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# Architectural History and Conservation Considerations of the Wooden *Minbar* in the *Kundekari* Technique in the Taşkın Pasha Mosque

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**ABSTRACT**
*Kundekari* is both a traditional Turkish wood carving technique and a construction system, which is produced by interfacing small geometrical wooden pieces at different angles in order to form a geometric composition. The technique encompasses both actual *kundekari* and imitated *kundekari*. The connections of the wooden elements are secured by dovetailing them without using nails or adhesives in actual *kundekari*, however, in the imitated *kundekari* system, use of nail and glue is needed to achieve the same appearance of actual *kundekari*. Early samples of *kundekari* are seen in the 12th century in Egypt, Aleppo and Anatolia. Elegant examples of *kundekari* can be seen in *minbars* and *mihrabs* of mosque architecture mostly from Early Islamic Art. In this paper, the *minbar* of Taşkın Pasha Mosque in Damsa Village of Ürgüp Town (Nevşehir, Turkey) is investigated in terms of the characteristics and development of the *kundekari* system, the *minbar*'s material problems, and conservation proposals.
**Keywords:** *kundekari*, *minbar,* wood conservation, woodcarving

## INTRODUCTION

Wood is a material that has been in continuous use since Prehistoric Age because of its durability (Kürklü, 2011: 14), and unique anatomical and chemical characteristics (Usta, 2016: 141). In context of wood's physical structure, trees are classified as hardwoods that have broad leaves; and softwoods or conifers that have needle-like leaves (Kandemir, 2010: 26).

Wood has been used as a structural element and decoration material. It is a significant structural material in timber framed buildings and also masonry systems (Kandemir, 2010: 1). Wood carving is a form of decoration technique which is generally used in religious and civil architecture of different techniques. In wood carving that is developed by Turkish people in Anatolia, motives, figures, compositions, use of material and technique are all noteworthy (Yüksel, 2002: 1). Extant examples of woodcarving in Anatolia are few in number because wood was exposed to deterioration agents like meteorological conditions, fires, and intentional and unintentional damage (Bozer, 2007a: 533).

The Great Seljuk Empire had absorbed the development of early Islamic art with the rich material in eastern art; and handed down Turkish culture and art in Central Asia to Anatolian Seljuks (Yüksel, 2002: 8-9). Seljuks gave importance to woodworking from trees like ebony, walnut, apple, pear, rose, pine and cedar; used wood in the architectural elements, and also in *minbars*, platforms, desks and drawers (Yüksel, 2002: 10). The most interesting samples of woodwork are presented in *minbars,* which were abundant in Early Islamic Art (Öney, 1992: 137).

A *Minbar* is the high pulpit with stairs in a mosque, where the speaker stands to read khutbas on Fridays. It is located on the right side of the kiblah wall of the mosque (Öney, 1992: 138). Some of the *minbars* are preserved in museums rather than in mosques. A *Minbar* is composed of door, body and kiosk (*taht*). The body consists of stairs, balustrade and side boards (*yan aynalık*) (Oral, 1962: 23). Doors and side boards of the wooden *minbar*s are generally made with tongue and groove jointing (*kundekari/geçme/çatma*) technique (Yılmaz, 2001: 36).

The *minbar* of Siirt Great Mosque (1129) is known as the first example of *kundekari* in Anatolia (Bozkurt and Bozkurt, 2010: 2). The *minbar* of Alaeddin Mosque (Konya) shows the woodworking developed by the Seljuks, when they came to Anatolia (Bozer, 2002: 913). It was constructed in 1155 by Hacı Mengümberti, a master from Ahlat (Bitlis) (Bozer, 2007a: 534).

The *Minbars* of Aksaray Great Mosque, Harput Sare Hatun Mosque (Elazığ), Kayseri Huand Hatun Mosque, Divriği Great Mosque (Sivas), Arslanhane Mosque and Ahi Elvan Mosque (Ankara) (Figure 1), Sivrihisar Great Mosque, Ayaş Great Mosque, Beyşehir Eşrefoğlu Mosque are other good examples of woodworking in Turkey (Öney, 1992: 137).

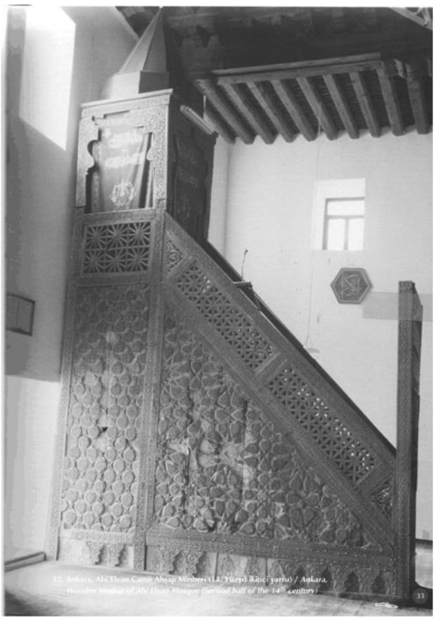


Figure 1. Ahi Evran Mosque (Ankara), wooden *minbar* (Republic of Turkey General Directorate of Foundations, 1999, 33)

## *KUNDEKARI* TECHNIQUE

*Kundekari* is a technique that is composed of interlocking panels and laths (Bozer, 2007b: 204). This technique is obtained by interfacing the small geometrical pieces of hardwood trees by placing the directions of the fiber at different angles (90°, angled, multiple and *narlama*) according to the motifs in a geometric composition (Yılmaz, 2002: 33-35). It is adhesive-free and nail-free by interweaving tiny wooden pieces which are cut in triangular, octagonal, hexagonal, and star-shapes with housed mortice and tenon or butt joints (*zıvana-kiniş)*. A skeletal system is placed underneath the borders of *kundekari* for additional durability (Söğütlü, 2004: 5). This frame provides support in case of strength loss (Bozer, 2007b: 189).

Wood loses moisture in conditions of low humidity and shrinks; in high relative humidity, it swells. These responses do not occur the same in all directions: a minimum parallel to fiber direction, a maximum at tangent to annual rings (Söğütlü, 2004: 2). Wooden blocks tended to separate from each other over time with deep cracks. To overcome this condition, artists began to join wood from same or different trees by dovetailing without nails or glues in order to create large surfaces (Bozkurt and Bozkurt, 2010: 1). By placing the fibers of these pieces in opposite directions, possible problems of wood deterioration over time because of humidity and heat are prevented to some extent (Yücel, 1968: 22-23). Thus, the *Kundekari* technique prevents the undesirable responses of wood. The structure remains structurally stable whether the infill materials are contracted or dilated. The cracks and swelling that occur in wood over time are prevented by means of the air spaces between the joined elements (Bozkurt and Bozkurt 2010: 1-2). Therefore, this very difficult technique containing both decoration and structure requires mastery (Bozer, 2007b: 188-189). Since these artefacts are protected against deterioration agents, their durability extends to eight centuries (Bozkurt and Bozkurt, 2010: 1). In this way, wooden techniques have attained enhanced levels of durability.

In the *kundekari* system, a panel (*tezyinat tablası)* is composed of framing strips (*omurga çıtası*), *narlama*, infill elements (*iç dolgu malzemesi*) and outer locking frame (*dış kilitleme çerçevesi*) (Figure 2, 3) (Söğütlü, 2004: 7-10).

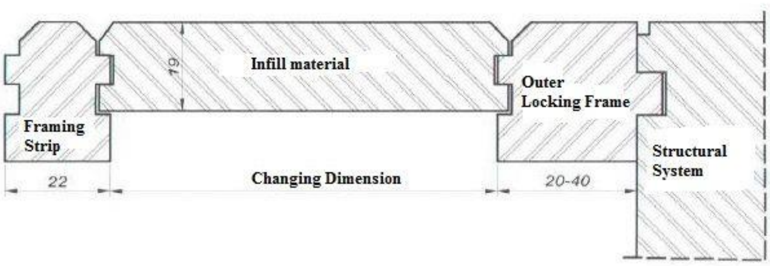



Figure 2. Plan of a kundekari system (Söğütlü, 2004, 11)

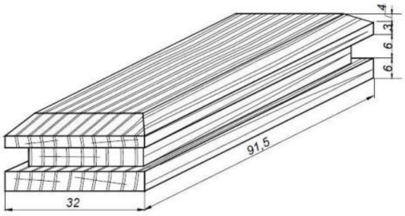



Figure 3. Infill material (Söğütlü and Sönmez, 2008, 351)

Framing strips are the elements of the skeletal system being 30-40mm in thickness, 22-35mm in width and having changeable length and edges in terms of the motifs. The upper part of the strip can have different profiles and the edges have butt joints (*kiniş)* in order to connect to each other (Söğütlü, 2004: 8).

*Narlama* strips are the elements which extend in an axis through the width of the panel in order to strengthen the framing strips in case of perpendicular impacts. They are combined with framing strips with housed mortise and tenon (*zıvana*) joints. *Narlama* strips take place at back side of the panel however only the framing strips and the infill elements are seen in the front side (Söğütlü, 2004: 8-9).

Because of the necessities of the implementation of the technique, geometric compositions are used within the technique (Bozer, 2002: 912). Infill elements are the triangular, octagonal, hexagonal, and star-shaped mostly carved wooden elements having 16-20mm thickness with laps or butt joints with 3-4mm in depth and 6mm in width (Kürklü, 2011: 15).

The outer-locking frame forms an enclosed surface on the side boards. The width of the outer frame is greater than the framing strips'; and the inner parts have same profile with one side of the framing strip (Kürklü, 2011: 16).

The technique is divided into two: actual *kundekari* and imitated *kundekari*. In actual *kundekari*, connections between pieces are provided by not using nails and adhesives, but crossing each other like a puzzle (Söğütlü, 2004: 6). However, in the imitated *kundekari* system, the same appearance of actual *kundekari* is obtained by using nail and glue (Bozer, 2002: 912). The imitated *kundekari* system is grouped into embossed and relief, full embossed and pasted determined by the way of production. Examples of this technique are seen in Ankara Alaaddin Mosque, Divriği Castle Mosque (12th century), sideways of Divriği Great Mosque and Kayseri Great Mosque *minbars* (13th century); actual *kundekari* examples are seen in Malatya Great Mosque *minbar* (12th century). In these samples, laths have been flat and geometrical pieces with vegetal decoration (Bozer, 2007b: 189-191).

First examples of *kundekari* are seen in 12th century in Egypt, Aleppo and Anatolia (Soysal, 2007: 26). The *Mihrab* of Seyyide Nefise Tomb and Seyyide Rukiye Tomb, *minbar* of Amr Mosque from 12th century are the examples with *kundekari* in Eygpt (Bozer, 2007a: 533). Development of this technique was parallel with each other in these areas; it was also continuous in Seljuk, Emirates and Ottoman Era since the middle of 12th century (Bozer, 2007b: 188-189).

The Konya Sahip Ata Mosque, which dates back to 1258, is the first known example of door wings made with original *kundekari* technique. *Kundekari* is thought to be not much preferred in doors, since a limited number of doors with *kundekari* are seen from this date to 15th century (Bozer, 2007a: 535). The door wings of Eşrefoğlu Mosque (Beyşehir) are examples of actual *kundekari* by directly joining the elements without strips (*çıta*) in the end of 13th century (Bozer, 2002: 915).

In the *minbar* of Bursa Great Mosque (Figure 4), semi-domical elements (*kabara*) with miscellaneous dimensions are used in the superimposing composition of actual *kundekari* (Bozer, 2002: 915). This *minbar* is the most monumental example of Seljuk and Emirates period (Bozer, 2007b: 202).

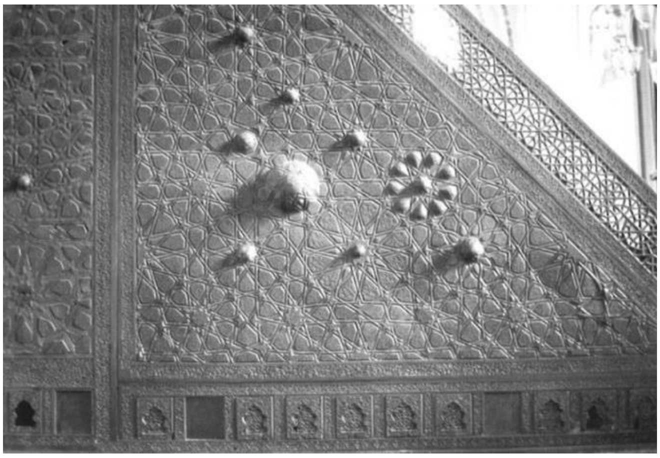


Figure 4. Bursa Great Mosque, *minbar* (Bozer, 2007b, 199)

The *Kundekari* technique was also used together with carving, repousse, *tarsi* (marqueterie) and *kafes* techniques (Bozer, 2007a: 534). In the Seljuk period, geometrical elements in *kundekari* compositions were decorated in carving technique, however some examples with repousse technique were seen at the end of 13th century

(Bozer, 2007b: 192). Similar decorations in *kundekari* were also used in stone, stucco faces and tiles (Bozer, 2007a: 534).

Since marble *minbars* had become common from the 15th century to Ottoman Period and monumental examples of traditional wooden *minbars* had disappeared, use of actual *kundekari* technique in *minbars* remained and began to be used on the kiosks, wings of doors, windows and cupboards (Bozer, 2002: 916).

The *kundekari* technique has contributed to the Anatolian architectural history in such a way that decoration and construction techniques perfectly come together. It is not only an art but also is a construction system.

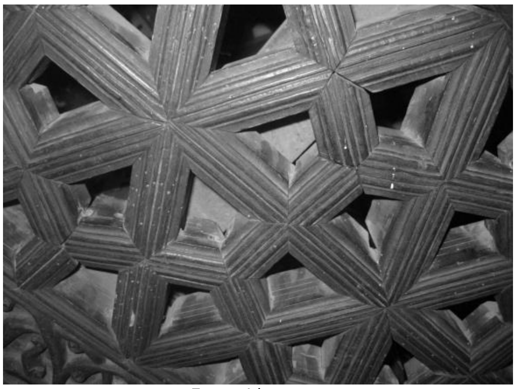
## *MINBAR* OF TAŞKIN PASHA MOSQUE

One of the *kundekari* examples of good quality belongs to the *minbar* of Taşkın Pasha Mosque in Damsa village, Ürgüp town, Nevşehir city, Turkey. Although there is no inscription panel at the mosque (Bakırer, 1971: 367); the mosque is thought to be constructed in Karamanogullari Sultanate age; in 13th or 14th century stated in different sources (Bozkurt and Bozkurt, 2010: 2-3; Bakırer, 1971: 367; Bozer, 2007a: 535). Historical buildings in Damsa belonged to Taşkın Pasha, who is thought to be from a wealthy and powerful family, even in some resources from the family of Seljuk sovereign 2nd Kılıçaslan (Oral, 1962: 65).

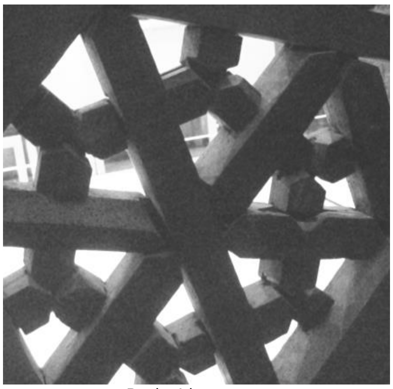
Taşkın Pasha Mosque is one of the mosques of Seljuk period and period of principalities (*beyliks*) in Anatolia, which occurs in a complex (*külliye)* next to the Taşkın Pasha Madrasa and tomb. Although there is no inscription panel giving information about the construction date, the mosque is thought to be probably built at the same dates of the madrasa (Çiftçioğlu, 2001: 21). The Mosque is made of cut stone in walls, earth in the roof; and timber in *minbar* and *mihrab*. The wooden m*inbar* of Taşkın Pasha Mosque is recently exhibited in Ankara Ethnography Museum with inventory number 11928. It was taken to this museum in 1940 with the *mihrab* (Semen Uzar, 2003: 254-258). The *Minbar* is composed of stairs, kiosk and a door (Figure 5), which is made of walnut tree (Bozkurt and Bozkurt, 2010: 3). The dimensions of *minbar* are 318 x 290 x 92cm. gained from the inventory card of the *minbar* in Ankara Ethnography Museum. The *minbar* stands on a wheeled platform made of medium density fiberboard with a glass balustrade.

Figure 5. Taşkın Pasha Mosque, *minbar* (Author, December 2018)

The stairs have 6 steps, which have a 45° angle, balustrade and side boards. The width of the stairs is 92cm. The balustrades are made of *kafes işi kundekari* technique (Figure 6). The *Ayet el Kürsi* section of the *Koran* is written with *Seljuk neshi* on the balustrades (Oral 1962: 64). Sideboards are composed of framing strips in triangular, star and polygonal shapes with dovetailed connections (Figure 7) (Söğütlü, 2004: 13). It is determined that some of the infill elements of the side board are either fallen or destroyed. From the front side, the framing strips are seen as if they have almost same lengths however diagonal *narlama* strips are seen only from the back side, and the framing strips have half length of the *narlama* strips. The width of the strips is 40mm. The depth of the *narlama* strips is approximately 50mm. and the depth of the framing strips are 35mm.

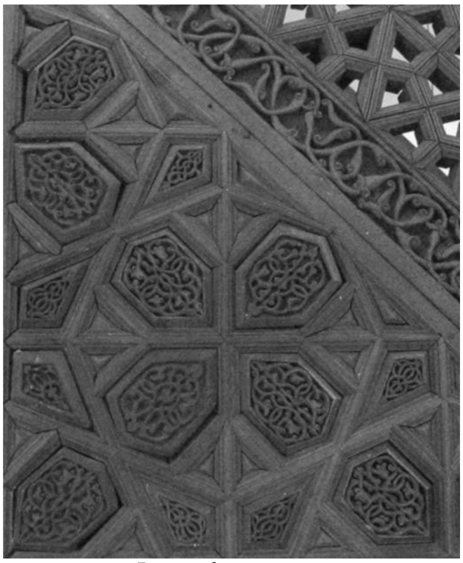


Front side



Back side

Figure 6. Taşkın Pasha Mosque, construction of the balustrade (Author, December 2018)

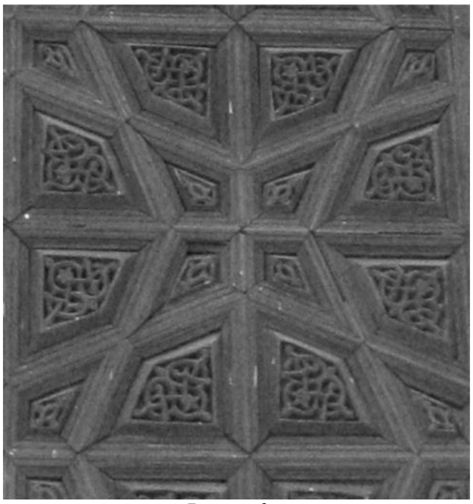


Front surface

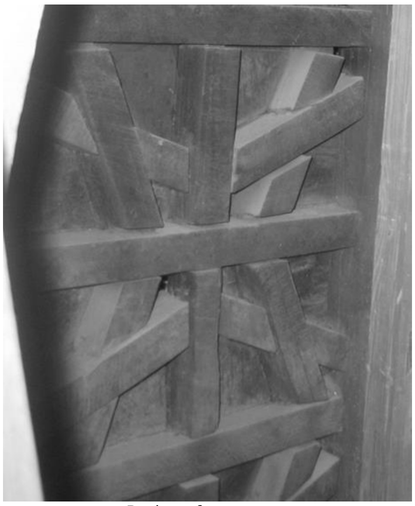
Back surface

Figure 7. Taşkın Pasha Mosque, construction of the side board at the stairs (Author, December 2018)

The height of the kiosk's floor is 255cm. The size of the floor are 70x92cm. The kiosk used to have an upper structure as understood from the extended smaller wooden posts. The side boards of the kiosk are constructed by actual *kundekari* technique (Figure 8).



Front surface



Back surface

Figure 8. Taşkın Pasha Mosque, side board of the kiosk (Author, December 2018)

The sizes of the door are 92x255cm. The double door is constructed with *kundekari* with plain inner panels surmounted by an inscription in the topmost section. In the frame of the door wings there are two horse-shoe arches overlapping with carving. The upper panel of the frame is made of *kafes işi kundekari.* The *Kakma* technique is also used in the door together with *kundekari* (Figure 9).

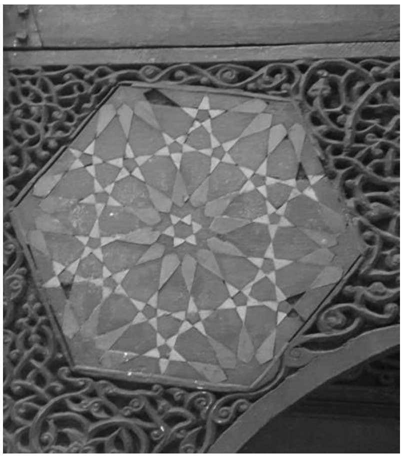


Figure 9. Taşkın Pasha Mosque, *kakma* technique (Author, December 2018)

## *MINBAR'*S MATERIAL PROBLEMS AND CONSERVATION PROPOSALS

Wood is a lifelong material in architecture when it is conserved properly. However, it is open to deterioration factors such as water, incorrect relative humidity, temperature, light, fire and pests (Canadian Conservation Institute, 2015). The mechanical characteristics of wood are affected by "moisture, density, structure, temperature, duration of load and defects in wood", which are mainly exterior factors rather than effects of time (Kandemir, 2010: 38, 44).

Since it is a hygroscopic material, wood has a capability of taking off and giving off moisture. It has a characteristic of permeability, which is a term used for transformation of liquids under pressure (Güler, 2011: 15, 17). Wooden material contracts dimensionally losing moisture, otherwise widens when taking on moisture (Söylemez Özköse, 2014: 9). Moisture content affects wood's strength according to its fiber directions (Kandemir, 2010: 38). In order to conserve wood from deteriorations, wooden artefacts should be maintained in an environment with relevant values of relative humidity for wood (40-65 %) (Kökten, 2007: 106). Degradations because of high relative humidity are swelling, softening, moulding and infestation; low relative humidity causes shrinkage, cracks and splits; and also fluctuation in relative humidity causes change in dimension, deformation, buckling, cracks and salination (Kökten, 2007: 106). Stain and decay fungi are types of fungi; which are the reasons of wood discoloration, decrease in density and speed of water absorption (Kandemir, 2010: 45, 46). Besides, disintegration, change in colour can be seen under high temperature; breaks and embrittlement can be detected under low temperature; and breaks and delamination under daily and seasonal changeable temperature (Weintraub, 1992: 22). These can be affected by the type of heating system, heat exposure time, density, dimensions and moisture content of wood (Güler, 2011: 27).

It is seen that *minbar* in the Taşkın Pasha Mosque, which was made of walnut tree (hardwood) is mostly durable. Only some infill pieces of the side board are either fallen or destroyed. It is understood from visual investigation that the *minbar* had not been exposed to physical forces or fire. Walnut tree wood used in the *minbar* is classified in the medium grade of durable trees (Güler, 2011: 21). Durability is provided because of the construction system of actual *Kundekari*, which is made by interfacing small geometrical wooden pieces by placing the directions of the wood fiber at different angles to form a geometric composition. Although loss of elements is mostly seen in wooden structures, there is not much splitting or loosening of joined components since the undesirable actions of wood are prevented by putting the veins of the elements oppositely.

Since wood is an architectural element which is exhibited in museums, preventive conservation measures must be taken against the deterioration agents. The relative humidity and temperature values in the Timber Artefacts Exhibition Hall of the Ethnographic Museum in Ankara were measured for a month in March-April 2019. The temperature values differed between 18-23°C and relative humidity between 15-40 percent (Boydaş and Koçak, 2019: 2). It is seen that there is a fluctuation in relative humidity and temperature (Figure 10). As the variation in relative humidity levels are great, some recommendations are made. The display areas of the museum should be preserved from sunlight in order to minimize the deterioration due to energy absorption by closing windows. Also, the space must be controlled by using an appropriate Heating, Ventilation and Air Conditioning System in order to reduce the rate and amount of decay (Beşkonaklı, 2010: 23). The exhibition hall should be a closed space, separated from the entrance or loading area with walls/doors in order to provide an environment with exact control of the relative humidity and temperature (Canadian Conservation Institute, 2015). However, it would be worthwhile determining whether the *minbar* has equilibrated to ambient conditions in the museum since it has been housed there since 1940. It would also be useful to know how other wooden objects are responding to conditions in the same hall.

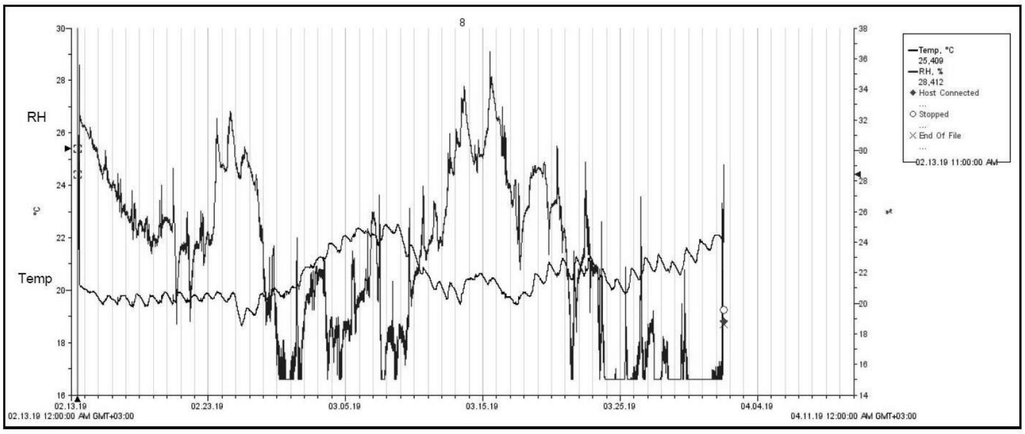



Figure 10. Taşkın Pasha Mosque, relative humidity and temperature values (Boydaş and Koçak, 2019: 2)

The horizontal and perpendicular edges of the *minbar*'s triangular side wall are detected to have been replaced with new wooden elements during restoration. A wooden element should be renewed only if it is badly decayed or destroyed, otherwise it should be restored (Güler, 2011: 199). In order to detect whether the structural condition of the other wooden elements have lost strength because of insects, non-destructive methods can be used besides visual analyses. Ultrasonic pulse velocity measurements and infrared thermography are among the techniques used for soundness assessment of wood in situ (Kandemir, 2010: 48). Impregnation is a treatment for the consolidation of severely weakened wood. The unqualified additions should be removed and structural additions should be appropriate to authentic wooden elements.

Wooden materials are susceptible to attack by wood infesting pests. The types of these pests in museums are usually woodboring beetles or drywood termites. The larvae of woodboring beetles feed on wood and leave behind a mass of powder. Their presence can be understood by the shot holes called pin hole openings. Infested wood has lots of holes and tunnels. Drywood termites are sheltered in dry and sound wood with low levels of moisture. They excavate chambers that are connected by tiny tunnels (NPS, 2006: 5:5, 5:6). Wood destroying organisms disintegrate the cellulose and lignin of wood; and obtain the necessary food in order to live by consuming wood (Güler, 2011: 35). The determination of the insect types is crucial in defining the correct conservation implementation (Güler, 2011: 67). The *minbar* has too many insect tunnels on the wooden elements because of an ancient insect invasion. The first step should be to determine whether in fact there is an active infestation in the minbar. The choice of insecticide and its method of application should be determined based on a variety of factors: type of insect, toxicity, safety considerations for staff and visitors, etc. Gaps should be filled with a variety of modern gap filling materials containing a natural or synthetic resin, a solvent and a filler material which could be wood powder or other solids, to provide long term stability. A disinfection technique proposed by conservation experts can be applied without damage after cleaning the wooden surface. Surface strengthening materials that have vapour permeability and waterproofing and do not change the wood's colour are recommended. Insects cause tunnels in wood that reduce the strength when abundant in number (Kandemir, 2010: 47). In order to detect whether the insect tunnels weakened the structure, visual analyses and non-destructive methods should be used. Integrated pest management programs should be established in the museum for preventive care of the artefact (NPS, 2006: 3:20).

Moreover, we do not see deterioration of chemical agents like acids, alkali, salt etc., which weakens the resistance of wooden material, in this *minbar* (Söylemez Özköse, 2014: 10).

**CONCLUSION**

Wood, which is a natural and organic raw material, has had wide range of use in architecture as well as other fields. Wood carving which has been developed in Anatolia has been mostly used in religious and civil architecture; in the architectural elements, *minbars*, platforms, desks and drawers (Yüksel, 2002: 1, 10). The *Kundekari* technique is one of the techniques of woodworking like carving, repousse, *tarsi* and *kafes* techniques (Bozer, 2007a: 534).

The initial examples of *kundekari* started to be seen in Mamluk and early Seljuk periods. Firstly, wood carving was used, and over time geometric designs were made of wood and placed side by side by using *kundekari* (Bozkurt and Bozkurt, 2010: 1). A choicest example of *kundekari* is at the *minbar* of Taşkın Pasha Mosque in village of Damsa in Ürgüp, Nevşehir. The mosque is one of the mosques of period of principalities (*beyliks*) in Anatolia, as a part of a complex (*külliye)* together with a madrasa and tomb (Semen Uzar, 2003: 254).

The wooden *minbar* of Taşkın Pasha Mosque was transported to Ankara Ethnography Museum in 1940 in order to be exhibited (Semen Uzar, 2003: 254); and was investigated in December 2018 by the author. It is composed of stairs, kiosk and a door. The actual *kundekari* technique was used on the side boards, door wings, upper panel of the door and balustrades. The panel on the side board is composed of framing strips, *narlama*, infill elements and an outer locking frame. Connections of these wooden elements are provided by interlocking with each other, without nails or adhesives. Compositions on the side boards are composed of small geometrical elements (hexagon, tetragon and triangle). Balustrades and upper panel are made of *kafes işi kundekari*. On the door, the *kakma* technique is used together with *kundekari.* Although some of the infill pieces of the side board are either fallen or destroyed, the whole system has saved its durability since centuries because of the features of actual *kundekari* technique. Undesirable reactions of wood have not occurred by means of putting the fibers of the elements on opposite directions.

Few elements had been changed with new ones during restoration of the *minbar*. Minimum implementation should be done to the historic materials; conservation and structural strengthening should be preferred rather than completing new elements. Visual analyses and non-destructive methods should be made in order to define the need of strengthening or renewing the wooden elements. Surface protection should be applied to conserve new wooden elements against deterioration. Moreover, the new materials should be compatible with the older ones in terms of physical characteristics.

The biggest problem for preservation of the wooden elements in *minbar* is insect tunnels because of an ancient insect invasion. Firstly, cleaning and scraping the authentic wooden elements gently, then disinfection, surface strengthening with vapor permeable and waterproof materials; filling the missing parts with relevant resins; and finally preventive varnishing should be applied. The reversibility of the treatment is very important in the authentic materials.

Material conservation techniques must be selected and applied according to scientific principles by conservation experts. The proposed techniques should be tested before applications; and life of materials should be extended by periodical conservations.

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