design which is suitable with the ideal solution. Biomimicry is a new way of considering and evaluating nature based not only on what can be gained from the nature, but also on what can be learned from it. Biomimicry explores to understand how we ought to integrate ourselves with nature. It addresses extensive study field such as medicine, manufacturing, engineering, architecture, material technology and many other technologies. Ecological products design that compatible with nature is a significant factor. The integration of biomimicry in the phase of creating an ecological product design, there are some key factors to realize. They should be adaptable in short term novelty, recyclable, manageable, easily maintained and self-repairing although some characteristics could have limited functionality but credible [6].

3. Biomimicry in Architecture

Biomimicry proposes a transformational approximation to response the requirements in the building industry via imitating the forms, working mechanisms, living process and systems in the nature [7]. It offers a theory that can be called as model, mentor and measure. It helps imitating designs in the nature in terms of forms, processes and systems as a model. It develops a point of viewing and understanding as a mentor. And as a measure, it benefits from an energy efficiency standard to evaluate the sustainability of the designs [8].

3.1. Form

Biomimicry as the main resource of creativity in design has been secured a position to its application in architecture and engineering, through inspiration and innovation as two key elements for a sustainable development [9, 10]. However, some misconceptions and practices of biomimicry have realized. As an example that some architects and designers only imitate the forms of living organisms. However, the appearance should not be only taken. Its concepts, structure, mechanism and its incredible functioning should be taken into account. If these are not considered in a design this cannot be counted as a real biomimicry. It can be only called as bio morphism [11]. The ever-changing nature of our environment has enabled both plant and animal life to develop and adapt to survive. This valuable process has long been a vital source of inspiration for architects, engineers and for the building design. This is significant because these designs are not just aesthetically pleasant but are also durable, energy

efficient and environmentally friendly. Imitating forms from nature is generally the most known type of biomimicry usage in especially architecture and engineering. However, instead of simply imitating the forms in the nature, the architects and engineers should integrate certain concepts of nature into their designs such as functionality, durability, sustainability, material technology, construction and working mechanisms of nature's great structures. Le Corbusier declared biology to be "the great new word in architecture and planning".

3.2. Structural Design

Most of the structural systems imitate the nature. People have struggled to survive against challenging climate conditions such as rain, wind, snow and etc and from possible dangers from past to present. The structure and strength are in the foreground rather than aesthetic concern. In order to survive, they begin to make shelter for themselves by referring to the natural materials available and some natural structures such as bird nests and other animal huts. Living outside for hunting and gathering needs temporary shelters. In the first stage, it means the beginning of architecture. As technology progresses, it allows people to have more variety in the design of their shelters. These developments can be easily seen by looking at the history of architecture. Later, when people started farming instead of hunting, it became a main factor of permanent settlements in that time. The story of architecture begins with the transformation of tent-like structures into round houses. The mud-shaped and sunbaked brick technology was invented in the age of architecture. Later on the development of buildings with flat walls with windows was realized. After the Stone Age came and buildings were constructed from the block of limestone. Arches, domes, vaults and etc. were invented. These developments continued until one of the largest expansions of industrial revolution, and as it approached the Iron Age, architecture was overthrown at this age, and structural systems and architectural forms became more complex. It is going today's and tomorrow's architecture. As this technology grows faster and faster each day, some scientists think that nature can be the best source for people to learn from it. They believe that the organism does everything the people want to do without damaging their environment and their future.

Nature embodies all the prototypes of structural systems from cave houses to pneumatic structures. The search for new ways of building and maintaining a structure has the main purpose of reducing the amount of materials used to be more efficient, showing different options that can be confused with other functions such as nature, flexibility, deployment or pneumatic [12]. We can see the reflection of nature to the structural systems. A biomimetic structural form emulates natural structural forms in their sustainable performance, producing [13]. Biomimetic structural forms appear as a more effective flow system in which functions and forces show a tendency to move efficiently and survive better. Moreover, these members are abstracted in terms of geometry and structural system from the forms-

organisms in nature. For instance, while shell structures likes eggshells, tensile structures likes spider's web. On the other hand, while cell structures likes honeycombs, pneumatic systems like soap bubbles. Suspension structures, such as bridges have all of a piece with spider's webs. Membrane structures such as stadium roofs share the same structural principles with cell walls. Dome is similar to a seashell. It gains its strength from its multi-dimensional curvature.

3.3. Sustainable design

A new architectural style is to create an eco-friendly and adaptive building that is compatible to both indoor and outdoor on nature [14]. Nature has richest resources to provide humans for a more sustainable life. The ability of the buildings to the changing conditions on the environment is relatively new to the architecture profession. Living organisms in the nature are all capable of adapting to changing climatic conditions. Because, their anatomies are able to provide thermal balance through especially morphological and physiological behavior. In this regard, biomimicry is an important design tool that has a significant potential to develop a healthier, more sustainable design strategies. However, imitating nature does not conclude in more sustainable solutions under any circumstances [15]. Therefore, it is significant to consider different imitation levels: form, process ecosystem [1] Ecosystem level should be considered how a building behaves in a particular environment for improving probability of more sustainable adaptive designs [16,17]. Biomimicry for developing more sustainable, energy efficient and adaptive designs with nature needs a sophisticated practice and interdisciplinary attitude. Nature is the most basic road map of architects and engineers for energy efficient and durable designs. The principles of biomimicry lead to an understanding of how energy usage can be reduced on a building. Benefiting from an integrated design process can help developing facilities to determine energy oriented solutions to building problems.

3.4. Materials

Biomimicry plays a significant role in material technology. The main area of interest is to produce better materials without secondary products, which are generally toxic, to produce materials from nature itself, and these inert materials are always biologically organic compounds [18]. The energy needed comes from the sun, so biomimicry can be a way of creating clean production processes with zero waste [19]. Many features of natural materials are environmental sensitivity, hierarchy binding, growth and auto repair [20]. This structure helps recover the coral reefs during the deposition of minerals diluted in sea water. This can be a way of creating strong materials for construction [21]. The usage of light materials should be preferred for the ecological balance in the nature. Nature is always using limited resources at its maximum level. The organisms and elements in the nature has valuable resources in this context. They include various clues

related to a lighter, durable and sustainable construction. For instance, concrete is commonly used material in constructions. By the way of imitating the natural coarse aggregate in concrete, environmental degradation can be prevented largely [22]. As in many sectors in the building industry, biomimetic reflections can be observed in the paint sector. The self-cleaning incident in the lotus leaves and flower was known for many centuries. The lotus effect or in other words nature's principle of self-cleaning surfaces is related to the high incidence of repellence between the leaves of the lotus flower and water. Water drops pick up the dirt particles. Lotus plant is considerable significant and nowadays commonly used for various conditions. The most well-known application is self-cleaning paint, as known as Lotusan [23] On the other hand, Reflective glasses are shown responsible for the bird deaths, especially in multi storey buildings. The reflection of the nature to the reflective glasses seems like there in no glass in the building for the birds. The Arnold Glass Company developed a product by using biomimetic. The company evaluate spider webs in terms of their ability that how they have protected from bird flights. They realized that spider webs have a reflective element that is in the UV range, however it attracts insects. While this element increase foraging of spiders, it prevents destruction on the spider webs at the same time. The company called this element as 'Ornilux' that integrates UV reflective elements into its glass [24].

3.5. Systems

Nature inspired building cooling system comes from the African termite mound. Termites and the structures they build have been used as samples of biomimetic designs for climate control in buildings like termite-inspired buildings as Zimbabwe's Eastgate Centre. Similar with the termite mound, the building benefits from the mass of the building as a heat sink that insulates the building from the daily temperature changes. In that building, an air-change system was developed that uses a central atrium to passively drive air from the ground level of the building towards to the stacks on the roof [25].

Buildings envelopes are significant systems for a building in terms of energy efficiency and especially its sustainability. For the design concept of an energy-efficient building, building envelope is the first to count on the energy consumption change [26]. It will provide us to reduce energy needs by carefully designed building and its envelope. In today's building skins do not have an interaction with nature and are dangerous to the environment. Moreover, energy efficiency is a vital condition on today's building skins. Because, the building skins have a key role in energy consumption of a building. They are the skins of a building as an organism's skin in nature that they provide interaction between interior and exterior of a building. Lately, integrating biomimetic design in building envelope is one of the most development parameter for energy management in the building [27]. Natural skins organisms in nature give vital clues for building envelope design. By an investigation that how natural skins protect the interior from the exterior

environment, bio-inspired architectural skins in a building can be developed [28,29]. The building must be compatible with the local climate of the area where it is built. Organisms use what is available in their environment, concerning availability of energy source, material, climatic condition, adaptability cooperation etc.' Architects would be wise to learn how organisms do so [30,31]. Nowadays, building envelopes are connected with a wide range of innovative technologies. Technology can be counted as one of the main driving forces to transfer natures' principles to architectural designs

Solar radiation is a significant resource of light. It changes throughout various scales of time (i.e., hours, days, and seasons). The solar energy that gained from the sun in nature drives natural ventilation and the lighting. This condition provides reducing energy loads during whole life cycle of a building. Therefore, the solar energy usage could be performed during construction process. The building cannot entirely ensure its own energy needs. The adaptations of a building to its local climate is a key factor in terms of energy efficiency. The systems in a building and its envelope play significant role. Adaptive buildings can store the energy and provide when it is needed [32,33]. By inspiring the wrinkles and folds on leaves, scientists accomplish major gains in light absorption and efficiency of solar cells. They produced a biomimetic solar cell design that consists of a relatively cheaper plastic material. It can generate 47 % more electricity than the solar cells with a flat surface. Ultra-violet light is used to cure a layer f liquid photographic adhesive material, changing the speed of curing to design both shallower wrinkles and deeper folds in the material as like a leaf [34].

To simulate mechanisms and dynamics is to move or transport a small amount of energy. An important example is the whale-inspired wind turbine blade. The lumps on the hump allow them to equilibrate at low speeds because the wind blades allow to maintain rotation and reach continuous operation by increasing 20% of efficiency over a year [35].

4. Examples for Biomimicry in Architecture

There are various biomimicry examples in architecture. In this study some of them are presented. For instance, Beijing national stadium, constructed in China like the Bird's Nest **(Figure 1)**. The steel shell is designed by Arup architecture. This building is not only energy efficient and eco-friendly but also inspired by the nature.

Figure 1. Beijing natural stadium [36]

Architect Norman Foster inspired by this Venus flower designed Gherkin tower **(Figure 2)**. It has a hexagonal skin. Venus flower sits in an underwater environment with strong water currents and its lattice like exoskeleton [37].

Figure 2. Venus Flower and Gherkin Tower [38]

Eiffel tower which is constructed in Paris, is designed by Stephen Sauvestre. While Sauvestre is investigating thigh bone, he realized that thigh bone could carry the body's all pressure and force. He inspired from this function and used it in the design of Eiffel tower **(Figure 3)**.

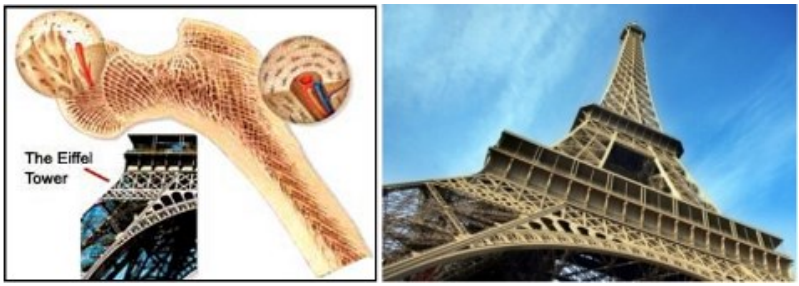

Figure 3. Thigh bone and Eiffel Tower [37]

Crystal Palace is one of the first and most famous examples of biomimicry was seen in 1851, designed by Joseph Paxton. He inspired from a kind of lotus called Victoria amazonica in the design of Crystal Place. Despite its elegant appearance, lotus has huge huge leaves and can carry people. Paxton inspired from the function of the lotus leaves in the design of the Crystal palace roof **(Figure 4)**.

Figure 4. Crystal Palace and lotus [39]

Munih Olympic stadium's roof is designed based on the wings of the dragonfly. Despite the thinness of the wing of the dragonfly, it is very strong. Because, it consists of approximately 1000 compartments. Thanks to this segmented structure, the wings of the dragonfly are not turn and they can resist air pressure **(Figure 5)**.

Figure 5. Munih Olympic stadium [40]

Radiolarians and diatoms have rich structures that can provide an architectural catalog. Various architects are inspired from these alives in their projects. EXPO 76 USA pavilion, constructed in Canada in 1976, inspired from Radiolarians. The dome of the building is imitated from these alives **(Figure 6)**.

Figure 6. EXPO 76 USA pavilion [41]

In EDEN project, the building consists of two main biomes and each consist of several domes joined together and joined in the middle by the link building. The project's starting point is the geodesic dome. The area is a rugged terrain. It is a clay pit area. For solving this problem, Grimshaw inspires from soap bubbles. They can adapt to any surface they settle on and

when two or more bubbles join to these, the line of the join is always exactly perpendicular. It is the source of inspiration for the rugged terrain and shifting sands of the pit **(Figure 7)**. Domes in the biomes have pentagonal and hexagonal connections. These surfaces in domes are covered an ultra-lightweight covering material called ethylene tetrafluoroethylene copolymer.

Figure 7. EDEN project [42]

One of the most effective ways to cut down the ecological footprint of the buildings is to evaluate nature through biomimicry. The Habitat 2020 building envisioned for China **(Figure 8)** is a future forward example of biomimetic architecture that fuses high-tech ideas with basic cellular functions to create 'living' structures that operate like natural organisms [43]. The 'skin' of the Habitat 2020 building reacts to external stimuli, opening, closing and breathing throughout the day through a system of 'cellular' openings that allow light, air, etc. like the surface of a leaf. Habitat 2020 enhances the indoor air quality and ensures natural air conditioning. The skin can even absorb moisture from the air and collect rainwater before purifying and filtering it.

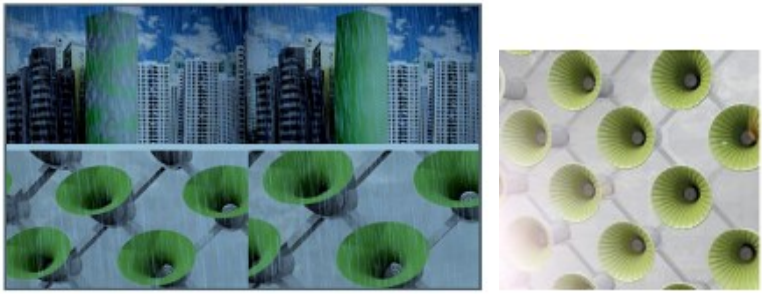

Figure. 8. EDEN project [43]

Conclusion(s)

Human being was surrounded by nature from the beginning of human creation. Everything in nature is well organized in a harmony with the other parts of it. Humans have long researched to nature for inspiration in answering the difficulties in every part of life. Biomimicry provides a better understanding in the design context for a more sustainable and durable future. The principles of biomimicry, especially imitating biological systems in architecture and engineering, generate new solutions to live in harmony with nature.

The main source of energy-efficient design approaches is the nature. All organisms in nature are equipped monumentally especially in terms of survival and energy matters. Nature has the most optimized organization in terms of form, function, structure, and material. It has all the makings of energy efficient design solutions in architecture. For this reason, architects or designers need to perceive nature as the main source and in this context, developing biomimetic design solutions by inspiration from nature have a great potential for innovation and energy efficient solutions.

In different periods of the history of architecture, many architects inspired from nature in their architectural designs. Architects are interested in biomimicry not only to discover new ways of building, but also to find new resources of inspiration for aesthetic concern. In many examples, it is observed that the buildings which are called as energy efficient, ecological or environmentally friendly buildings are more durable and require less energy or fewer materials. The issues related to the sustainability structures in architecture are among the problems that can be addressed by integrating the biomimicry understanding to an architectural design. Benefiting from an integrated design process can help developing facilities to determine energy oriented solutions to building problems.

In conclusion, nature will be a more effective inspiration source to architects, engineers and many other disciplines as it is in the past. The design of ecological environmentally friendly buildings must be increased. Nature and architectural design must be intertwined for durability, energy

efficiency and sustainability. Architects and engineers have to make buildings that do more and using less.

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A CONTEMPORARY REVIEW OF A TRADITIONAL CHILDREN PLAYGROUND

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INTRODUCTION

Child, as in all human societies, has also an important meaning for Turks (in the culture of Yörük [nomad] tribes) for the future of the public. Child is love of life, liveliness and young shoot for nomads who have had a long nomadic life at Middle Asia and after 1071 at Anatolia. The child who is the one that will provide the continuity of the generation in a society is the porter of tradition, custom and culture. Besides his/her other needs as being a small man, his/her playing need as much important as feeding has been known for ages. In lots of archeological studies it has found that small models of the things existing in life were realized for children. In this manner, "Cızırgan" functions as not a hand toy but as an outdoor playground, is a playing object that proves the importance given by Turkish Yörük culture to the child.

This paper focuses on current development of "Cızırgan". The paper, after an informing step, has an experimental method which shows the development steps of a product in the design field and the definition of its contemporary applications.

CIZIRGAN IN TURKISH YORUK (NOMAD) CULTURE

Important part of Turks, named as 'Türk', 'Türkmen', 'Yörük', 'Tahtacı' etc., and according to Prof.Dr.Faruk Sümer, grandchildren of Oğuz Tribe, have continued to their walk and lived as nomad communities after they have immigrated to Anatolia [1].

The general name 'Yörük' is the name given to the nomadic tribes that were existing at Anatolia and Roumeli (Balcans), living on with stockbreeding, living at grasslands (pastures and meadows) in winters and at plateaus in tents made of animal hair in summers.

Yörüks were innocent, artless, benevolent, honest and hospitable Turkish tribes. They were doing all of their own works. They were making their tents which were their homes, manufacturing their clothes. They were doing their ground clothes, saddlebags, sacks, carpets, covers and carrier bags etc. and preparing all of their foods. In the days of migration when all individuals in the community got decorated kids got dressed with their colorful clothes. At the camping sites, meat were eaten together, musical instruments were played; if there stayed a long time horse races and wrestling tournaments were held [2].

As 'being a Yörük' sense, gained by having a nomadic life and being in movement all the time, affects all life of nomad Turks, it also has affected the kids' playing life. Thus it has caused the born of a playing area that could be produced everywhere they have gone and installed easily. The name of the playground mentioned above, has developed with variety parallel to the development of the accents of Yörüks at different regions. At the west Mediterranean region "Kıncırak" is given to a playground that even children can install and play by rotating it. At Balıkesir region a playground named "Cingirgüç" having the same properties with "Cızırgan" could have been

surviving till today with Yörüks who live in a settled form but not nomadic any more.

"CIZIRGAN", "CINGIRGÜÇ" , "KINCIRAK"

This three names, having similar pronunciations, show that they have same definitions according to their explanations. "Cızırgan" is a playground that the paper owner, whom is a Yörük originated Turk, realized and played at her childhood: It consists of two very simple sticks and a connection element having a hanger. This connection element is assembled as rotating on the short stick. It has got a fork shape and this end part divided into two pieces is carrying the long stick. The long stick is a wood body, which Yörüks have found at the regions they settled, having 4 – 6 m length and 13 –20 cm body diameter capable of carrying one or two kids and an adult, or four kids, or in some cases guys having a kid spirit. The short stick is thrusted into the ground and carries the long one with its fork end and provides rotation with its rotating head. The name "Cızırgan" comes from the sizzling sound coming out from the friction between the long wood stick and the fork head of the short one while the long one is rotating and doing wavy movement.

Picture 1: "Cingirgüç" 1. Step

Picture 2: "Cızırgan" 2.Step

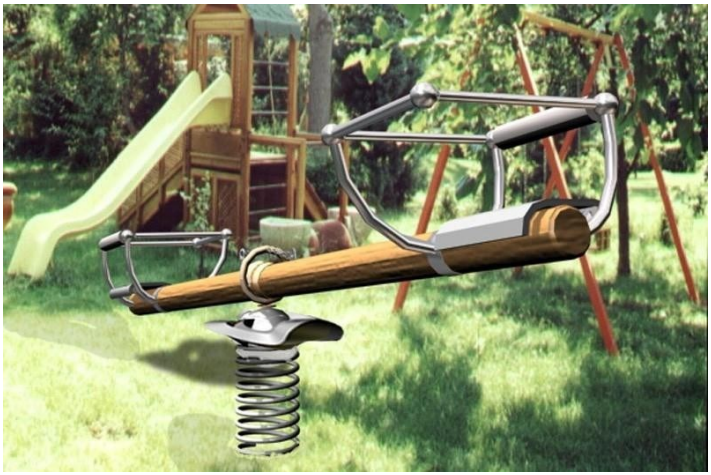
Either with its name or with its simple structure this playing tool is a sort of lever. This type of a lever-playing tool which is the fundamental of today's technology is also the first application of seesaws and revolving cupboards at the funfairs. "Cingirgüç"[3] even can be seen today at the settled Yörüks of Balıkesir city at west Turkey has the same properties with the "Cızırgan" which the writer saw and partially realized at her childhood. The writer who was born at the Elmalı Village of Niğde-Ulukışla and he was lived as a nomad at one end of Toros mountains, even a little, at the Toros Plateaus and remembers "Cızırgan" very well. "Kıncırak" is perceived as a playing tool similar to "Cızırgan" according to Musa Seyirci's description in a record explaining Yörüks. It is thought that both these three concepts describe same thing or very similar things with littledifferences.

Improvement of "Cızırgan"

The main principle of "Cızırgan" is that a stick rotating around a center activates and entertaines the ones on it by making wavy movements. The physical property of the stick assembled to the center from it's middle point and elongates to the opposite sides, is that it gains moment according to it's length, and this moment causes winnowing and waving movements. Improvement of Cızırgan is designated considering one or two kid sitting places, pushing and pulling places at the ends of the sticks, and motioning positions coming from the center:

1. **STEP:** First step has developed according to dealing with the most primitive state of "Cızırgan", redesigning it by adding catching bars, and providing rotation to half or all of the main body[4].
2. **STEP:** At the second step the connection to the center is reinforced. At the same time it's tried to prevent accentuation from the center. Seats are added to both sides and catching bars are added to the ends to provide an adult to rotate the sitting kids [5].
3. **STEP:** The third step provides the grown kids to achieve the Cızırgan to rotate and wave by their own confidentially without adults' help. For this reason sitting direction is adapted to the rotation direction [5].
4. **STEP:** At fourth step Cızırgan changed from center. Cızırgan's center will have a spring motion according to the moment on the stick length. Center is fixed to the ground using a well calculated spring. A semi-sphere item located at the top of the spring constitutes the motion mechanism; which the long stick is assembled to it and the piece, having a diameter of 60 cm, making wavy motion while rotating, is connected with plate elements at five points.

Picture 3: "Cızırgan" 3. Step



Picture 4: "Cızırgan" 4. Step

With this motion system Cızırgan will take first motion acceleration from kids' feet, it will wave equally and its rotational wavy motion will get easy by spring motion, during the poster presentation motion systems will be presented with that ergonomic situation. In the improvement of Cızırgan Design Turkish Standard 1176 is taken in consideration [5].

CONCLUSION

Cızırgan, as being a traditional Turkish playground, should not be covered in the history and should be transferred to today's life. The special area of Turkish Culture for kids should be enriched. In today's cultural improvements densifying on globalization, wealthies of local cultures should be protected and take their roles on protection of characteristics of their countries. Measures against every kind of degeneration should be taken.

Improvement of Cızırgan has started with these ideas. This improvement is going on, and studies to reach the ultimate aim have been carrying on.

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BIBLIOGRAPHY OF FIGURES

8. Figure 1- "Cızırgan" – "Cingirgüç" : Definitions of M.Dündar's childhood memories and Star TV Documentary Film on 22.05.2002 at 09:27 AM from Bükdere Village of Balıkesir City.
9. Figure 2 – Transfer of Cızırgan's first definitions into drawing format by Refik Yüksek, B.A. Architecht,
10. Figure 3,4– "Cızırgan"s 3.,4. Step Improvement, Designer: Seçil Şatır

TO INVESTIGATE THE DESIGN APPROACH FROM NATURE TO SPACE WITH SAMPLES

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1. Introduction

Biomimesis, a new discipline, is looking for ways to create innovative designs inspired from nature in many ways, from computer science to engineering, medicine to agriculture (Arslan Selçuk and Kumkale, 2005). The concept of biomimesis consists of the words "bios" meaning *life* and "mimesis" meaning *imitation* in Greek (Genç, 2013). Biomimesis has been a source of inspiration for the next generation of design by learning by mimicking the construction/formation processes and solutions of natural organisms. This concept has entered the literature as a product of the 20th century and has begun to be studied by different disciplines (Yıldız, 2010). Furthermore, biomimesis tries to find the answers to the needs of people, inspired by functional characteristics and systems organisms (Gertik, 2012). In essence, biomimesis offers a methodical approach to how to consider this biological data and how to transfer this knowledge to other domains.

After 3.8 million years of evolution, natural solutions are innovative, efficient and functional inside a perfect balance with the environment. For this reason, scientists from many fields of knowledge have begun to develop many projects with the aim of copying natural processes. This idea may seem radical for many people, but it is actually a new concept used for the production of goods and services by different organizations around the world (Rocha Rangel et al., 2012). In this sense, the idea of biomimicism for some ecosystem features plays an important role in reshaping ecologically human systems in terms of the notion of sustainability (Riechmann, 2006). The use of minimal materials and sustainability, as in nature, play an important role in the cities of the next century with the struggle to obtain lighter structures (Kaya et al., 2018). In the same way, structures in nature motivate innovation in architectural and engineering disciplines in terms of aesthetic, functional and structural advantages (Minsolmaz Yeler, 2015).

The aim of the study is to examine the concept of biomimesis with examples including a concept café design from bee-eye and separator element for a café from peacock feather.

2. Materials and Methods

In general, design methodologies of biomimesis consist of two main stages, including pre-design and simulation processes. The preliminary design phase involves the discovery of the problem and the examination of natural systems and organisms, which leads to a design concept. After the first stage, the transformation of the acquired knowledge into solutions for nature envelopes is a complex and multidisciplinary process that must include technological and industrial knowledge (Öztoprak, 2018). Therefore, the design approach developed in this study is at the preliminary design stage. In the study, bee eye and peacock feather were used as imitation material. The designs were created using 3D modeling programs.

The peacock is a bird that represents the sun, the beautiful, glorious prosperity and the nine virtues. It shows immortality, longevity, love and sympathy (Figure 1). Whatever the color, the peacock's feathers are made of protein in the form of melanin, which is transparent. The feathers have a main body, such as pine trees, where several small branches are firmly attached. Smaller branches are covered with feathers (Kang, 2013).

Figure 1. A view of peacock (URL-1, 2019)

A bee consists of three main parts: the head, the thorax and the abdomen. Its head has a pair of compound eyes, simple eyes, antenna, mandibles and a proboscis. It has three simple eyes (or ocelli) that allow the bees to detect changes in light. It also has two compound eyes to detect color and movement (URL-2, 2017). The compound eyes are made many small and repeating eye parts that is called ommatidia (Figure 2). In each compound eye, about 150 ommatidia specialized in seeing molds. This allows the bees to perceive the polarized light, something that people cannot do. Polarized light comes from the sun; this allows bees to see ways to return home on dark, cloudy days (URL-3, 2015).

Figure 2. Bee-eye (URL-4, 2014)

3. Results and Discussion

3.1. Cafe Design from the Bee-Eye

A concept cafe designed by inspiring from the bee-eye is illustrated in Figure 3. The design consists of three parts, one main and two side sections. The main section has some requirements according to the desired activity. The side sections are designed as a seating area. Tube transitions were established to provide the connection between the sections. The gates of tube passages can be opened and closed at any time. As the dimensions of the gates are large, a mechanism system has been developed to open and close easily. The electricity of the mechanism is provided by solar panels. The café design inspired by the bee-eye provides great potential for innovative natural light solutions. This design ensures that the area receives more sunlight than reinforced concrete buildings. This means a new understanding for sustainability and a new perspective for architectural design.

Inspired by the bee-eye, Fuller (1969) used Exohedral forms in the Geodesic Dome. Similarly, Badarnah (2015) focuses on the biophysical framework of heat regulation strategies for the design of biomimesis building envelopes, and states that such a design offers a great potential for innovative thermal solutions. There is a research that conducted to determine a biomimesis advantage of Saguaro cactus. In that study, a cylinder inspired by the Saguaro cactus with 24 circumferential grooves was observed to fluctuate over the cutting and tipping moments of the wind base compared to smooth cylinders for smooth and fluctuating waves, and it was found to be consistent

with two-dimensional studies in uniform low turbulent flow (Letchford et al., 2016). In addition, ElDin et al. (2016) and Radwan and Osama (2016) have developed thermal solutions for buildings with a biomimesis approach. Öztoprak (2018) redefines compliance with a new design approach called adaptive assembly lam by taking the analogy between skin and building coatings.

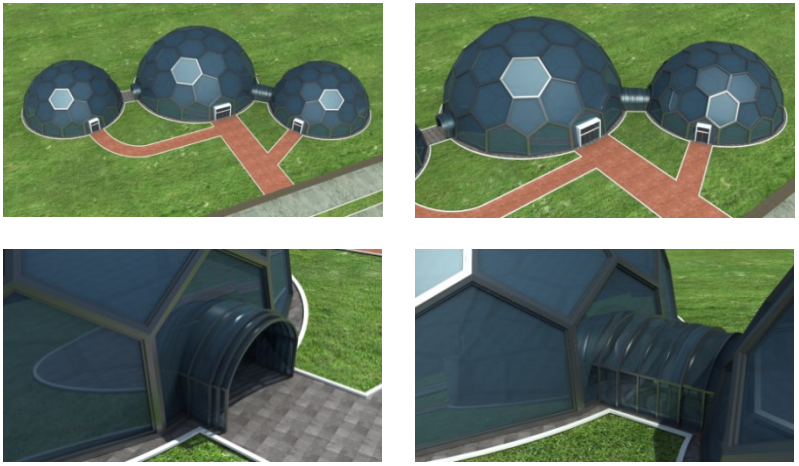

Figure 3. A view of the cafe design from bee-eye

3.2. Separator Element from the Peacock Feather

The separator element for a café inspired by peacock feather is shown in Figures 4 and 5. The cafe shape is half cylindrical, the height and width are 370 and 560 cm respectively. The separating element is located in the center and separates the cafe area, height 318 cm and width 530 cm. The wires that provide electricity pass through each arm to the colored glass sphere. The distinctive element is inspired by the peacock and is inspired by the opening and closing of its feathers. It works like a fan and is made of metal. In addition, the color of sitting elements of the cafe is chosen from the colors of the eyes on the peacock feather. This design provides both aesthetics and functionality to cafe. It also enables people to be aware of nature.

In a previous study (Canbeyli and Özen Yavuz, 2018), a distinctive element is planned by inspiring the honeycombs due to their features such as function, aesthetics, form, durability, flexibility and storage. There are other studies (Yiatros et al., 2007; Rian and Sassone, 2014; Holstov et al., 2015; Tavşan and Sönmez, 2015; Askari Nejad, 2016) proposing the possibility of biomimicry design use in buildings: material, shape and process.

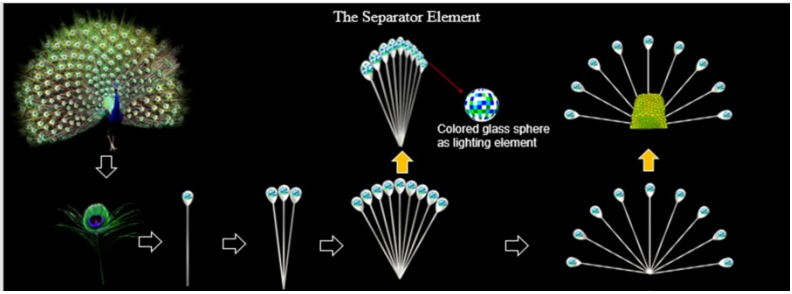

Figure 4. Peacock feather and the separator element from peacock feather

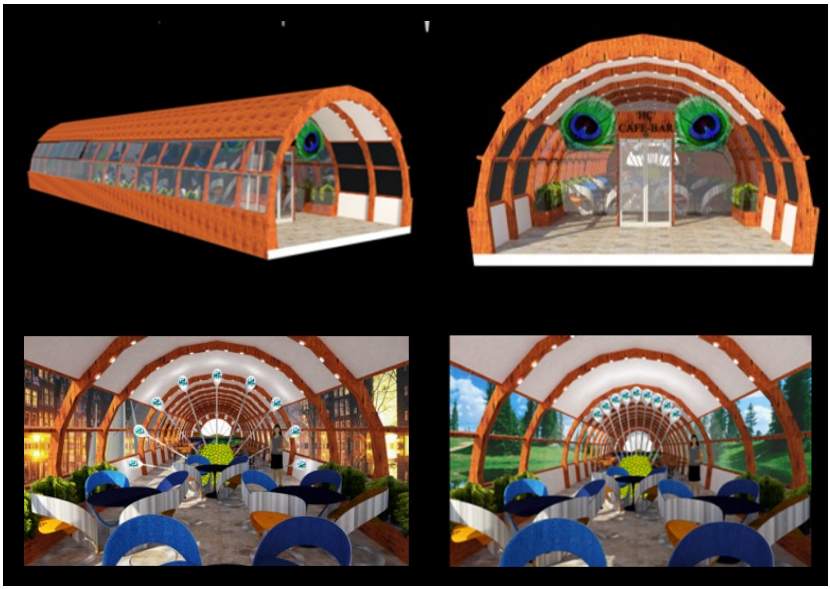

Figure 5. A view from the interior of cafe designed from by the Peacock Feather

4. Conclusions

This study is on the initial phase of a biomimesis design process providing an easier access to relevant analogies. With the proposed designs, this study can contribute to the sustainable development of the spaces and their structures. They also will present a new understanding to the usage of natural light and aesthetical material in different spaces. Eventually, spaces inspired by the bee-eye and peacock feather will be eco-friendly. Furthermore, it is possible to increase the awareness of people about nature with the spaces by means of biomimesis approach.

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ENVIRONMENTAL STRESSORS IN THE BUILT ENVIRONMENT PART THREE: CONTROL

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INTRODUCTION

Depending on their design approach and decisions, buildings with their interior environments are subject to be a contributor to cause of environmental stress on human behavior. This study is developed for raising awareness and reminds the design elements that have a potential to make a stress by influencing human physiological, psychological and psychosocial health.

Evans & McCoy (1998) describe five dimensions of the built environment that potentially could cause stress on human health. Stimulation, coherence, affordance, control and restoration are set of environmental dimensions inter-related to stress. In this study, interior design concepts that categorized under the dimension of control are defined and presented along with a view of environmental stressor.

Table 1. Control as an environmental dimension with interior design elements that may altered stress (Evans and McCoy, 1998).

Environmental Dimension	*Interior Design Concepts*
Control	Crowding Boundaries Climatic and light controls Spatial hierarchy Territoriality Symbolism Flexibility Responsiveness Privacy Depth Interconnectedness Functional distances Focal point Sociofugal furniture arrangement

CONTROL

Control refers to mastery or the ability to either adapt the physical environment or regulate exposure to one's surroundings (Evans and McCoy, 1998, 88). The concepts related to physical constraints such as crowding, boundaries, and territoriality and also the concepts of flexibility, responsiveness, privacy, spatial syntax, and spatial physical controls such as climatic and light controls are environmental design concepts salient to control. Inadequate resources and arrangements, lack of physical controls threaten human needs to for interacting with interior spaces efficaciously.

Crowding

The terms crowding and density are tried to differentiate by environmental psychologists and social scientists. Gifford (2002) reported a

distinction made by Daniel Stokols between density and crowding: *Density* is an objective measure of individuals per unit of area. It may be calculated for any area, from the whole earth to nations, cities, neighborhoods, buildings, homes and even rooms. *Crowding* is person's experience of the number of other people around. It is a personally defined, subjective feeling that too many others are around rather than a physical ratio. According to Evans and Lepore (1992) high density activates diminished control and overload on human behavior.

Crowding is one of the sources of stress. Spatial limitation heightens the salience of spatial constraints. "The restriction of movement occurred by limited space, would become most apparent while engaging in tasks requiring the coordination of one's own activity with that of others and the arousal of competitive feelings would eventuate in a tendency to perceive the presence of others as threatening and intrusive" (Stokols, 1972, 276). This feeling generates a desire to expand and protect one's personal space. Even in spaces except built environments, crowding is becoming a growing concern such as in public transport (Li and Hensher, 2013). It was reported that the experienced crowding leads to increased dissatisfaction such as stress and less privacy. Li and Hensher (2013) used a pictorial representation of crowding formed by UK Rail Safety and Standards Boards (2004). In this figure, the density variable was used as an objective measure of crowding, where respondents were presented with a scale made up of four pictorial representations (see Figure 1). Based on the Figure 1, it is supported by increasing the number of species living in the same area, crowding is aroused.

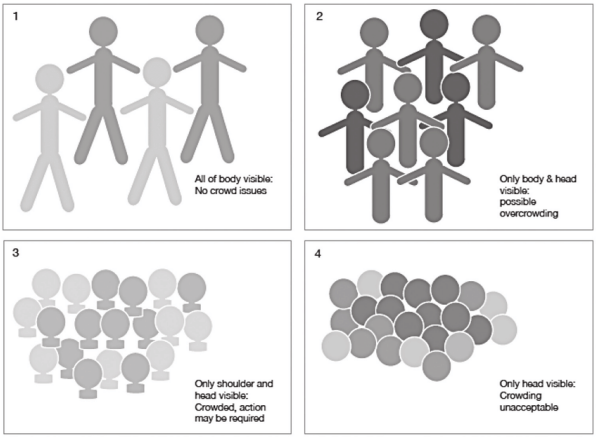

Figure 1. Pictorial representations of crowding. UK Rail Safety and Standards Board, 2004 (Li and Hensher, 2013)

Territoriality and Boundaries

Human territoriality is a powerful and widespread phenomenon in our lives. Territoriality is related to system the people use the land, organize themselves in space, and give meaning to place (Sack, 1986). Gifford (2002) defined territoriality "as a pattern of behavior and attitudes held by an individual or group that is based on perceived, attempted, or actual control of a definable physical space, object, or idea that may involve habitual occupation, defense, personalization, and marking of it" (150). Here marking refers to placing an object in as space to indicate one's territorial intentions, in other words determined the boundaries. Sack (1986) claims that in humans, territoriality is best understood as a spatial strategy to affect, influence, or control resources and people, by controlling area. Taylor (1994) stated that territoriality is a form of behavior that uses a bounded space, a territory. The concept of a territory can be managed and its character designed by controlling access to a territory through boundary restrictions.

Territoriality serves four functions: it provides security, privacy, autonomy, and self-identity, all which are important for human well-being (Hayter, 1981). Age, sex, culture and health status, influence the way people relate spatially to one another. Thus, territoriality varies with such personal characteristics as gender, age and personality. The most consistent finding is that males claim larger territories than females (Gifford, 2002). Careful attention to territorial needs as regard with demographic differences can contribute a great deal to humans' health and well-being.

Privacy

Privacy is a major contributor to a sense of control in interior environments. Like territoriality, it is an important process of our daily lives. According to Gifford (2002) privacy means two things to many people; being apart from other people, being sure that other individuals or organizations do not have access to personal information about them. Access is ambiguous here; it may sometimes mean physical contact or proximity but it is also used to connote the acquisition of knowledge about a person (Parent, 1995, 23).

One of the oldest definitions of privacy identifies it with the condition of *being let alone* (Parent, 1995). Parent also added another popular conception of privacy identifies it with *the control of information about oneself.* Privacy is based on the idea that there is a close connection between our ability to control who has access to us and to information about us (Barendt, 2017). Thus, privacy is important for human being as being a necessity to protect interests in competitive situations. If we are to maintain the variety of social relationships with other people that we want to have, then privacy is necessary.

Privacy has become more essential to the individual as the intensity and complexity of life have been increases. Through invasions upon one's privacy, subjected him to mental pain and distress (Brandeis and Warren, 1890).

Spatial hierarchy and responsiveness

Spatial hierarchy is a central design element that affects privacy. The spaces that present solitude and intimacy, through small group meetings to spaces provide a interaction with the others represents the major components of spatial hierarchy within buildings (Alexander, 1972 as cited in Evans and McCoy, 1998). *Solitude* refers to being alone; *intimacy* refers to group privacy, as when a pair of lovers wishes to be alone together (Gifford, 2002). Evans and McCoy (1998) gave a dormitory plan as an example in which a spatial hierarchy is supported well (Figure 2). Spaces for solitude or intimacy with private rooms, small groups and larger social gatherings with more public meeting areas are accommodated and defined well. A well designed spatial hierarchy influences the responsiveness of interiors. Responsiveness means the clarity and speed of feedback one receives when acting upon a setting or object (Wachs, 1989 as cited in Evans and McCoy, 1998). Distinct actions in a responsive environment produce unique feedback about the consequences of each act; the longer the delay, the poorer the responsiveness occur.

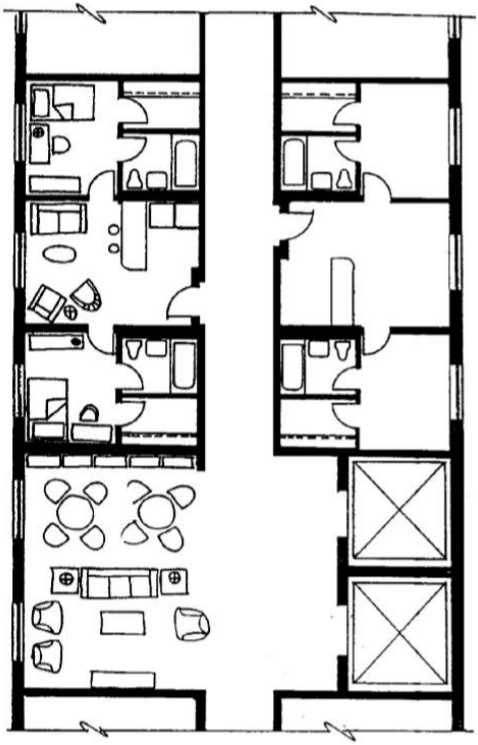

Figure 2. The scheme of a dormitory floor as an example of a design providing a well defined spatial hierarchy. (Evans and McCoy, 1998).

Interconnectedness, Depth, Functional distances and Focal point

The social adjustments of spaces are affected by doorways and passages that are interconnect spaces (Evans and McCoy, 1998). The physical adaptations connect two or more places and enables people to interact in new ways. The interconnectedness of spaces are provided by separations. Separations do not necessarily block the physical movements or all the senses at once (Zeisel, 1981). According to Zeisel separations may be;

- *visual* such as an opaque cardboard wall around a work area,
- *auditory* such as a blaring radio in an office so no one can overhear a conversation,
- *olfactory* such as a fan to keep kitchen smells out of the living room,

- *symbolic* such as a three-inch-high brick border around a front yard (105).

The number of spaces a person must pass through to get from one point to another in interiors refers to *depth* (Hillier and Hanson, 1984). Privacy is increased through deeper spaces, spaces provides social interactions are located mostly at welcomed first areas. Thus, visual and physical access through deeper spaces is mostly obstructed from social spaces. It is important to plan the spaces in a meaningful way according to their functions from the entrance to the deeper spaces of the structure. The functional distances between the spaces where has a potential of social interaction and spaces where mostly requires visual or physical privacy should be separated from each other and also related to each other at the same time. The directness of doorway openings and the intersection of circulation paths pave the way for a meaningful functional planning and influence social interchange (Evans and McCoy, 1998). Focal points that is a neutral territory in spaces, enhanced socialization and opportunities of small group interactions. In Figure 3 the small meeting area at an office as a focal point has social furnishing arrangements and provides a place where users can socialize by conversation, drinking coffee or tea. Focal point is separated from private offices and located near from wet spaces at circulation path.

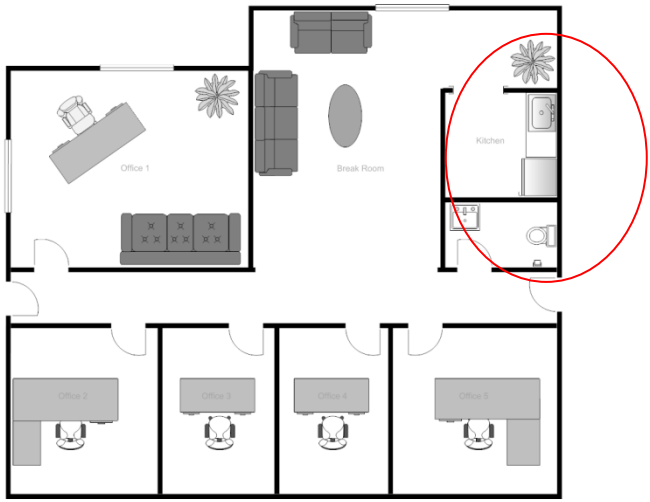

Figure 3. Focal point in an office floor.
(https://www.smartdraw.com)

Flexibility

Flexibility is an important quality that allows adapting emerged changes and occupancy rates in interior spaces. Abdulpader, Sabah and Abdullah (2014) define flexibility as:

> "one of the physical properties of materials and geometrical forms used in interior design, that property depends on the physical shape in additional to its compositional and other structural properties, so that repetition, balance, similarity can be used for making flexible space, which means that we can use that geometrical properties in order to gain a flexible space that can be transformed and multi-uses in the same plot area" (196).

The existence of flexibility can support spaces to adapt themselves to internal and also external changes, or even take advantage of new possibilities while in space (Nilchiani and Hastings, 2007) (see Figure 4 for flexible use of space). Abdulpader et. al (2014) supported the idea by stated the flexibility helps to find new architectural solutions to get maximum benefits and functional use of small areas. To create more flexible environments, the designers require an extensive framework that would allows an environment to accommodate in different usage scenarios.

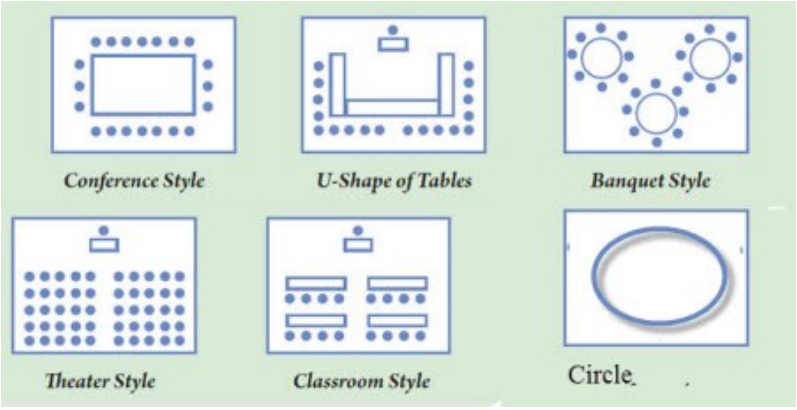

Figure 4. An example of flexible interior space design. (http://www.bethkanter.org/room-set-up/)

Sommer (1969) claimed that flexibility can be contributed by degree of perimeter openness, moveable partitions and semi fixed furniture. These suggestions of design solution can make the space feel more spacious and reduce the possible stress level constitutes by feeling of crowding, when there are so many people in the environment. Using moveable vertical and horizontal partitions gives occasions to control space levels according to demanded space area and makes the space feeling more spacious. The

flexible design of furniture (see Figure 5), flexible furniture with mobile anthers and flexible furniture with the structure of space allows maximum and optimum utilization of the interior spaces (Abdulpader et. al. 2014).

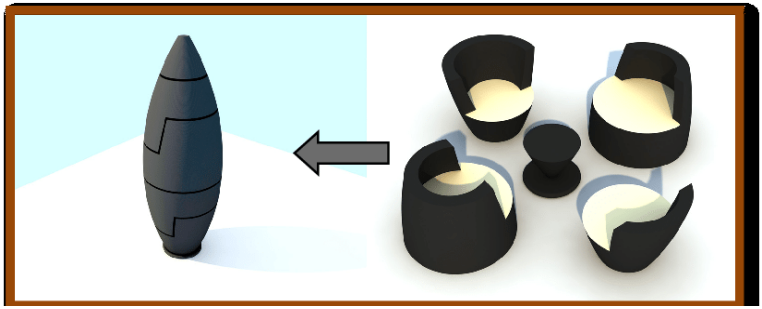

Figure 5. An example of flexible furniture design. (Abdulpader et. al. 2014)

Furniture arrangement

Researches on the social use of space suggest that, furniture arrangements in spaces can directly influence social interaction between human beings. Evans and McCoy (1998) stated that *sociopetal furniture arrangements* promote interaction by moveable elements, provision of comfortable interpersonal distances, ease of eye contact and physical comfort during conversation while *sociofugal furniture arrangements* are inflexible and eye contact is difficult or interpersonal distances are inappropriately close or far that discouraging social interaction (see Figure 6).

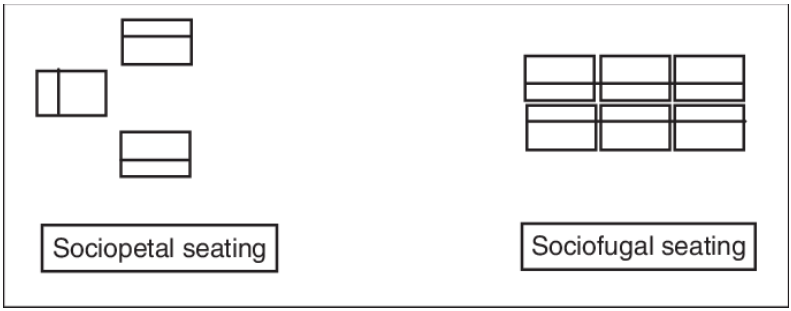

Figure 6. Sociopetal and sociofugal seating arrangements.
Sociopetal seating orients chairs to enable conversation; sociofugal seating discourages interaction (Rollins, 2009).

Holahan (1972) investigated the effects of seating patterns varied from structural sociopetal, sociofugal and mixed arrangements. Sociopetal and mixed arrangements demonstrated not only a greater amount and quality of social interaction, but also more personal interaction than did sociofugal

arrangement. Mehrabian and Diamond (1971) reported a two-sided relation between immediacy and liking: people who like each other prefer more immediate positions relative to one another, and immediate positioning of strangers' causes them to communicative liking to each other.

Circular and facing orientations in groups facilitate interaction. Patterson et. al., 1979 reported that the non facing orientation (L-shape) leads more frequent self-manipulative behaviors and postural adjustments and longer pauses than the facing orientation (circle-shape). Falout (2014) also stated that the circular seating arrangements provide a sense of belonging within a classroom community with positive effects on learning, emotions and well-being.

The design of the environment with the arrangement of furniture influences the social interaction by making regulation of interaction easier or more difficult. Social interaction serves more fundamental instrumental psychological functions (Evans, 1982). If the designed environment affect the dynamic regulation of the fit between what the individual needs and what the environment provides, then the possible way of interaction may become unpleasant that may also promotes a stress.

Climatic and light controls

Light affects not only vision, but also affects well-being and health. It is one of the most crucial physical design elements that give a character to a structure. Thus, the design of indoor lighting becomes a highly demanding task that requires great knowledge and experience (Küller, 2004). Considering lighting already in the beginning of the design process will ensure a much better result, including not only the fittings and power supply of the artificial lighting system, but the shape and size of rooms and windows, and even the orientation of the entire building. A good lighting system in the environment can be both satisfying and productive, bad lighting system might cause annoyance, fatigue and stress. The quality of lighting, the source of lighting influence the productivity, motivation, concentration levels of the workers in office environments.

Researches are an evidence that human being feel better under daylight conditions (Boubekri, 2008). Especially in the office interiors, workers prefer environments that have windows compared with those that don't. People feel energized, cheerful, and in a better mood when the sun is shining, but we feel grim, even depressed, during wintry or cloudy days. Daylighting openings allow people to connect with the outside world. In addition to psychological effects, Boubekri (2008) reported that for commercial and office buildings occupied during the day, total electricity and peak demand savings of 20 – 40% in lighting and cooling can be achieved with the proper use of daylight photo sensors along with other energy-saving systems. Thus, a strategic use of lighting in buildings has also affects the climatic qualities of the environment.

The influence of climate on human health is significant and varied. According to Mahmoud (2017) architects and interior architects have a variety of options to apply safety and health concerns considerations by adapting their design to utilize the features of climate environmental conditions through controlling the degree of sun exposure, temperature, wind, humidity and veneration. It is crucial to be aware of the materials chosen for the design, such as glass, paints, fabric types. the strength of friction as slip resistance. In addition it is important to be careful about the causes of toxicity and pollution that affect indoor air quality for preventing any chemical contamination especially with all types of paints, fabric and wall floor coverings (Mahmoud, 2017).

CONCLUSION

The built environment interferes into our consciousness when it stimulate particular harm, discomfort, pleasure or awe. Despite our lack of awareness, there is an increasing evidence that the designed environment may stress human both directly and indirectly (Zimring, 1981). The designed environment conceptualize here as a social-physical system where physical elements interact in complex ways with social structure and with individual goals and needs (145). According to Mental Health Awareness (2019) stress is our body's response to pressures from situation or life event. It is a degree to which human feel overwhelmed or unable to cope as a result of pressures that are unmanageable. Thus, as the built environment has influence mental health by altering psychosocial processes, the potential dimensions of the environments should be evaluated critically in regard to their causation of stress.

This study examines the *control* as an environmental dimension and investigates the influence of interior design concepts classified under the dimension in relation with human health. Crowding, boundaries, territoriality, interconnectedness and depth in structure, functional distances between spaces and also the concepts of flexibility, responsiveness, privacy, spatial syntax, and spatial physical controls such as climatic and light controls are demonstrated as environmental design concepts that influence the control dimension of an environment.

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THE REVITALIZATION OF URBAN RUINED REGIONS BY SUSTAINABLE DESIGN THOUGHT BRONX/NY SAMPLE

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INTRODUCTION

In big cities, the urban ruined and the area that has a better socio-economic condition can be juxtaposition however urban life continues independently of each other. Wealthy and poor regions separate as social and physical especially as from the end of the 20th century.

The concept of urban ruined especially has emerged intensively after 1960, as a result of failure to development of protection policies for the neighborhoods that had atrophied in the city center in parallel with the growth of the city. (2) Moreover, not only poverty regions are urban ruined areas but also developed metropolitan cities are able to become urban cavity areas. Because urban areas that have undergone disasters or wars, historical city centers that have lost their current functions and abandoned, industrial and port settlements that have out of use and located within the city had stayed out of everyday life and has grown irregularly.

BRONX REGION

The Bronx is located in the northernmost part of the five districts of New York City. It is located in the south of the Westchester area that is restricted with the Harlem River and in the northeast of Manhattan. Since 1914, it is the third densely populated region in the United States. According to the conducted census in 2017, the Bronx has a population of 1,471,160.

Picture 1. General view of the Bronx region / Yankee Stadium, Bronx Courthouse, Grand Concourse hill [16].

Figure 1. Location in New York [35].

The Bronx has divided by the Bronx River into a relatively higher region in the west and a section that could be considered flatter in the east. Western Bronx and the regions of east of The Bronx River have added in New York in 1874. They have left from New York region in 1914. Approximately, a quarter of the Bronx consists of open areas. These are Woodlawn Cemetery, Van Cortlandt Park, Pelham Bay Park, New York Botanical Garden, and Bronx Zoo in the North. These open spaces have obligately placed from north and east of the city as flourishing towards Manhattan at the end of the 19th century.

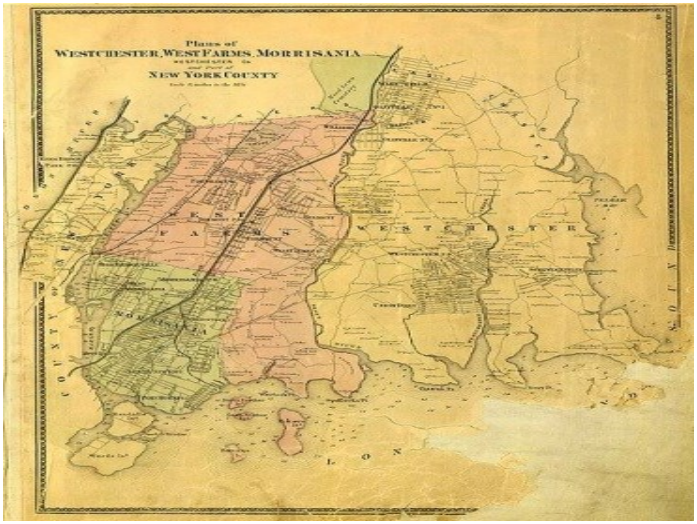


Figure 2. Bronx region in 1867 [16].

The name of the Bronx has derived from Jonas Brockton, who founded the first settlement in the region and known as a part of the New Netherland colony in 1639. In the 19th and 20th centuries, The Bronx turned into a cosmopolistic urban community such as including Africa, America, and Europe continentals.

Figure 2. President Jimmy Carter listens to his secretary Secretary, Patricia Harris, and visits the destroyed South Bronx, 1977 [19].

The Bronx is accepted as the 15th poorest region in the United States. However, it includes the neighborhoods that the wealthy, upper and middle-income groups, such as Riverdale, Fieldston, Spuyten Duyvil, Schuylerville, Pelham Bay, Pelham Gardens and Morris Park due to this cultural diversity. The Bronx, especially the South Bronx, lost a large part of its population in the late 1960s and 1970s due to the arsons. During these dates, the quality of life in the region has declined considerably. Since then, the city has developed relatively, especially in the late 1980s.

THE HISTORY OF BRONX REGION

It is possible to divide the history of the Bronx in the 20th century into three different periods. The Bronx region received very intense immigration between 1900 and 1929 and we can accept it as the first period. The population density increased to 1.3 million with the experience of 1929 and the World Economic Crisis. This period can be considered as a second period by extending it until the Second World War. After World War II it can be considered as the third period and it is observed that there is a somewhat, decrease in population.

Picture 3. Bronx region, 1900 [16].

While the Bronx had a predominantly middle-income population between the years of 1950 and 1985, it later became a low-income region with a high prevalence of violent crime and a high rate of poverty. Since the 1970s, Bronx came to the agenda with arson and building fires. The reason for these fires is very kindly. The fire starter aimed to take money from insurance companies by burning their low-value buildings. It is difficult to renovate an old building or sell it, therefore, this building is fired by an unnamed person. South Bronx was especially affected by this situation, and poverty and unemployment increased.

Picture 4. Simpson Street. The railway station on the bridge was built in 1904 and opened on 26 November 1904. It was included in the National Historic Places Register in September 2004 [16].

RENEWAL WORKS IN BRONX

A ten-year housing plan was created in the late 1980s in the Bronx. Economic and environmental infrastructure has been rebuilt through the creation of affordable housing and this project was encouraged. From this point, a working group has been created, this group contacted the churches in the South Bronx and they built Nehemya Houses in a thousand units. The parts of the South Bronx, high rise, multi-family city houses, as well as apartment buildings have been created and rehabilitated.

Chain stores such as Marshalls, Staples, and Target have started to open branches in the Bronx. Banks opened new branches in the region, and in the 1990s, $ 1 billion was spent on these renovation activities.

Picture 5. Charlotte Street and newly built houses [23].

In this process, 19,000 apartments were renovated and more than 4,500 new houses were built. As a result, the region has received more than 26,000 new immigrants. In 1985, prefabricated farm-style houses were built in Charlotte Street. In addition, as a feature of the region, the Bronx Courthouse has defined the Grand Concourse Art Deco architecture as a symbolic structure.

In 1997, the Bronx has been selected American City by the National City League of America. A significant number of new buildings have been built in the region since 2002. Since 2004, the value of the house has exceeded one million dollars. The majority of this settlement took place in vacancy in the South Bronx. Boutique and chain hotels started to open in the region.

Figure 6. Rebuilt Row houses [16].

Picture 7. Kingsbridge National Ice Center [36] [37].

The Bronx General Post Office at the corner of the Grand Concourse Street has been transformed into a market place, boutiques, restaurants, and office spaces. The Kingsbridge Armory army building has transformed into the Kingsbridge National Ice Center and re-planned.

Picture 8. Art deco apartment buildings in the Grand Concourse [23].

With the opening of Yankee Stadium in 2009, an important sports facility has been acquired in the region. Tennis courts, cycling, and walking paths, various shops and restaurants have planned and all connected by a new metro line.

Despite all these renewals and improvements, poverty, drug trafficking, and gang activities continued throughout the South Bronx region. The high crime rate also attracted attention by the NY police department and a special status has given to the region. Nowadays, the Bronx continues this renewal activity from the past with a changing design concept. The idea of sustainable design is the main idea of the renewal activity for the Bronx region. From this point of view, the buildings built with a sustainable design ideas and building complexes began to rise at various points of the region. The Via Verde Project, the Creston Parkview Project and the Bedford Green House can be given as an example to these.

VİA VERDE

The idea of sustainable design implementation to a large-scale building complex can come with some challenges. It can also be seen as another challenge to establish a healthy and efficient building and to make it affordable and accessible. However, the Via Verde project, completed in the Bronx, has been implemented with the idea of low-cost and sustainable design. The design of the building took six years and was built by Grimshaw and Dattner Architects and has been opened to service by New York Mayor Michael Bloomberg. The project, consisting of 222 housing units, is a mixed-use structure in the South Bronx. A green roof application was made in the project. Inside there are restaurants, health centers, quite a few green spaces.

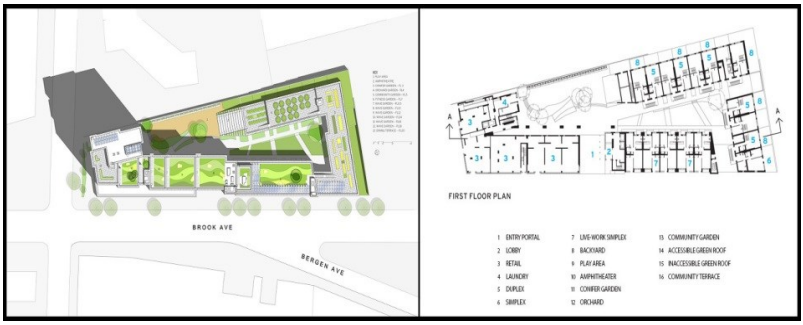


Figure 3. Via Verde site and floor plan [38] [39].

In the building, rainwater is collected from all roofs and stored for re-use. The structure is equipped with two fronts to provide maximum daylight and natural ventilation to each individual unit. Energy recovery and gray water recovery technologies have been brought into the building.

Picture 9. Via Verde [25].

The building has become one of the highest performance and low-cost buildings in the United States with these technologies. 20% of the materials used to build Via Verde has recycled and 20% an additional part has supplied locally. This situation reduces considerably the carbon footprint of the building. More than 80% of the debris and waste generated during the construction excavation was recycled and the obtained product was planned to be used for the construction of affordable land houses.

Mayor Bloomberg stated that at the opening ceremony of the building; ''The change in the South Bronx over the last decade, challenges the notion of what is possible and what is not possible in urban revival.

Via Verde has become a catalyst for high-quality and affordable housing investments thanks to partnerships. Via Verde is not just about building a project with sustainable systems and approaches. It has been carefully designed and strategically structured, allowing a healthy lifestyle for all residents. This kind of architecture, which really cares about the effects of design and the environment, is an example of future housing developments in the city and country.

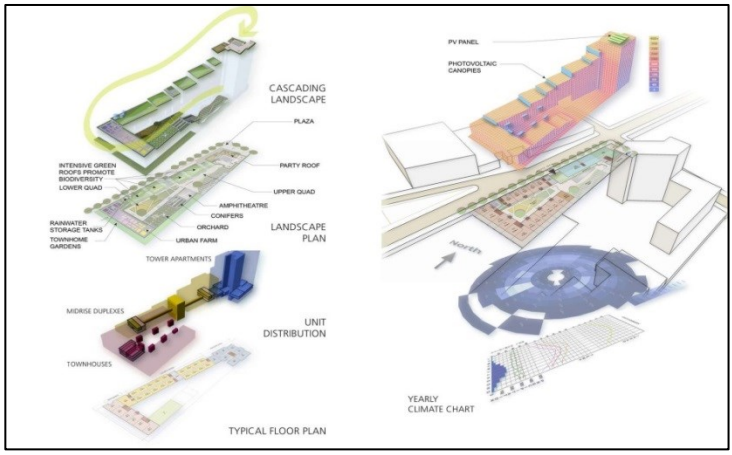


Figure 4. Design process. [40].

CRESTON PARKVİEW

Picture 10. Creston Parkview [28].

Creston Parkview, an important energy-efficient project in the Fordham division of the Bronx, was designed by Magnusson Architecture and Planning. This building that located on Creston Street has 181 apartments. The apartments range from studio to three-room apartments. The building is still under construction and It is expected to be completed in 2020.

Architects and developers aim that Creston Parkview satisfies passive home standards. Eco-friendly features include two accessible green roofs, extra thick windows, high-performance devices, and renewable building materials. Residents will also be able to enjoy a common area of 7,300 square meters on the ground floor and a landscaped inner courtyard.

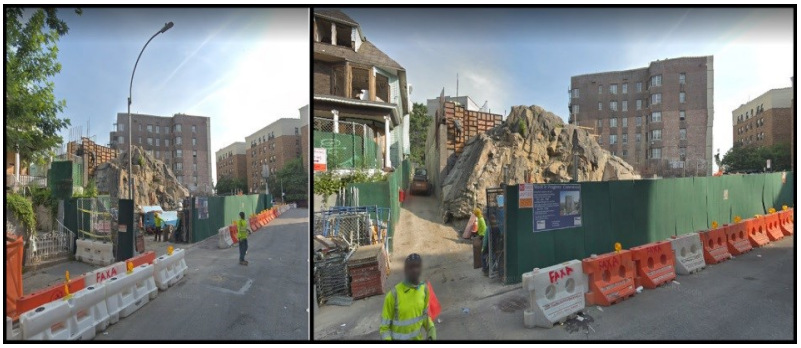
Due to the magnificent location of the building, the design has maximized the use of sunlight. The building emphasized the corner position that stands out with a tower opening onto Webster Avenue and the private roof terraces along the 191. Street. A combination of manganese, iron, spot brick, and fiber cement panels included the modern facade. There are a common area room and an exercise room on the 2nd floor opening onto a landscaped roof terrace for residents. A laundry room with a children playground on the ground floor overlooking Creston Street will also be provided.

Picture 11. Creston Parkview construction field[41].

BEDFORD GREENHOUSE

The building in Bronx Bedford Park is a 13-storey residential design built by federal, state and city authorities for non-profit purposes. Bedford Green House that is located on 2880 Jerome Boulevard, offers 118 affordable housing for families, seniors, and singles. To connect residents to nature, the building aims to have a roof greenhouse where they can grow and produce

fresh fish, participate in healthy cooking practices and enjoy a community playground. The 85,000-square-meter building designed by Edelman Sultan Knox Wood with Hollister management construction will have a LEED Gold certificate1 is a green building.



Picture 12. Bedford Green House construction field[41].

Picture 13. Bedford Green House Render [33].

The greenhouse area will benefit from aquaponic2, while the other half will focus on growing plants such as cabbage, spinach, and arugula. In addition to the agricultural area, residents will have access to a labor development office, laundry, community space, and a playground. In addition, the building will include special works of art made by local people.

The site is three blocks after the Bedford Park Boulevard stations, between the New York Botanical Garden and the Bronx Zoo. The building, which has a height of 124 meters, consists of a living space of 160 people and a space of 76,500 square meters.

The active design of the project is inspired by the biophilia theory, which claims that humans have an innate emotional bond with living organisms and reduce stress in life. It also includes decorating the façade with live vines, creating a green wall in the lobby and an outdoor playground.

Picture 14. Bedford House greenhouse area [33].

CONCLUSION

There are many reasons for a region to become a ruined area. As in the case of the Bronx, an area that has been exposed to natural disasters in a consciously or unconsciously can transform a ruined. The important thing is the studies thereafter. For the re-development of the region, revitalization and time are needed.

These revitalization implementations should prevent the formation of unqualified and unhealthy areas that resulting from rapid urbanization and carried out as qualified within the framework of a specific layout and design idea. In the Bronx example, the opening of branches of famous stores, the opening of the shops, the construction of cultural and entertainment structures have revitalized the region. In addition, many collective housing have been constructed in order to be considered as a residential area in terms of society. These structures are sustainable in various areas have also increased the attraction effect of the region.

The Bronx example is one of the most important and current examples of urban scale that can be given for sustainable development and sustainability. The idea of sustainable development can be implemented starting with simple building material to the entire building, a region or a city. The Bronx region has survived the bad days of its past and realized this with its sustainable architecture and sustainable design ideas and private and public support. The Bronx region overcame the hard times and realized this with its sustainable architecture and sustainable design ideas and private and public support.

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