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RESEARCH ARTICLE

STRUCTURAL SYSTEM MATERIAL SELECTION CRITERIA: THE CASE OF WOOD

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ABSTRACT

Objectives: This study aims to understand the tendencies of architects on the selection of materials, depending on the developing new technologies. Especially, it is the subject of this study that wood as structural material is preferred according to which criteria in building production.
Methods: For this reason, a questionnaire study was carried out in Ankara with architects.
Results: The architects considered the ecological and aesthetic criteria of the materials as the most important one in the selection of the structural system materials. The preferences of the architects compatible with the current discourse of the architectural environment.

INTRODUCTION

The structural system is a holistic system constituted by the elements that transfer the load acting on the structure to the ground within the safety limits (Dilber, 2001). The loads acting on the structure are divided into two groups as horizontal loads and vertical loads. Vertical loads are dynamic and static loads created by gravity whereas horizontal loads are earthquake and wind loads. In order that the buildings can resist all these loads, the structural systems must be designed correctly. However, structural system requirements are not limited to load bearing. This system also has a number of requirements, such as being balanced, functional, economical and durable (Öğüt, 2006). Thus, the choice of structural system is a complex process that depends on a number of effects. Three materials are widely used in the selection of the structural system; reinforced concrete, steel and wood (Güneş and Şengün, 2015). These materials have advantages and disadvantages compared to each other. Steel is widely used especially in multi-storey structures due to its advantages, that is, cost efficient, sustainable, durable, recyclable, modular, lightless etc. By the way, steel is a good conductor in terms of heat and sound, low resistance to fire and corrosive (Öğüt, 2006). Reinforced concrete is one of the advantageous materials too. It is economical, durable, and can be produced in desired shapes and sizes.

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Beside, reinforced concrete is the most common building material in Turkey. According to statistics, Turkey is in the first place in Europe in the production of ready-mixed concrete since 2009.[1] Despite these advantages, reinforced concrete is worse than steel in terms of labor costs (Esirgen and Gültekin, 2005). In addition, factors such as the fact that reinforced concrete structures are heavier than steel and wooden constructions and that they are made in a longer time period are other disadvantages. Wood is a material much older than both reinforced concrete and steel. Although the use of timber in traditional residential architecture is very common until the 20th century, the insufficient strength of timber to the fires has caused the widespread use of reinforced concrete and steel construction techniques over time (Güzel andYesügey, 2015). The most important advantages of wood are a renewable resource, the amount of energy used in production is low, the carbon dioxide release is close to zero and it is a natural material that does not harm human health. Especially today, the increase in the importance given to nature and human health has increased the importance of natural and renewable building materials. For this reason, wood as a structural building material has come back to the stage nowadays. Thanks to industrial production, the mechanical and technical properties of the wood have been improved and superior quality wood materials have been achieved that do not have the drawbacks of solid wood materials. Industrial wood products are finding increasing use due to their ability to be produced in

[1]2013-2014 Ready Mixed Concrete Sector Statistics http://www.thbb.org/media/1952/20132014hazirbetonsektoruverileri.pdf

desired shapes and sizes, ease of use and processing, being cheap, being recyclable and accordingly having a positive contribution to the environment (Güzel andYesügey, 2015). In particular, the technological possibilities of the 21st century cause wood to be viewed with a new perspective and to add new possibilities to architecture. In many European countries such as UK, Sweden, Norway and Austria, wood is often used not only in detached houses but also in the production of multi-storey buildings. Legislative regulations and building standards for wood production have also been established. In Turkey, there are no legal regulations, necessary facilities and infrastructure studies to enable the production of wooden buildings (Ayaz, 2011). But, the use of wood in our country for modern building production is necessary for a sustainable environment. The purpose of this study is to question the awareness of architects working on the market about the possibilities of wooden materials as a structural system.

The construction sector is undergoing rapid change and transformation with the technological possibilities and new materials not just in Turkey but also all around the world. Forms, structures that had not been tried can be made easily and rapidly. Thus, the aim of this study is to show how architects can adapt themselves to new information and ideas. Many studies have been made in the literature on the selection of materials / building products. The SfB System, developed in Switzerland in the 1950s, is one of the pioneering work for the classification of building products and product information (Jorgensen, 2009). This system is based on the classification of the actions related to the building and its immediate surroundings, the steps followed in construction and the construction inputs. Much more comprehensive classification systems based on the reorganization of SfB tables have also been developed. CI / SfB systems were developed by RIBA in England in 1978. The BIC system was also developed in the same year by the Nottinghamshire Department of Architecture whereas in Sweden, the CBSAB system was developed by the Swedish Building Construction Coordination Center. In 1997, the classification criteria have become more comprehensive with the Omniclass System in America and the Uniclass System in England (Crawford et all, 1997).

Today, ISO 2001 standards are taken as a reference in the selection of building products. By the way, there are many systems developed for product selection in Turkey and basically these systems are based on the SfB system. In 1975, informations in the Okan System was collected in four groups for designers; product features, building functions, building requirements and building types. The Özkan System, which was developed in 1976, has been classified in a very comprehensive manner. It consists of nineteen criteria. Similarly the systems developed in 1993 by Arıoğlu and in 1997 by Balanlı are quite comprehensive and hollistic (Çayak, 2005). According to Balanlı's method, the steps taken in the selection of the building product as follows: decision-making in product selection, making the distinction between elements and components, determining environmental factors, identification of functions and qualifications that can meet requirements. The most appropriate product selection will be made by evaluating these options (Genç, 2011). In Balanlı's method, four characteristics were determined for product selection: properties of natural and artificial surroundings (humidity, heat, sound, light, fire, pests, animals, plants, microorganisms, architectural environment, construction and usage process etc), features dependent on users (environmental and human health), features dependent on production resources (building products, labor force, monetary instruments) and features related to laws and institutions. The master thesis of Evci in 2003 named "Examination of Material Category in Sustainable Building Assessment Methods" contains three classification based on Balanlı`s system: environmental, economic and social criteria. A total of twenty sub-criteria were defined for these criteria as follows: environmental sensitivity, climate, maintenance-repair-renovation, function, transportation, catalogs, standards, earthquakes and disasters, lifecycle, recycle, cultural values, socio-economic situation, aging and deterioration, cost, environmental harmony, user comfort, user psychology, user interaction and human health. In this study, a new categorization was established using the criteria in both studies. The mean titles of this classification are technical criteria, constructional criteria, ecological criteria, functional criteria and aesthetic criteria. [Table 1] A total of thirty-eight sub-criteria were identified for these criteria.

Tablo 1. Structural System Selection Criteria.

Technical Criteria	Constructional Criteria
size / dimensions	software compatibility
lightness	technology compatibility
flexibility	compatibility with regulations
durability	affordability
ageing resistance	construction time
humidity	modularity
fire resistance	precision production
sound resistance	laber force
heat resistance	maintenance-repair-renovation
earthquake resistance	cost
Ecological Criteria	experience
sustainability	Functional Criteria
recyclability	structured
green product	constructed
local architecture compatibility	hollistic fiction
climate compatibility	functioned
compatibility with human health	convertibility
Aesthetic Criteria	temporariness
psychological effect	multi-level production
comfort	
aesthetic	
cultural value	

MATERIALS AND METHODS

In this study, the product selection criteria, which are made by using the literature, have been tested on the structural system materials through the questionnaire survey. The survey was conducted with young architects operating in Ankara for five to ten years of experience. All interviews were realized face to face in the office environment. It has been researched which criteria the architects use in the selection of structural system materials. The reason for the selection of young architects in the study; the architectural information they receive from the school is still fresh and more up to date. A total of 47 architects participated in this study. There was a balanced distribution of male and female participants: 22 female and 25 male. The questionnaire consists of two phases. It has been researched what criteria architects have chosen for both all structural materials and wood. For this, architects were asked binary questions. For example; `I prefer the wood structural system material in my designs because of its cultural value ' and `I prefer structural system materials in my designs because of its cultural value '. These two questions were answered for each criterion. Values from 1 to 5 (1: very insignificant, 2: insignificant, 3: moderate, 4: significant, 5: very significant) were created for each question to answer. Architects indicated according to these values which criteria they consider more important and which criteria they consider less. The values that the architect gave for each question were collected, and certain numerical values were obtained for each criterion. Binary graphics are obtained in this way as follows: "Criteria For Wood As Structural System Material" and "Criteria For Structural System Materials".

RESULTS

In the selection of the structural system material, a value ranging from one to five according to the degree of importance for each criterion was made. The values given by 47 architects for each criterion were calculated separately and numerical scores were obtained. [Figure1.a-b, Figure 2.a-b, Figure 3.a-b, Figure 4.a-b and Figure 5.a-b] Criteria that take the highest values are seen as the most important criteria in selecting the structural system materials. By the way, the criteria that received the lowest values are seen ineffective in selecting the structural system materials. There was no question left unanswered by the architects in the questionnaire evaluation. It makes easier to evaluate the work.

Technical Criteria

The criteria that Balanlı referred to as `properties dependent on natural and artificial surroundings' in product selection criteria were interpreted as technical criteria in this study (Genç, 2011). In the study, the technical criteria of the structural system materials were examined on ten criteria as follows: `size / dimensions`, `lightness`, `flexibility`, `durability`, `ageing resistance`, `humidity`, `fire resistance`, `sound resistance`, `heat resistance`, and `earthquake resistance` [Figure 1.b]. The same grouping was also used for the technical criteria of the wood structural system [Figure 1.a].

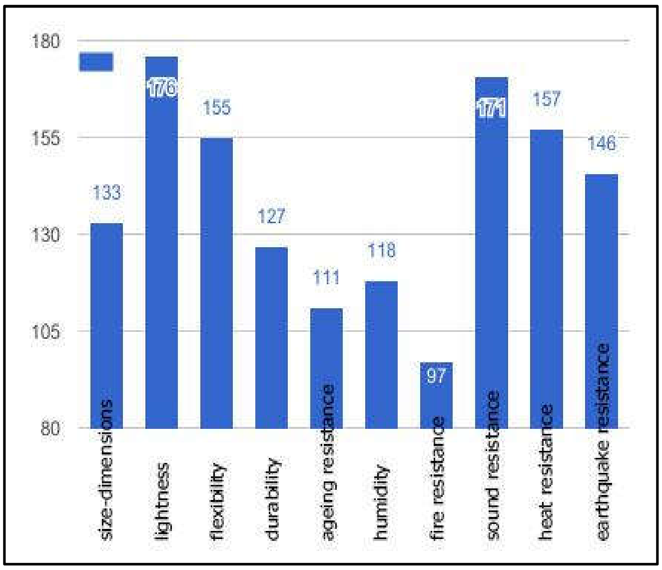

Figure 1.a. Technical Criteria For Wood As Structural System Material

In the scope of the survey, it was seen that the most important criterion was "lightness" in the evaluation of the technical criteria of wood [Figure 1.a]. When compared to concrete and steel, wood is a lighter material (Arya, 1994). This feature makes it possible to build timber structures quickly and easily, while at the same time it causes less damage during the earthquake than other materials.

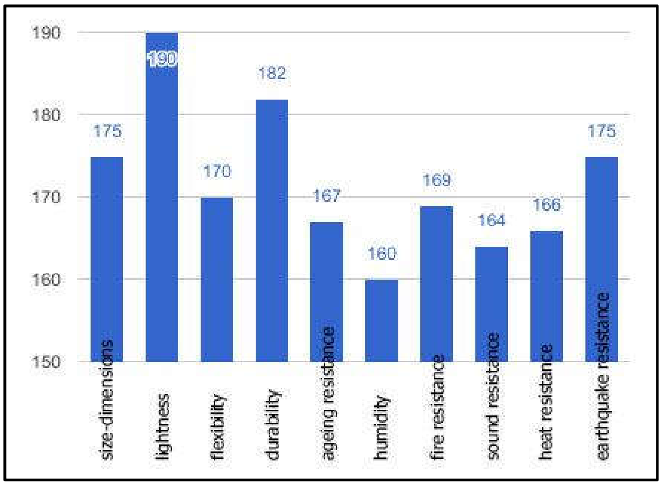

Figure 1.b. Technical Criteria For Structural System Materials

For this reason, the "earthquake" criterion was one of the highly valued criteria. In the graph, as well as the `lightness` criterion, the` sound` criterion is also highly valued criteria [Figure 1.a]. Wood is an ideal material in terms of sound absorption ability (Yaman, 2007). Architects have revealed their awareness on this issue in their selections. The lowest value in the graph is the `fire` criterion [Figure 1.a]. Due to the low ignition temperature of wood materials, fire resistance is lower than steel and concrete (Güneş and Şengün, 2015). Today, in order to increase fire resistance of wood, the material can be dimensioned in suitable sections, as well as its surface coated with fire-retardant chemical materials (Yaman, 2007). Polyurethane adhesives, especially used in industrial wood materials, increase the durability of wood against fire (Ayaz, 2011). Architects' evaluations do not seem to involve this information.

In the scope of the survey, it was seen that the most important criterion was "lightness" in the evaluation of the structural system materials [Figure 1.b]. Since Turkey is located on the earthquake zone, the lightness is seen as an important criterion because the earthquake force will decrease with the decreasing loads acting on the structure (Hattap and Eşsiz, 2005). Likewise, In the graphic, the `earthquake` and` durability` criteria also have high values [Figure 1.b]. Steel is the material with the highest pressure and tensile strength in terms of durability. The tensile and compressive strength of steel (S420a) is 420 MPa whereas concrete(C25) 1.8 MPa. By the way, the material with the lowest pressure and tensile strength is wood. When the average humidity is in the range of 10-20%, its tensile strength is 11 MPa and its pressure strength is 14 MPa (Güneş and Şengün, 2015). Although the material with the highest strength is steel, the reinforced concrete construction system is more common in our country. This is because the reinforced concrete construction system is more economical than the steel construction. According to Ministry of Public Works's unit prices for 2007; the price of 1m3 of C25 ready-mixed concrete is 98.79 YTL and the price of a ton of iron carcass is 2883.75 YTL (Keçelioğlu, 2008). According to this data, the concrete material is about 20 times cheaper than the steel. Although the mechanical properties of steel are superior to other materials, it is not as common as reinforced concrete in Turkey due to its cost. Architects have revealed their technical awareness of materials in their selections [Figure 1.b].

Constructional Criteria

The criteria that Balanlı referred to as `features dependent on production resources' within the product selection criteria were interpreted as constructional criteria in this study (Genç, 2011). In the study, the constructional criteria of the structural system materials were examined on eleven criteria as follows: `software compatibility`, `technology compatibility`, `compatibility with regulations`, `affordability`, `construction time`, `modularity`, `precision production`, `laber force`, `maintenance-repair-renovation`, `cost`, and `experience`. [Figure 2.b]. The same grouping was also used for the constructional criteria of the wood structural system [Figure 2.a].

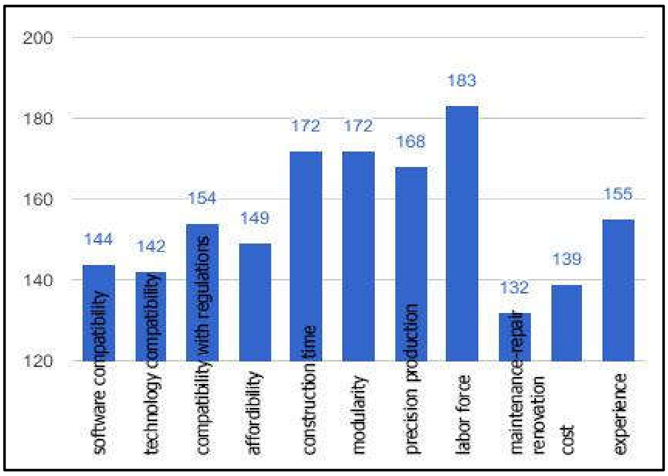

Figure 2.a. Constructional Criteria For Wood As Structural System Material

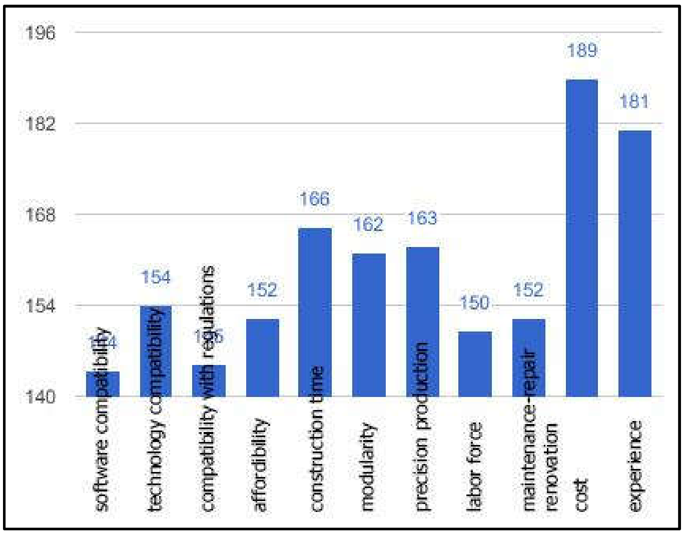

Figure 2.b. Constructional Criteria For Structural System Materials

In the scope of the survey, it was seen that the most important criterion was "labor force" in the evaluation of the constructional criteria of wood [Figure 2.a]. According to BS648, the lightest structural system material is wood. The weight of soft wood is 400-800 kg / m3, the weight of concrete is 2400 kg / m3 and the weight of steel is 7850 kg / m3 (Arya, 1994). Because the wood is very lightweight compared to steel and concrete, it makes the installation easier and faster. In addition, wood does not require different work items like reinforced concrete which creates less labor requirements. This advantage, which was provided by the wood, has been influential in the selection of architects. At the same time, `construction time` is one of the highest value criteria in the graphic thanks to wood`s modularity [Figure 2.a]. On the other hand, `maintenance-repair-renovation` are the lowest criterion in the graphic. Wood treatment varies according to the type of tree used and the environmental conditions (Yaman, 2007). It can be applied impregnation, varnish, paint, etc. to repair the damaged wood due to moisture, harmful insects, earthquake, building loads or it may be necessary to renovate the wood as well. These processes make the wood less preferred than other materials in terms of constructional criteria. At the same time, the fact that wood is an expensive material in Turkish conditions is another issue that negatively affects its preference.[2]

In the scope of the survey, it was seen that the most important criterion was "cost" in the evaluation of the constructional criteria of structural materials [Figure 2.b]. One of the most important reasons for taking the highest value of this criterion is that the architect is under the influence of employer, contractor, market conditions etc. In the graphic, `experience` was checked the second most important criterion [Figure 2.b]. This indicates that architects tend to prefer materials that they have used in material selection before. In the graphic, `software compatibility` is the lowest value [Figure 2.b]. Although architects produce their designs through with computer programmes, they consider the compatibility of the materials with the computer programs as an insignificant criterion in their choice. The reason of this, it can be argued that computer programs can not be used effectively, although there are now drawing programs that are compatible with material data.

Functional Criteria

The criteria that Balanlı referred to as `features dependent on users' within the product selection criteria were interpreted as functional criteria in this study (Genç, 2011). In the study, the functional criteria of the structural system materials were examined on seven criteria as follows: `structured`, `constructed`, `hollistic fiction`, `functioned`, `convertibility`, `temporariness` and `multi-level production` [Figure 3.b]. The same grouping was also used for the functional criteria of the wood structural system [Figure 3.a].

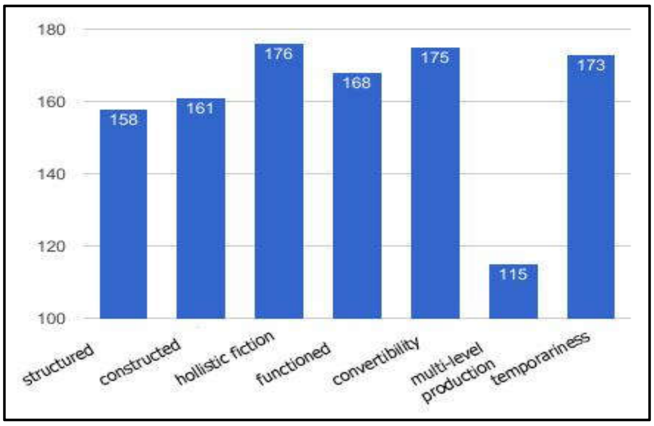

Figure 3.a. Functional Criteria For Wood As Structural System Material

[2] Türkiye Orman Ürünleri Meclisi Sektör Raporu 2013. http://www.tobb.org.tr/Documents/yayinlar/2015/Orman-Urunleri-sektoru-20151117.pdf http://

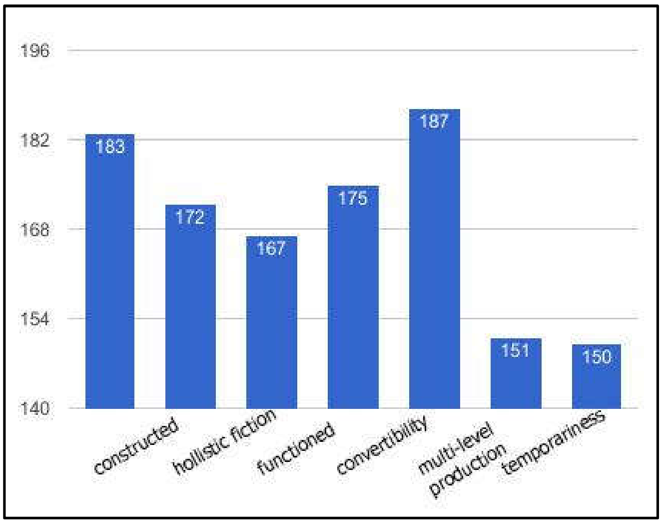

Figure 3.b. Functional Criteria For Structural System Materials

In the scope of the survey, it was seen that the most important criterion was "hollistic fiction" and "convertibility" in the evaluation of the functional criteria of wood [Figure 3.a]. Wooden material can be used as building materials such as columns, beams, slabs, as well as as a covering material, wall-filler, door-window construction and decorative element. The fact that the constructional usage of the wood is higher than its structural usage makes the wood more useful for building production than the materials such as steel and concrete. Likewise, the ability to make spatial changes in the structure and is an important other functional feature of wood material. When architects made their choices, they expressed their awareness of these properties of materials. On the other hand, the lowest value in the graphic is the `multi-level production` criterion [Figure 3.a]. The use of wood as a precaution against fire has been restricted in order to obtain durable constructions in Turkey and throughout the world since the 20th century (Güzel andYesügey, 2015). But with the advancement of industrial wood technology in the 21st century, it became possible to build multi-storey wooden buildings in many parts of Europe (Bowyer, 2016). In Turkey, industrial wood materials are used only as low-rise buildings, so multi-layer production has not been done yet. The Building Regulations in Turkey do not include the legal regulations required for the production of multi-storey timber structures (Ayaz, 2011). In the selection of architects, the multi-storey possibilities of wood are the lowest value criterion that supports these deficiencies in theory and practice.

In the scope of the survey, it was seen that the most important criterion was "convertibility" in the evaluation of the functional criteria of structural materials [Figure 3.b]. The changes that take place in the society shape the needs of the people and therefore the spaces undergo a secondary or spatial transformation to adapt to these changing conditions. In order for these conversions to take place, the ability of the material to adapt itself must be high. Architects have shown this awareness in their selections. Furthermore, the structural ability of a material is seen more important than constructional one in the graphic [Figure 3.b]. In architecture, since the form-structure-material is often taken as a whole, the construction-material relationship is often less deterministic on the building form (Sönmez, 2008). This causes the structure to be considered as a more important criterion than the construction in terms of material selection.

In the questionnaire evaluation, the lowest values were 'multi-level production' and 'temporariness' criteria [Figure 3.b]. Persistence is seen as one of the basic conditions of a successful architecture since Renaissance (Dağlı and Hoşkara, 2010). Therefore, temporality is not considered as an important criterion in material selection unless conditions require it. On the other hand, although the multi-storey production facility of materials is considered as an insignificant criterion by architects, a large part of the buildings of today's cities constitute multi-storey buildings [Figure 3.b]. Increasing population and ground rent in the cities make the production of multi-storey buildings more and more compulsory. Today, about 50% of the world's population live in urban areas, and this number is predicted to reach 80% by 2050 (Al-Kodmany, 2012). Therefore, despite the fact that `multi-layer production` is an important factor in today's conditions, it has not been decisive in the selection of architects.

Ecological Criteria

The criteria that Evci referred to as `environmental criteria' within the material selection criteria were interpreted as ecological criteria in this study (Evci, 2013). In the study, the ecological criteria of the structural system materials were examined on six criteria as follows: `sustainability`, `recyclability`, `green product`, `local architecture compatibility`, `climate compatibility`, `compatibility with human health`[Figure 4.b]. The same grouping was also used for the functional criteria of the wood structural system [Figure 4.a].

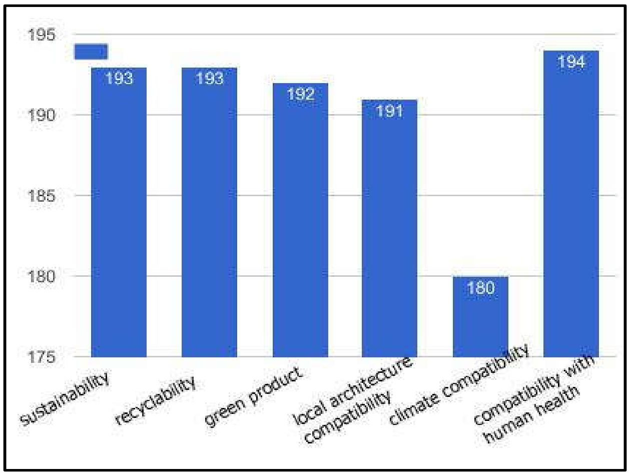

Figure 4.a. Ecological Criteria For Wood As Structural System Material

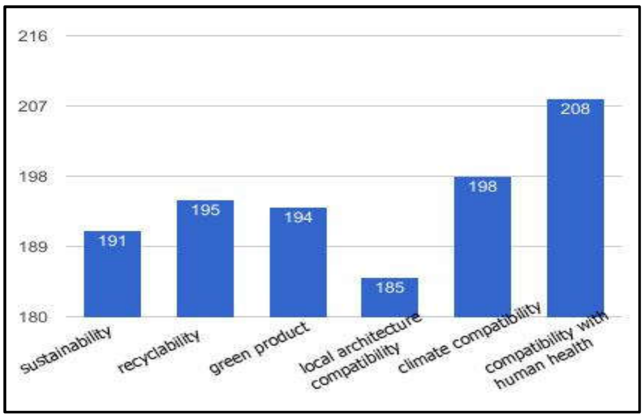

Figure 4.b. Ecological Criteria For Structural System Materials

In the scope of the study, it was seen that the criteria except `climate compatibility` had close values [Figure 4.a]. The criteria used here were closely related to each other and overlapping concepts were decisive in terms of evaluation. Wood is a renewable material to support all these criteria. The amount of energy used in the production of wood products and the amount of carbon dioxide produced in the production process is quite low. Also, wood does not produce toxic wastes and has no negative effects on human health. For all these reasons, wood is one of the materials that is now identified with the concept of sustainability (Güzel and Karaman, 2015). In our country, the use of wood as a structural system material in the construction of traditional houses has an important place. Wood, which is one of the most common materials of Anatolian architecture, is frequently used in the Black Sea region where forest texture is especially intense. However, with the widespread use of reinforced concrete construction system in Turkey since the 20th century, the use of wooden materials has been limited. Reinforced concrete construction system is applied in every region without regard to climatic conditions. Therefore, despite the fact that wood is one of the most compatible materials with the climatic conditions, the prevalence of the reinforced concrete building technique in today's conditions causes it to become backward even in the Black Sea region where wood products is used most. This has affected architects' preferences for materials that are compatible with climate data [Figure 4.a].

In the scope of the survey, it was seen that the most important criterion was "compatibility with human health" in the evaluation of the ecological criteria of structural materials [Figure 4.b]. The relationship between building material and health is one of the important issues in the recent period. Today, instead of natural materials, industrially produced, chemical processed artificial materials are more widely used.These materials have negative effects on human health. For example, the magnetic field generated by reinforced concrete and steel structures affects the heart patients negatively. Also, it is known that toxic gases released from building materials cause respiratory diseases (Güneş and Şengün, 2015). In addition to the harmful effects caused by the use of materials, fossil fuels used in production negatively affect human health and nature. Gases and particles scattered around due to fossil fuels might be cause cancer and respiratory diseases. The adverse effects of air pollution on health also bring additional concerns (Kuzucuoğlu and Polat, 2014). According to the research carried out by The Cooperative of Forest and Forest Products Research and Development in Australia in 1996, wood is the least fossil fuel consuming material in its production. 266000 MJ/m3 fossil-based energy is used for the production of steel and 4800 MJ/m3 fossil-based energy is used for the production of concrete. But only 750 MJ / m3 of energy is used for rough-cut timber (Abimaje and Adams, 2014). So, the material that consumes the least fossil fuel and therefore most compatible with human health is wood. For this reason, in the selection of architects `compatibility with human health` is the highest value criterion [Figure 4.a].

On the other hand, the lowest value among the ecological criteria of the structural system materials is 'local architectural compatibility' [Figure 4.b]. Also, in the graphic, materials 'compatibility with climate' is higher than 'compatibility with local architecture'. In other words, the second graphic shows the opposite result of the evaluation on the first graph. For the first graphic, it is possible to say that architects see wood more closely with local architecture and not seeing climate conditions as an important ecological criterion for choosing wood [Figure 4.a]. For the second graphic, it is possible to say that material compatibility with climate data is more determinative than with local architecture [Figure 4.b].

Aesthetic Criteria

The criteria that Evci called `social characteristics` in the product selection were interpreted as aesthetic criteria in this study (Evci, 2013). In the study, the aesthetic criteria of the structural system materials were examined on four criteria as follows: `psychological effect`, `comfort`, `aesthetic` and `cultural value` [Figure 5.b]. The same grouping was also used for the aesthetic criteria of the wood structural system [Figure 5.a].

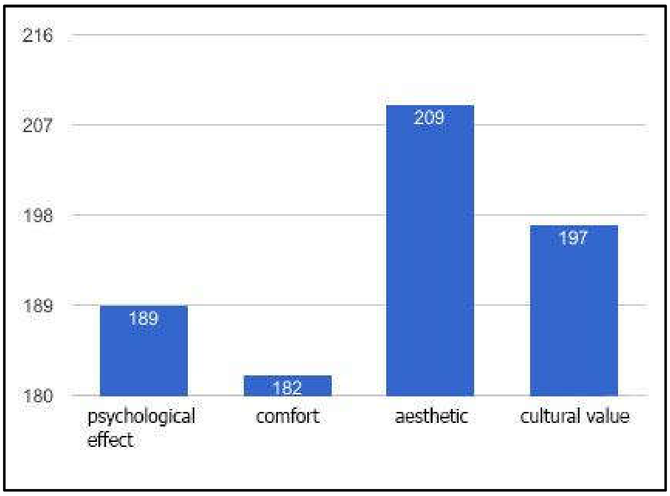

Figure 5.a. Aesthetic Criteria For Wood As Structural System Material

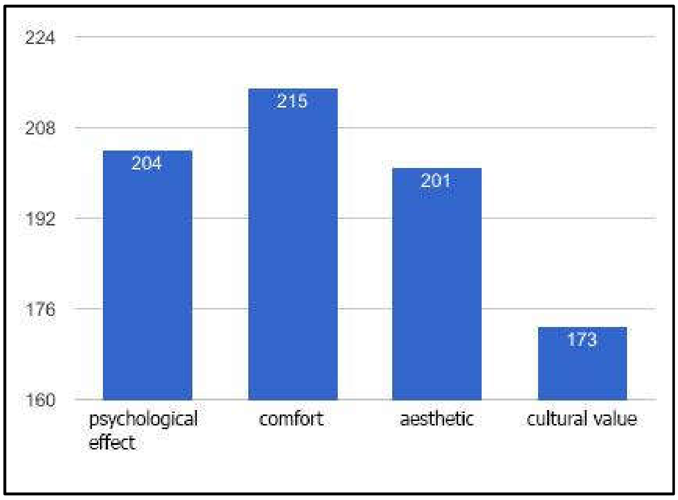

Figure 5.b. Aesthetic Criteria For Structural System Materials

In the scope of the study, it was seen that the most important criterion was "aesthetic" in the evaluation of the aesthetic criteria of wood as structural materials [Figure 5.a]. Wood is the only building material that can directly associate with people along with its color, texture and smell (Ersel, 2000). As a result, it was not only limited to being used as a structural system material in the buildings, but it found a wide usage area in the building from decorative parts to furnitures. The cultural significance of wood material is the second highest value in the graphic [Figure 5.a]. Wooden material overlaps with the cultural structure of Turkish society. The wooden construction system has shaped traditional residential architecture for centuries in order to be able to be installed quickly like a tent and to respond quickly and easily to the needs of nomadic society (Güneş and Şengün, 2015).

Architects have shown their awareness in this regard when making their selections. In the questionnaire evaluation, `comfort` was chosen as the lowest criterion [Figure 5.a]. Wood requires more repair than materials like reinforced concrete and steel as well as it undergoes deterioration over time depending on the internal and external factors (Yaman, 2007). Organisms such as fungi and insects, temperature changes, humidity negatively affect interior of the wood; UV rays, gases and liquids, and structural loads damage the outer surface of the wood. With the influence of these factors, it is necessary that wood is renewed and repaired with certain periods. As a result of this situation which negatively affects the building costs, wood is not preferred as a comfortable material in the selection of architects. In the scope of the study, it was seen that the most important criterion was "comfort" in the evaluation of the aesthetic criteria of structural materials [Figure 5.b].

Average Values

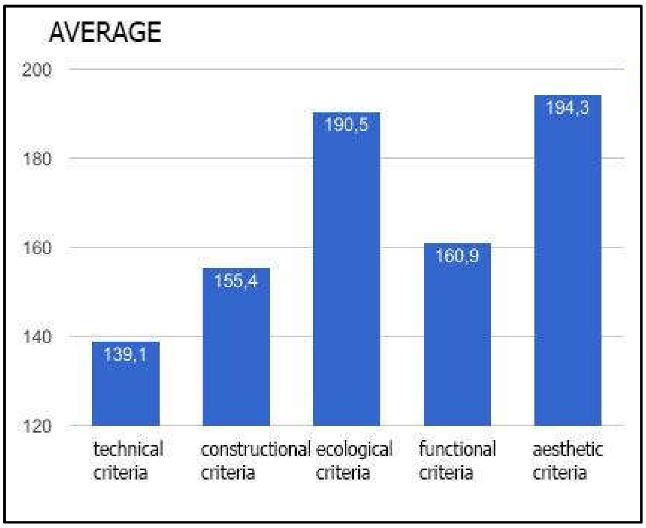

Figure 6.a. Averages For Wood As Structural System Material

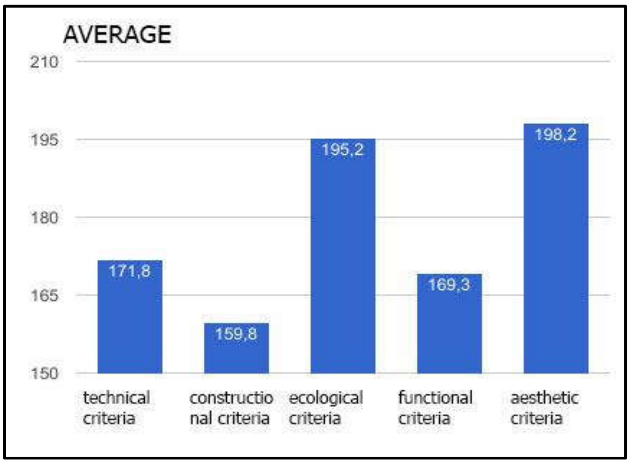

Figure 6.b. Averages For Structural System Materials

The fact that the material is aesthetics comes here second. The reason why user comfort has the highest value in material selection is that the concept of `comfort` is presented as an important value in today's consumption norms. Especially the materials and advanced systems used in the newly constructed buildings increase the comfort of life considerably (Korkmaz and Alacahan, 2014). According to Tocqueville, happiness is measurable welfare through objects, signs and comfort (Baudrillard, 1998). So, Tocqueville sees comfort as a obligation for happiness. Today, this situation is often revealed through the media. Residences and skyscrapers as comfortable living spaces are identified with concepts such as happiness and level of prosperity in people's minds (Nar, 2015). These elements, which are frequently encountered in everyday life, undoubtedly affect architectural choices for materials.The lowest value in the questionnaire was the criterion of 'cultural importance' [Figure 5.b].

In the 20th century, materials such as concrete and steel have become widespread throughout the world, so the cultural values of the materials have begun to be ignored. Materials such as concrete and steel have taken their place in the building sector as an important means of circulating global capital. Therefore, concrete and steel take the place of materials compatible with cultural heritage such as wood. The use of wood has limited with individual requirements (Ersel, 2000). As a result of these evaluations, cultural values and aesthetic perception are associated with the wooden structural system whereas user comfort and psychological perception are associated with structural system materials.

Conclusıon

As a result of the questionnaire, the values obtained for each criterion were added together and the averages were calculated: ten for technical criteria, eleven for construction criteria, seven for functional criteria, six for the ecological criteria and four for the aesthetic criteria. Figures 6.a and 6.b show average values for each criterion. The technical criteria are the lowest value in the use of wood as a structural system material [Figure 6.a]. On the other hand, the aesthetical criteria are the highest value in the use of wood as a structural system material. Ecological criteria is the second criterion that gets the highest value after aesthetic criteria. According to these results, it can be said that wood plays a decisive role in the selection of architects as a sustainable and aesthetic material that is harmonious with the environment.

In the evaluation of the structural system materials; it is seen that ecological and aesthetic criteria have the highest values. This can be explained for two reasons. First, the increasing interest in sustainable materials due to the deterioration of ecological balance with global warming. Second, constantly foregrounding of 'aesthetic' materials with the effect of marketing sector and media. Thus, the ecological superiority of the materials and their ability to respond to aesthetic concerns are considered as an important criterion by the architects. The concept of functionality, which modernization pioneered, is not considered as an important criterion in material selection. Looking at these results; it is understood that architects have a certain level of knowledge about the choice of structural system material. The importance they attach to criteria such as ecology and aesthetics is in harmony with the discourses of contemporary architecture.

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