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WOOD AND WOOD BASED MATERIALS IN URBAN FURNITURE USED IN LANDSCAPE DESIGN PROJECTS

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Abstract

As wooden material has been used in many different areas in the historical process, today it is frequently used in urban furniture within the scope of landscape applications. It is very important that the materials used should be eco-friendly and compatible with the design. Within the scope of this study, different urban furniture produced from wood and wood-based materials were examined in order to improve the existing designs. In the samples examined, urban furniture designed in accordance with general design principles are considered; Determinations have been made within the framework of elements such as aesthetics, size, form, ergonomics, functionality, construction, material, durability, safety, layout and economy. In addition, various suggestions have been given for the development of urban furniture, which is a part of landscape applications, and the emergence of new designs in harmony with nature, by examining the visually and material types on the sample wooden reinforcements.

Keywords: Urban furniture, wood, landscape, design

1. Introduction

With each passing day, reinforcement elements are increasingly used in landscape projects in cities. Wooden; It is an important reinforcement material for the landscape sector due to its physical, mechanical and technological advantages (Karadag et al., 2017). Today, the reinforcement elements do not serve the purpose fully due to the damage caused by the people using the reinforcement elements and the mistakes made during the planning and design stages. Factors such as cultural levels, accordance with the function in using furniture, the furniture's meeting the functional expectation, being user-friendly, and being correctly placed are effective in ensuring communication between the equipment elements and the people who use it (Sisman and Yetim, 2004).

Akyol (2006) aimed to reveal the urban furniture design process, which includes all the issues of correct placement and regular maintenance. Karadag et al.,(2017), based on the data obtained from people working in landscaping applications in Turkey, identified the problems related to the use of wood and divided them into three groups. These are, respectively, the weakness of the wooden material and its inability to be protected for a long time, the problems caused by the manufacturer, and the application problems especially encountered during the assembly.

These developing areas of use are also reflected in landscape projects. The use of materials with high visual quality at a scale that reflects the identity and symbol of the city in designs realized on a city scale increases the value in design. In this study, it is aimed to reveal various results with suggestions and recommendations by considering the wood and its derivative materials used in landscape designs by raising awareness on the value of the material.

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1.1. Urban Furniture Concept

The importance given to the examples of official or civil architecture in the traditional city concept also reveals the use and importance of these elements in cities. Because the city is not just a phenomenon created by building and building elements. In addition to providing urban function (Aksu, 2012), the most important complementary element can be given as urban furniture (Sagsoz et al., 1997). In order to maintain a healthy life in social environments with urbanization, shopping environments, communication, cultural environment, transportation systems, traffic regulations, entertainment and service units depend on the existence of design objects used in urban integrity (Erhan, 1990). Especially in public spaces, which gain importance as urban common spaces, urban furniture, which has an important place in meeting the real needs of the citizens, is also small-scale urban items, but many of them can affect newly formed-created or renewed environments with the union they create.

Demand for increasing environmental quality or raising spatial standards and the formation of social pressures; directly depends on the establishment of balances such as knowledge, economic power, social and cultural identity (Gursu, 1988).

The design, production, marketing and selection and positioning of the reinforcement elements should provide environmental awareness, visual and architectural integrity. At the same time, humanistic approaches and the use of materials that will tolerate ecological differentiation and multi-dimensional situation evaluations that meet social needs are required for the success of the implementation (Uludag, 1990). Urban furniture; supports and strengthens functions such as living, shelter, protection, siege, counseling, enlightenment, transportation, communication, games and sports in general or private areas of use for recreational purposes such as streets, roads, parking lots, terraces, pedestrian paths and squares around us, they are original design products that facilitate the community life, gain the appreciation and support of the users, and have an impact on the formation of functional, safe and healthy environments in urban and rural areas indoors and outdoors.

The concept of urban furniture is "urban reinforcement elements", "environmental reinforcement elements", "urban accessories", "landscaping elements", "landscape elements" and so on. They can be expressed in terms. However, these terms may differ due to their scope (Gul, 1991).

Landscaping elements are mostly landscape oriented. Urban accessories, on the other hand, have a meaning that includes only decorative elements. In this study, the term "urban furniture" was used primarily and mostly (Gul, 1991).

Criteria that can make a difference in urban furniture design and affect the level of appreciation of the users;

- color matching,
- measure / ratio balance,
- functional fit
- material compatibility,
- being modern,
- referring to history, being different, impressive, interesting,
- being original,
- good position,

It has been determined as being compatible with the environment, being semantic and monumental.

Urban furniture in structured or unstructured urban public open spaces, which are open to everyone and under the responsibility of the public, is elements that define and complement the space (Ozturk, 1991).

1.2. Wood Material Concept

The word wood comes from the word "Hasep", which means "goods made of wood" in Arabic (Eric 1978). Wood material has started to serve people as fuel, weapon and shelter since the early years of humanity, and today its usage area with the developing technology (Sofuoglu and Kurtoglu, 2016) continues to serve humanity by increasing day by day. Today, wood material is known to have 10,000 different uses (Ors and Keskin, 2001). Its widespread use is attributed to the anatomical structure, physical and mechanical properties and chemical composition of the material (Bozkurt and Erdin, 1997). The rational use of materials obtained from wood depends largely on knowing the physical and mechanical properties of the material well (Goker and Bozkurt, 1987). Today, in the detection and diagnosis of the condition of tree, log, timber or wood; Mechanical, electrical, optical, acoustic, thermographic, radiographic, nuclear magnetic, chemical and biological methods or some of these methods can be used together for analysis (Unger et al., 2001; Seckin, 2010).

In addition, wood material, due to its anatomical and chemical structure, although it has sufficient resistance and natural durability against some effects in outdoor conditions, it cannot withstand external weather effects for a long time (Ors and Keskin, 2001). For this reason, human beings, who have historical unity in the use of outdoor conditions, learned that this material should be preserved where it is used (Sonmez, 1989) by experiencing (Ulay, 2018). In order to protect the wood material and increase its aesthetic value, industrial wood varnish and paint systems developed in the early 20th century have been used (Sonmez, 2000) As the studies in the literature are examined, the wood material is completely compatible with nature and is easy to recycle, its strength compared to other building elements is quite good (Batur, 2004). Wood is a sustainable industrial material that is compatible with different building materials and can be very long-lasting when used correctly (Caliskan et al., 2019).

When evaluated from the design framework, the wood and wood-based materials are light, resistant to different climatic conditions, increased fire resistance with special surface materials, protection against rot and insect damage by impregnation (Seckin, 2010). When the structure is dismantled, rebuilding is easy. The properties such as being energy-friendly and earthquake resistant, being used in harmony with steel, concrete, stone and adobe show that the wooden material complies with all ecological design criteria (Bostanci and Birer, 2004). It has been reported that obtaining the material is very related to economic conditions and technology, not to the existing material as before the Industrial Revolution (Yildiz and Seckin, 2019). As a matter of fact, technological developments related to wood materials finally manifest themselves in nanotechnology applications and strategies for designing new wood-based materials (Jiang et al., 2018). Such developed wood-based composite materials are also used in landscape applications.

Landscape and wood material relationship: Landscape architecture is a profession that uses natural and artificial landscape materials together and emphasizes this in planning and design studies. Landscape architects who prepare landscape projects need to know artificial materials as well as natural materials. The harmony of these materials in the environment and design is very important. This is one of the most important factors of sustainability in planned designs.

For the production of urban furniture, solid wood material has a beautiful appearance, superiority in terms of color and texture (being homogeneous), easy processing and smooth surfaces, being suitable for surface treatments, being resistant to plant and animal pests, no bugs and insect holes, knot-free and it is smooth fiber, durable in climatic conditions, and its contraction and expansion percentages are low (Gursoy, 2011).

In general, high resistance properties are sought in kitchen furniture, sports equipment and garden furniture with wood moisture content with 8 ± 2%, 12-16% respectively and air dry in bench construction, good drying properties. The occurrence of narrowing and enlargement in the dimensions of the massive wood material by absorbing moisture is particularly inconvenient. Imperfections such as cracks, color changes, thick and thin parts, pitted joints caused by the absorption of moisture by the solid wood material use difficult, and is not tolerable for eye pleasure (Gursoy, 2011).

Undesirable size changes and deformations in the products can be prevented by releasing it. This is done by selecting the parts to be used in urban furniture in the desired quality class according to the function of the place of use, drying according to the place of use and then combining them according to the technique (Kurtogu, 2006; Dilik, 2008).

When the materials used are examined, it is observed that wood and its derivatives are frequently used and wood material greatly contributes to the creation of natural areas depending on the principle of protecting and using the environment (Ulay and Yeler, 2020). In addition, with the modern and wide range of products that have emerged as a result of the latest technological developments and chemical processes, options where the visuality and quality come into prominence are presented. In this case, it strengthens the basic principles of landscape designs such as color and texture. Considering the easy accessibility of wood and the sufficient processing opportunities in our country, it is easy and sustainable to choose it (Yeler et al., 2017).

2. Materials and Methods

In this study, by defining urban furniture from a general point of view, the values that can create originality with the use of wooden furniture in design are emphasized and some determinations and evaluations have been made by examining the current wooden urban furniture design examples as materials.

This method of examination is carried out by grouping urban furniture according to design principles. Various suggestions were put forward as a result of examinations and evaluations. The most important of these suggestions is; It has been demonstrated that original and innovative urban furniture increases both the quality of use and visual quality in open spaces where they are used with an aesthetic

design, and they provide the opportunity to positively affect the urban identity and the psychological status of the users.

3. Results

3.1. Classification of urban furniture according to their functions:

Wooden materials are very important in the use of urban furniture, especially in floor and floor coverings. In addition, it has different uses in many areas according to its functions. Since these materials are densely coated, they contain many active ingredients. In the manufacture of such products, around 30% recycled materials, 60% wood chips, and around 10% binding additives are used. In urban and rural areas, these coating samples are frequently observed in recreational areas that are generally open to human use and similar recreational areas. In the same way, garbage can, pergola, ornamental objects, sculptures and many different uses are observed in Figures 1-11, some of which are listed below with the main headings and wood-derived examples.

Figure 1: Wooden Floor Coverings (Web-1)

Figure 2: Wooden Seating Units (Web-2)

Figure 3: Wooden Lighting Elements (Web-2)

Figure 4: Wooden signs and information (Web-3)

Figure 5: Wooden limiters (Web-4)

Figure 6: Wooden Water Items (Web-5)

Figure 7: Wooden Top Cover Items (Web-6)

Figure 8: Wood Sales Units (Web-7)

Figure 9: Artistic objects (Web-8)

Figure 10: Playing field elements (Web-9)

Figure 11: Other wood items (Web-10, Web-11)

3.2. Wood Derived Materials Used in the Production of Urban Furniture:

3.2.1. Wood Laminated

Lamination technique in wood material; it expands its application area in parallel with technological development with the possibility of obtaining a more stable, perfect and aesthetic material compared to solid wood as well as for the rational use of wood material. As a rule, different wood species, variable number of layers (layers), different sizes and shapes can be applied in lamination (Dilik, 1999). Longer and wider wood material can be produced by clearing the defects (knots, cracks, worm holes, irrigation, etc.) of wood material that is not too long and wide (Percin et al., 2009). Much research has been done in the literature on the physical and mechanical properties of wood laminated materials and their use of different types of wood in Figure 12 (Dilik, 1999; Uysal and Ozciftci, 2004; Ozturk and Arıoglu, 2006; Percin et al., 2009; Zor et al., 2016; Keskin and Togay, 2019). In Figure 12, examples of different uses of wooden laminated beams are given.

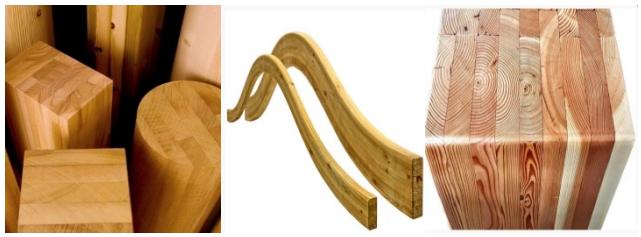

Figure 12: Wood Laminate Appearance (Web-1)

3.2.2. Wood / Solid Material

The use of wood as a building material is older than concrete and steel (Bostancıoglu and Birer, 2004). Among the domestic species in Figure 13, which are used in industrial wood reinforcement elements today; beech, chestnut, oak, walnut, hornbeam, scotch pine, fir, spruce, cedar, ash, birch, acacia, maple, foreign species; Examples are iroko, teak, mahogany, sipo, bamboo (Karadag et al., 2016).

Figure 13: Wood / Solid View (Web-12)

3.2.3. Medium Density Fiberboard (MDF)

MDF has been one of the most important board products developed as an alternative to solid wood material (Akgul et al., 2013). Fiberboards are a large-surface board obtained by reshaping fiber and fiber bundles obtained by fiberizing ligno-cellulosic raw materials (Eroglu and Usta, 2000; Istek et al., 2015). It is a wooden product designed in the form of a plate formed with wax and resin glue under high temperature and pressure, after breaking up hard or soft wood residues and turning them into wood fiber. MDF material can be used by painting its raw form for example in figure 14, as well as MDFLam etc. with surface coating materials.

Figure 14: MDF View (Web-12, Web-13)

MDF-Lam (Melamine Coated MDF) Raw MDF board coated with decor paper by impregnating melamine resin and glue with impregnation machines to color, fireproof and waterproof the surface is called MDFLAM. In the literature, many researchers have been done on the technological properties of MDF boards. The effect of fibers belonging to different types of wood used in making MDF on MDF board properties has been studied (Separated, 2000; Winandy et al., 2003; Shi et al., 2006; Ozyhar et al., 2020; Pugazhenthi et al., 2020).

3.2.4. Chipboard

It has found a wide range of use due to its conversion into a large size plate using small size and relatively low value logs. Particleboards are the boards in Figure 15, which are obtained after gluing and shaping dried chips obtained from wood or lignified lignocellulosic raw materials with synthetic resin adhesives under temperature and pressure (Guller, 2001).

Figure 15: Particle Board View (Web-14)

3.2.5. Plywood

It is a material in the form of a large sheet, which is obtained by gluing thin peeling plates (plate, papel) obtained by peeling logs with certain characteristics in special machines and pressing them by placing at least 3 layers or more in an odd number of layers perpendicular to each other for examples in figure 16. Their thickness is between 3-70 mm and they are generally produced in 130 x 220 cm or 170 x 220 cm dimensions (Guller, 2001). They can be classified according to different parameters such as the place they are used, the type of tree they are made of or the sector used.

Figure 16: Plywood View (Web-14)

3.2.6. Oriented Strand Board (OSB)

Produced from low quality thin-diameter logs that cannot be used in plywood production, OSB has been used in many areas, especially it has become a rival to plywood. OSB is a type of chipboard produced by directing specially prepared strands (Ayla, 2001). All kinds of raw materials used in particleboard production can be used in OSB production. The smallest tree diameter that can be used is 5 cm. Bark is not used in the production of OSB. In the production of OSB, fast growing trees with low specificity such as poplar and pine, can be used in Figure 17 (Guller, 2001).

Figure 17: OSB Plate View (Web-14)

3.2.7. Wood Plastic Composite (WPC)

WPC defines a wide range of materials, from polyethylene as a polymer to polyvinyl chloride as a polymer, and from wood flour to natural fibers as a filling material (Ozmen et al., 2014). Today, technological and economic imperatives have made it necessary to research and develop some negative properties and to produce wood polymer composites (Kaymakci et al., 2014), smart bioplastic composites (Ozdemir and Ramazanoglu, 2019) from other wood originated new materials.

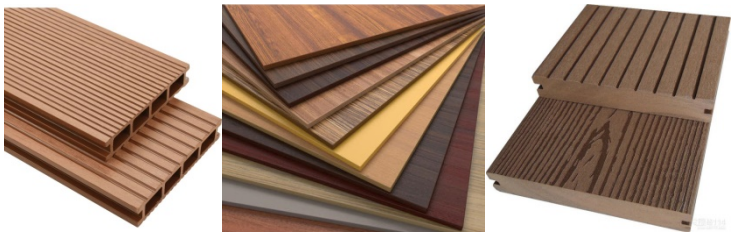

Figure 18: Wood Plastic Composite View (Web-15)

3.2.8. Wood Based Sandwich Panel

Product diversity is increasing day by day in the production of wooden boards and foam (polyurethane)(figure 20), honeycomb (paper and polypropylene, aluminum) (figure 20) or low-density wood types are used as core material in wood-based sandwich boards (Guler and Ulay, 2009; 2010; Ayrildi et al., 2015). Generally, a sandwich layer structure in Figure 19; it consists of two surface layers being covered with a thick middle layer (Ayrilmis et al., 2015).

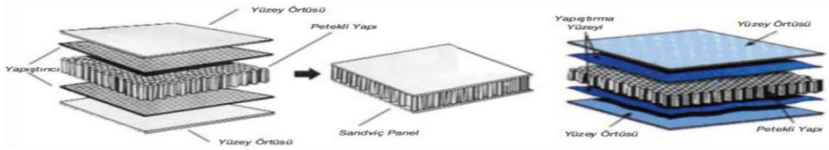

Figure 19: The structure of the sandwich plate (Güler and Ulay, 2009).

Figure 20: Wood-based sandwich plates (Guler and Ulay, 2010).

It has been reported that this type of composite (sandwich) plates are 40-70% lighter, flexible and resistant to water and moisture compared to other composites (Ulay and Guler, 2010). It is thought that such boards are more resistant to moisture, mildew, fungi and the negative properties of wood such as swelling and expansion and are considered suitable for use in urban furniture.

4. Discussion

Urban furniture is important not only for functional purposes but also as visual urban items that complement and define urban spaces. The positive or negative effects of the environment are more visible in places where urban furniture is used extensively and is reflected in the urban landscape.

An urban furniture should be in harmony with the environment it is located in, no matter how well designed. In different environments (historical texture, urban park, streets, focal points, squares, etc.) the same type of material, color, texture, form, etc. Standard urban furniture produced with a sense of design should not be used. However, certain standards should be developed in order to meet certain functions. Factors such as life style, traditions, historical framework and technological development specific to the existing environment and its users that shape an urban furniture should be determined (Aksu, 1998).

It may not be possible to use certain standards in the use of urban furniture. However, certain restrictions may be imposed depending on the space, the size of the space, and the service the space offers to the users. Urban public spaces, which are of great importance for the city, should not be prevented by excessive use of urban furniture. It should be used in line with needs, and efforts should be made to create plain, clean, spacious and open spaces. Aesthetic urban furniture that is related to each other, that can fulfil several functions, suitable for their environment and architecture should be used. In addition, the ready-made urban furniture chosen should be compatible with the tastes and wishes of not only local governments but also all users.

Today, most of the materials are produced by simply imitating them to basic materials (natural stone, wood, etc.). Wall panels made of natural stone-like polyurethane instead of natural stone material, wood-printed vinyl floor coverings instead of wood, steel panel coverings that are close to concrete texture instead of concrete, brick-shaped 3-dimensional wall coverings instead of brick, metal-looking ceramic coverings instead of metal can be examples of imitation materials and often they are used in buildings. However, the correct and appropriate use of the original material will be effective in providing both the real appearance of the final product and a healthier material durability (Yildiz and Seckin, 2019).

Today's technology is very suitable for reproducing imitations of materials with samples. However, imitation materials cannot show the mechanical, acoustic or thermal properties of the original materials, they can only provide the visual comfort of the user. Therefore, it cannot fulfil the functions of original materials. In addition to misleading the user, imitation materials also change the architect's relationship and role in design. These materials, which are marketed with resolved detail and easy application strategy, are added to the projects as finished products, paving the way for the production of uniform building and put the architect in the position of choosing more than the designer. However, the space and material experience of the user is not only realized through visual perception. On the contrary, all its sensory features stand ready to be stimulated. At this point, the experience that the architect wants to give the user while designing a building is established by the relationship of both parties with the material (Yildiz and Seckin, 2019).

Urban furniture, which is a branch of industrial design, should not be considered as a part of a system, it should be considered as one of the city elements that make urban spaces livable, affect the physical structure and appearance of the city, and it should not be forgotten that they are in close relationship with all other urban elements of small and large scale (Aksu, 2012).

In urban furniture design, architects, landscape architects, industrial product designers, furniture manufacturers and material engineering etc. dealing with the livability of urban spaces other than local governments. Such expert groups should first be organized by communicating among themselves and then ensure the participation of the public, who are direct users and effective decision makers.

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