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The Dimensions of the Two Remaining Türbes in Ottoman Hungary: Contributions to the Methods of Ottoman Construction Practices in the Sixteenth Century

Macaristan'da Ayakta Kalan İki Osmanlı Türbesinin Ölçüleri: 16. Yüzyıl Osmanlı Yapım Tekniklerine Katkılar

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ABSTRACT

Despite the fact that during the sixteenth century, the so-called golden age of classical Ottoman architecture, thousands of significant buildings were constructed, the methods of designing in the classical Ottoman period still raises several unanswered questions. The present paper surveys some features of classical Ottoman designs, the types of drawing documents used by the craftsmen, and the operation of the architectural institutions. By outlining the dimensions of a specific group of commemorative buildings, the mausolea or türbes erected in Ottoman Hungary, this article aims at providing historical contributions to the evaluation and construction methods of the remaining examples of this building type in Hungary. For this reason, the dimensions of the Türbe of Gül Baba and the Türbe of Idris Baba, the two Shrines in Hungary that still stand, will be investigated.

Keywords: *Arşın (c. yard); Classical Ottoman Architecture; dhirā, (cubit); Hungary; Ottoman Architecture; türbe.*

ÖZ

16. yüzyıl boyunca klasik Osmanlı mimarisinin 'altın çağı' olarak adlandırılan dönemde binlerce önemli bina inşa edilmesine rağmen, klasik Osmanlı dönemi tasarım yöntemlerine ilişkin hala cevaplanmamış birkaç soru olduğu görülmüştür. Bu yazıda, klasik Osmanlı tasarımlarının bazı özellikleri, zanaatkârların kullandığı çeşitli çizim belgeleri ve mimari kurumların işleyişi incelenmektedir. Makale, Osmanlı Macaristanı'nda inşa edilen belirli bir anıtsal yapı türü olan türbelerin boyutlarını ana hatlarıyla açıklayarak, bu tür yapıların günümüze dek kalan örneklerinin değerlendirilmesi ve yapım tekniklerinin anlaşılmasına katkı sağlamayı amaçlamaktadır. Bu nedenle, makalede Macaristan'da halen ayakta duran iki türbenin, Gül Baba Türbesi ve İdris Baba Türbesi'nin boyutları incelenecektir.

Anahtar sözcükler: *Arşın; klasik dönem; zira; Macaristan; Osmanlı Mimarisi; türbe.*

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Introduction

The Position of the Chief Architect of Buda in the Institutional System of the Ottoman Imperial Architecture

The flourishing of classical Ottoman art in the sixteenth century resulted from the conscious protective measures of several Ottoman emperors, which has resulted in an institutionalized system of the imperial architecture. In the sixteenth century, the age of Süleymān I (1520–1566), the members of the group of artists and craftsmen, the *ehl-i ḥiref*, worked in specialized groups and workshops, known as the *Miʿmārān-ı Khāṣṣa or Khāṣṣa miʿmārları*.[1] This group was in charge of designing and supervising the constructions as well as of educating the next generation of members. In other words, it was also the institution of imperial architectural education. The architects and constructors operated in two districts. The first was at the outer court of the Topkapı Palace, at the workshops of the *Bīrūn*, where administrators, accountants, architect-restorers, and craftsmen of different materials (such as marble cutters, glaziers, blacksmiths, lead sheet makers, and lime-burners) worked. The second area was the Vefa district of Constantinople, close to the ancient imperial palace, in the quarters of the chief architects.[2] Two individuals acted as the head of imperial architecture: the *şehremīni*, and the *miʿmārbaşı*.[3] The latter was responsible for the development and supervision of all phases of the architectural design and, in many cases, personally instructed the craftsmen working in the palace. The designing of several different constructions, including infrastructure (canalization and road construction), and even the supervision and on-site inspection of the buildings were among his main duties. In the age of Süleymān, the eminent master, Sinan Pasha occupied this position.[4] The monumental oeuvre of Sinan, as recorded by his biographer *Saʿi Muṣṭafa Çelebi*,[5] included more than 400 buildings of various functions and dimensions—from wells to the imperial mosques (i.e., *cāmiʿ*) and building complexes (i.e., *külliye*).[6] He was directly assisted by eight architects (five Muslims and three Christians) in addition to the numerous local architects who worked in the provincial centers throughout the empire.[7]

However, prior to the seventeenth century, there is considerably limited evidence regarding the official position of provincial architects, although a network of architects serving in provincial centers had started to prevail during the age of Sinan. The architects had to possess a knowledge of architectural art *(ṣanʿat-ı miʿmāriyye)*, the science of geometry *(ʿilm-i hendese)*, construction methods *(emr-i binā')*, and architectural surveying techniques *(mesāḥa)*.[8] The position of the architect was directly under the local *qāḍī*, a representative of authority in the provinces, who directly reported to the imperial council or the chief architect.[9] In Buda, the existence of a provincial architect (*Budun miʿmārı*, i.e., the architect of Buda) was recorded in this period.[10] However, the process and methodology of the architectural design and, consequently, the existence of drawn documents in the territory of Hungary in the Ottoman Era are still open-ended questions.

In the following paragraphs, contributions to the methods of Ottoman construction practices that were used in the territory of Hungary will be investigated. First, a comprehensive overview will be provided on the documents and unit systems of the classical Ottoman architecture. Second, the two still standing Ottoman shrines, the *Türbe of Gül Baba* in Buda and the *Türbe of Idris* Baba in Pécs are surveyed as case studies.[11] The general question is the following: were there any general proportions or units used in the construction method of the Ottoman era in the territory of Hungary? This, in turn, leads toward a more specific question: could any drawn document used in the construction process exist?

Resm ve ṭarḥ—The Documents of the Architectural Design

From the architectural culture of the medieval Islamic world, some historical, theoretical documents, and drawings, are known today, not only for the dimensions of cities and buildings but also for constructional details and geometric constructions. Muḥammad al-Ghazali (d. 1111) records how the *"architect designs, and the decorator decorates."* The Persian historian Bayḥaqi (d. 1077) recounts about the Ghaznavid emperor Masʿud I (1030–1041) how his buildings were designed as *"he constructs on his own geometrical knowledge."* The earliest known drawings on *muqarnas*,[12] dating from 1270s and representing a *muqarnas* projection with the system of squares, triangles,

[1] Gerelyes, 1994, p. 22.

[2] The two groups had been operating in the mentioned workshops since the reign of Sultan Meḥmed II. See: Necipoğlu, 2005, p. 154.

[3] The responsibility of the şehremīn was mainly the organization of the estimate of the projects. This function became the responsibility of the şehremīnliği in 1831, which was theoretically a function of the mayor of Constantinople.

[4] For the comprehensive survey of the architecture of Sinan, see: Necipoğlu, 2005; Günay, 2016.

[5] The manuscript has been published as: Develi, 2002.

[6] For the list of the buildings, see the chart of Rabb, 2013, p. 26.

[7] Necipoğlu, 2017, p. 210.

[8] Necipoğlu, 2005, p. 160.

[9] In some cases, the provincial architect communicated directly with the chief architect, for example in the case of the restoration of the Dome of the Rock in Jerusalem between 1579 and 1588. See: Necipoğlu, 2005, p. 160.

[10] The activity of the provincial architect of Buda (Budun miʿmārı) was recorded in a document from 1572, mentioning the conversion of the Virgin Mary Church of Buda to an imperial mosque. Necipoğlu, 2005, p. 158, citing from BOA KK 67 (5 M 80) 5.

[11] The building type of türbe is a mausoleum or shrine in Islamic funerary architecture. The construction of the building can either be transitional (canopy) or enclosed interior space.

[12] Muqarnas is a geometrically connected three-dimensional composition of a series of niches embedded within an architectural frame.

and rhombi, were made for Takht-e Soleyman to be constructed in the palace of the Ilkhanid emperor Abaqa (1234–1282). The plan is on a plaster panel c. 50 × 50 cm. It shows a simplified or schematic design in two-dimensional projection of the three-dimensional stalactite-vault made in *muqarnas*.[13] Some of the planned compositions or materials were transferred from Tabriz to several areas, for example, to Yazd, illustrating that the composition method of the royal center could be transferred to many different territories. The thirteenth century historian Ibn Bībī records how the Rum Seljuq Emperor, "Ala" al-Din Qayqubad (1219–1239) "draws" the arrangement and structure of his palace, which is then detailed and designed by the building masters. Certainly, in this case, the literal acceptance of the term "drawing" is questionable; the description proves the existing relation between the design and geometric construction at that age.[14]

Although thousands of significant Ottoman buildings were constructed in the sixteenth century, no models and only a few drawn documents are available for research at present.[15] Thus, regarding the architectural historiography, the written sources such as accounts and letters are particularly relevant for current research, shedding light on the construction and drawing practices for decision-making and cost estimation as well as on the details of buildings in the Ottoman Empire.

The written sources reveal that, apart from the written directions for the site of the construction, several other types of drawn documentation were used.[16] Before the beginning of the detailed design and after construction, an architectural survey *(mesāḥa)* was prepared. This drawn document, used primarily as the basis of cost estimation as well as a report, could also provide details regarding the environment of the site.[17] Drafts and plan versions *(resm ve ṭarḥ)* also existed that included cost estimates *(takhmīn)* for the preparation of the construction in the form of drawings and models.[18] The making of models *(timthāl)* served both for decision-making and imperial representation,[19] also featuring as ceremonial or procession models.[20] After the verification of the concept, technical and detailed drawings were drafted,[21] which would be used for cost estimation or alignment. Consequently, the methodology of Ottoman drawing representations has to be reviewed from this perspective.

Khaṭṭ ṣanʿat ve resm—The Relation Between Calligraphy and Architectural Representations

During the architectural practices of the Ottoman Empire, architectural drawings and the art of calligraphy *(khaṭṭ)*[22] were often executed by the same artists.[23] Consequently, the interrelationship between the two methods of drawing is perceptible. Among the architects of the Anatolian Seljuq state, the same person could draw both the plans and the calligraphic decoration on the buildings. The architect Badr al-Din Ṭabrīzī, who worked in Konya around the mid-thirteenth century, practiced this comprehensive mastership; the same practice existed in Ottoman architectural culture.[24] On the *khitābe* (epitaph) of the Yeşil Cāmiʿiin *Bursa*, it is recorded that both the design of the building and its decor, including its inscriptions, were designed by *Ḥacciʿlwaḍ Pasha*.[25]

The aforementioned phenomenon was observed among the artists of the imperial workshop. Indeed, the *mısṭār ṭahṭāsı*,[26] traditionally used for calligraphy, was also the tool of the architectural drawings and the designing process. A paper was placed on a board, and its surface was rubbed with a finger rolled in cotton, pressing the surface of the paper in the form of thin raised lines that were used as a ruler for writing and drawing.[27] This modular grid system was used as a base for both the design calligraphy[28] and constructional details, especially for *muqarnas* (Figure 1). As an example, the *Topkapı Scroll* can be mentioned, which records several *muqarnas*-constructions.[29] However, not only the architectural details but also the entire building construction could have been designed on the basis of the method outlined above.

The plan versions of a *türbe* from the first half of the sixteenth century, as a complete construction designed on a modular grid system, preserved at the Topkapı Palace Museum, is particularly relevant here (Figure 2).[30] The plan was presumably a draft prepared for decision *(resm)*,

[13] Necipoğlu, 1995, p. 4.
[14] Necipoğlu, 1995, p. 4.
[15] The reason for the lack of surviving drawn documents is controversial. One of the possible explanations is the several fires at the center of the chief architects in the Vefa district. Therefore, the plan versions found at the archive of the Topkapı Palace Museum are rare examples. See: Necipoğlu-Kafadar, 1986, p. 224.
[16] Necipoğlu, 2005, p. 174.
[17] Necipoğlu, 2005, p. 162.
[18] The order to the beylerbeyi of Buda contains the written sources of draft (resm) according to preparing resm about the castle of Szigetvár, which would be sent for the sultan's court for approval. See Mühimme Defterleri, No: 23, page 30, order no: 58 (25 Cumādā al-Ūlā 981), Page 25. BOA, MD. 23, #58, (25. Ca. 981)
[19] Necipoğlu, 2005, p. 176.
[20] On one of the miniatures of Sürnāme-yi hümāyūn, the model of Süleymaniye mosque is carried by eight officers during a ceremony in front of the padishah. TKSM H 1244 f. 190V-191R, see Kuban, 2011, p. 10.
[21] According to the account book from the construction of the Süleymaniye mosque, at one phase of the design process, approximately 120 sheets of paper were needed for the details of the decoration of the dome. See: Necipoğlu, 2005. p. 176.
[22] The members working at naḳḳaşkhāne were led by eminent artist. Among them were Baba Naḳḳaş, Şahqulı, Qara Memi, Maṭraḳçı Naṣuḥ, or Naḳḳaş ʿOṯman. See: Gerelyes, 1994, p. 25.; Gerelyes, 2007, p. 236.
[23] Şenyurt, 2015, p. 27.
[24] Şenyurt, 2015, p. 28.
[25] Şenyurt, 2015, p. 28.
[26] The thin lath used for monitoring the wall plane by the stonemasons. See: Hasol, 2016, p. 310.
[27] Şenyurt, 2015, p. 54.; Derman, 2012, p. 229.
[28] This modular grid system is referred to as "chessboard" (satrānç).
[29] For the comprehensive history and analysis of Topkapı Scroll, see: Necipoğlu, 1995.
[30] The drawing is a design for for the türbe of Abdal ʿAṭa, Emīr Seyyid, Receb and Burqān (Bermekan) Dede in Çorum. Source: TKSM E.9495/11., published: Orgun, 1938, p. 336.; Ünsal, 1963, p. 190.; Necipoğlu, 2005, p. 169.

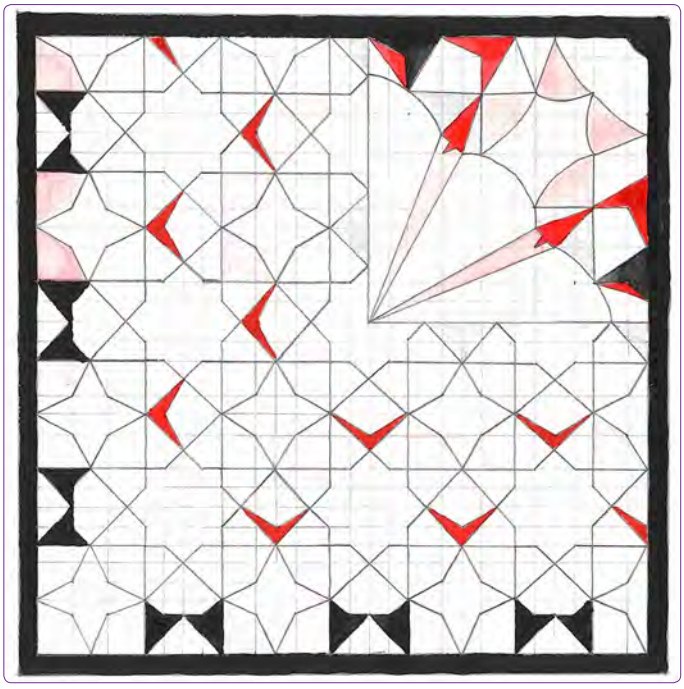

Figure 1. Repeating unit for a stellate muqarnas quarter vault based on a composite orthogonal and radial grid system with patterns limited to 45, 90, and 135 degrees. (Redrawn by Gergő Máté Kovács after Gülru Necipoğlu. The Topkapi Scroll—Geometry and Ornament in Islamic Architecture [Santa Monica, 1995], 272, 333.)

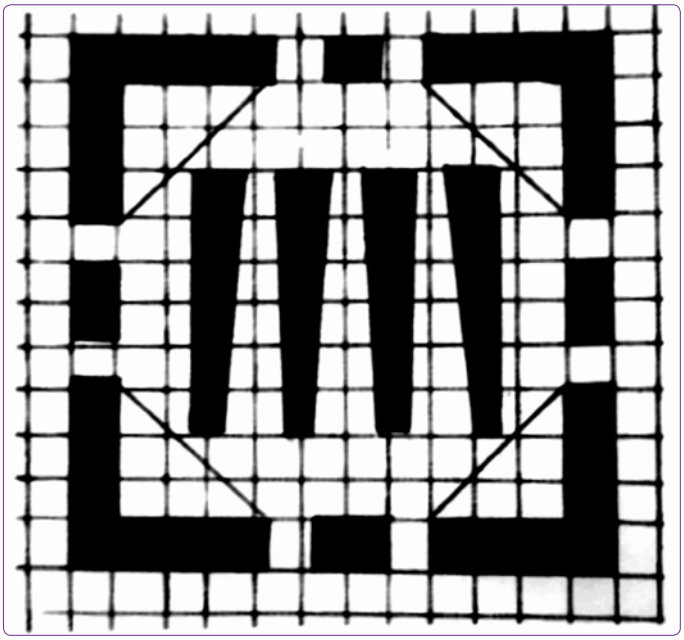

Figure 2. A drawing of the three plan versions of the *türbe* of Abdal 'Aṭa, Emir Seyyid, Receb, and Burqan (Bermekan) Dede with the modular grid system. Source: TKSM E.9495/11, after Gülru Necipoğlu, The Topkapi Scroll, 6.

representing the three model variants of the design of the türbe of Abdal Ata in Çorum.[31] The base of the building is a modular grid system based on the *arşın* as a unit: the dimension of the interior is 10 × 10 *arşıns*,[32] and the thickness of the walls is 1 *arşın*.

The *arşın* is the characteristic measuring unit in classical Ottoman architecture. According to Halil İnalcık, 1 *arşın*—also denominated as *dhirā'*[33] ––was 0.758 meters,[34] equal to 24 *parmak*, 12 × 24 *khaṭṭ*, or 288 × 2 *noḳṭa*.[35] As can be seen on some other Ottoman drawings, the interiors and constructions[36] of the buildings were recorded as the integral multiples of the *arşın*.[37] The application of the modular grid system was not only used as a design but also for the estimation of the construction material, and it enabled the standardization of the building.[38] Given that the two *türbes* analyzed in this paper were constructed during the sixteenth century, their dimensions to one of the canonized imperial measurement units called *arşın* will be examined and compared.

Arşın—The Dimensions of the türbes in Ottoman Hungary

In the central territory of Hungary, which was under Ottoman occupation during most of the sixteenth and seventeenth centuries, only two examples of the building representing type of *türbe* survive today in good condition. However, their original number, as attested from written sources, was at least 18. One *türbe* was erected by Yaḥya Pashazade Meḥmed Pasha, the *beylerbeyi* (governor general) of Buda between 1543 and 1548 for the honored Bektāşī dervīş[39] Gül Baba (Figure 3).

Despite the limited evidence for the life of Gül Baba, according to tradition, Sultan Süleymān I and the *qāḍī 'askar*[40] of Rumelia, Ebus-Su'ud Efendi, both participated in the

[31] Dündar, 2008, p. 991.

[32] Necipoğlu-Kafadar, 1986, p. 230.; Şenyurt, 2015, p. 55.

[33] The architectural dhirā' appears in the endowment deed or waqfnāme of the beylerbey of Buda, Soqollu Muṣṭafa Pasha, in the sixteenth century. (Budin'de merḥūm Muṣṭafā Pasha'nın waqf-nāmesi). In the document, an empty area of 200 x 120 dhirā' can be seen in the outskirts of Buda. See Schmidt, Simon, Yıldıztas, 2016, p. 133., citing from TS.MA.d, 7000, p. 10., line 2.

[34] In the territory of the Ottoman Empire many different local measurements existed and thus the units used in architecture are also questionable. In this paper, the measure of arşın is determined according to a most widely accepted source, the list of measurements between 1300–1600 prepared by Halil İnalcık. However, for the measurement of textiles a different arşın (68.579 cm) was used.

[35] Ünsal, 1963, p. 194.

[36] The width of the walls of the aforementioned türbe-plan in Çorum was recorded as 1 arşın in width (TKSM E.9495/11.), on the plan of the khān, catalogue number 9493, the dimension of the walls is also 1 arşın (Ünsal, 1963, p. 170., plan no. 1.); the plan of the çift ḥammām was recorded as 2 arşıns (Ünsal, 1963, p. 184., plan no. 12.)

[37] Ünsal, 1963, p. 194.; Necipoğlu-Kafadar, 1986, p. 231.

[38] In Iran and Central Asia the method of estimating the construction material from the drawing over a modular grid system was also in use. The unit of the grid defined a unit of material (e.g. brick), from which the amount of required material could be calculated. The method was adopted by the Ottomans. See: Necipoğlu-Kafadar, 1986, pp. 231, 233.

[39] The Bektāşī (Bektashi) Order is a Sufi order (tariqat) named after the Haji Bektash Veli from Khorasan and had particularly strong influence in the territory of Balkans and in Ottoman Hungary.

[40] The position of "the judge of the army", was first appointed by Sultan Murad I in Bursa in 765/1363 with authority for military jurisdiction and also supervisory powers over all ḳāḍīs. Their influence greatly increased by the fact that both the Anatolian and Rumelian qāḍī 'askars were members of the imperial council. See: Káldy-Nagy, 2012.

Figure 3. The *türbe* of Gül Baba in Buda, southeastern facade with its entrance. (The photo was taken by Gergő Máté Kovács in 2019.)

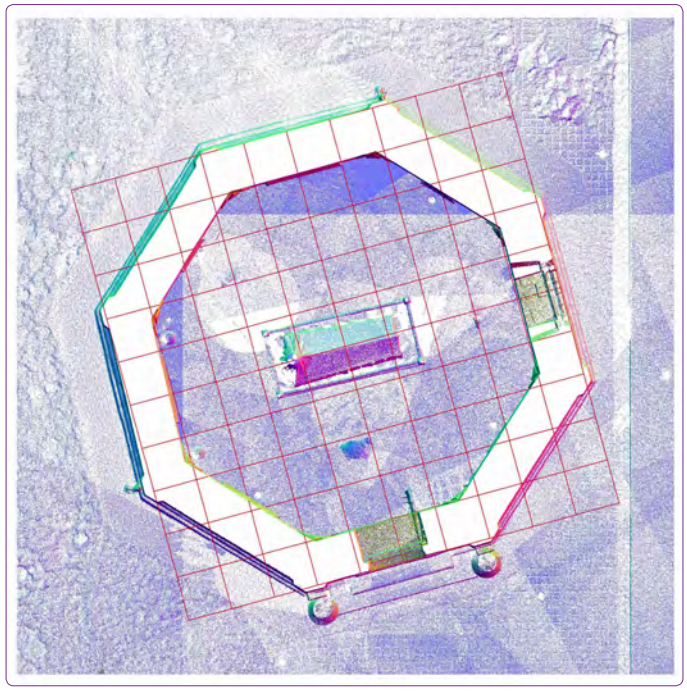

Figure 4. Plan of the *türbe* of Gül Baba in Buda (built in 1543–1548). The *türbe's* three-dimensional model was prepared with a laser scanner, shown here in relation with the 10 × 10 arşıns modular grid system. (The laser scanning was taken by Gergő Máté Kovács in 2019.)

funeral ceremony.[41] Therefore, the *türbe* constructed over his tomb represents high architectural quality, despite having been constructed in a peripheral territory of the Empire. Following the Ottoman era in Hungary, many modifications were made to the building; however, its original high quality can still be observed today. The materials were precious, with the walls of the octagonal building constructed of cuboid limestone ashlars, covered by a hemispherical dome of brick, featuring an outer layer of lead.

The modular grid system based on the *arşın* module (Figure 2) can be accurately applied to the surveyed plan of the *türbe* of Gül Baba (Figure 4). The contours of the exterior facade correspond with a 10 × 10 *arşıns* grid, while the interior conforms with a modular grid system 8 × 8 arşıns, demonstrating that both its interior and exterior are symmetrical on two sides. The thickness of the wall construction of the *türbe* is 1 arşın, whereas the nominal size of the door is 2 *arşıns* (Table 1). Consequently,

Table 1. Comparison of representative dimensions and the construction materials of the *türbe* of *Gül Baba* and *Idris Baba*

Characteristic	Measurement	Investigated building	
		Türbe of Gül Baba, Buda	Türbe of Idris Baba, Pécs
The horizontal dimensions measured at the of level the lower window line (h1)	cm arşın	604–607 8	610–615 8
The vertical dimensions of the interior measured on the symmetry axis of the dome. (h_2)	cm arşın	665–669 8 ¾ (1 *arşın* 18 *parmaks*) Thickness of the internal floor construction: ¼ *arşın* or 6 *parmaks*	756–759 10
Thickness of the wall (v)	cm arşın	75.6–77 1	86–89 1 1/6 (1 arşın 4 parmaks)
Material of the wall		Ashlar limestone masonry; the interior is plastered, and the exterior surface is covered with regular limestone	Inhomogeneous rubble stone wall with an irregular arrangement and surface

[41] Ágoston–Sudár, 2002, p. 60.

it can be assumed that the dimensions of the *türbe* were determined according to these units during its construction.[42] This means that the design of the *türbe* of Gül Baba is closely comparable to the modular grid system used for the abovementioned sixteenth-century *türbe* in Çorum.

When the 10 × 10 *arşın*s modular grid is compared with the survey plan of the other existing *türbe* of Idris Baba in Pécs in present-day Hungary (Figure 5),[43] the dimensions are similar to this unit with an apparent deviation (Figure 6). There is a 13 cm difference in average between the *arşın* units and the exterior dimensions of the building.

The variation between the *arşın* units and the actual measures of the building may be explained in three different ways: (1) the building was not constructed according to *arşın units*; (2) the *arşın* modular grid was applied imprecisely; or (3) the variation was created intentionally. Regarding the first explanation, the proposal that the artists avoided using the *arşın* units may be due to the following reasons: the building was erected in a peripheral place of the Ottoman Empire, in Pécs, that was nothing but a rural city in the peripheral *vilāyet* of Hungary. Although the city of Pécs was a frequented area by the Ottomans for construction activity (among others, the *külliyes* of Ferhad Pasha, Yakovalı Ḥasan Pasha, and Ḳasim Pasha), Idris Baba was a less prominent person than Gül Baba, and the building itself might have been constructed by less well-trained artisan than those in Buda.[44] However, the difference in the dimensions of the two buildings can be noticed only in the exterior of the horizontal plan, which strongly suggests that the *arşın* system was, in fact, deliberately done.

The building was presumably constructed by local craftsmen, using materials from the surrounding area, which could be confirmed on closer examination. In contrast with the *türbe* of Gül Baba, which was constructed with ashlar limestone masonry, the material of the one at Pécs is of nonhomogeneous rubble masonry, and the surface of the dome was covered with ceramics. This would comply with the hypothesis of the lower quality because it was constructed in the border area of the empire for a less prestigious and, indeed, historically unimportant individual. Regardless of the lower standards revealed in the construction materials or by the 130 mm variation from the 10 × 10 *arşın*s grid system, this difference is greater

Figure 5. The *türbe* of Idris Baba in Pécs, southwestern view. (The photo was taken by Gergő Máté Kovács in 2018.)

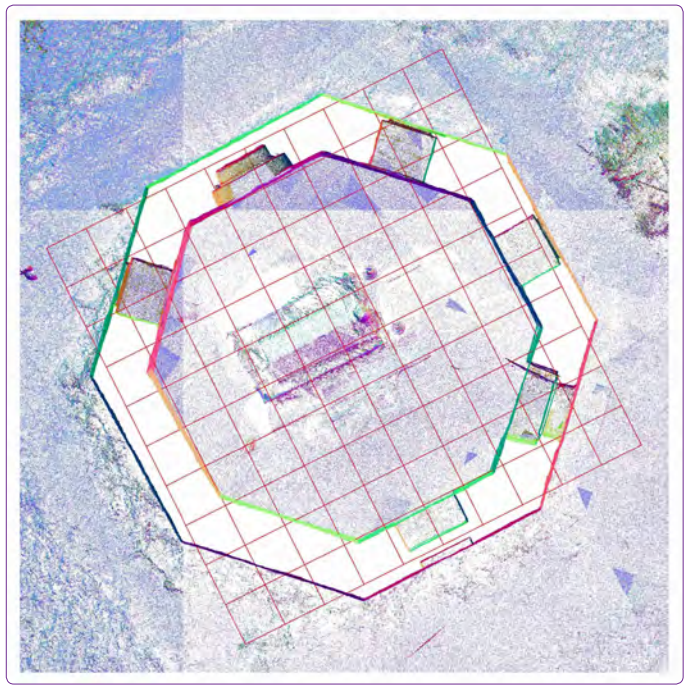

Figure 6. Plan of the *türbe* of Idris Baba in Pécs. The *türbe's* three-dimensional model was prepared with a laser scanner, shown here in relation with the 10 × 10 *arsıns* modular grid system. (The laser scanning was taken by Krisztina Fehér and Gergő Máté Kovács in 2018.)

[42] For the conscious use of proportions in the architecture of Ottoman Hungary, see Horváth–Zsembery, 2008, p. 23.

[43] The true-to-form survey of the türbe of Idris Baba was carried out with a laser scanner. The survey was prepared by Krisztina Fehér and the Author in Autumn 2018. The laser scanner operates with +/- 4 mm punctuality on a distance of 10 meters – the survey was prepared within this distance. Since the surface of the exterior facade of the building is not plastered, one or two cm of irregularity is visible on the rubble stone texture. Therefore, the margin of error of the scanner is acceptable in this case. About the comprehensive methodology of the digital analysis see: Somogyi–Fehér–Lovas–Halmos–Barsi, 2017, pp. 640-651.; Fehér–Halmos, 2015, pp. 237–284.; Daragó–Bakonyi, 2015, pp. 6-16.

[44] The most important sources which record the name of Idris Baba are the Taʾrīkh (history) of Ibrāhīm Pečewī, the Ottoman historian, who was born in the city of Pécs and Ewliyā Čelebi. Besides, according to his life only legends and myths can be observed. However, there is no doubt that Idris Baba belonged to the Bektāşī order according to the clarification of Balázs Sudár. (Sudár, 2013, p. 9.) Meanwhile, despite the fact that there is also a limited amount of information about the life of Gül Baba, his name is absolutely more known. As it was aforementioned, according to legends which were recorded by Ewliyā Čelebi, Sultan Süleyman and the qāḍī ʿaskar of Rumelia, Ebu s-Suʿud Efendi, both participated in the funeral ceremony. (Ágoston–Sudár, 2002, p. 60.).

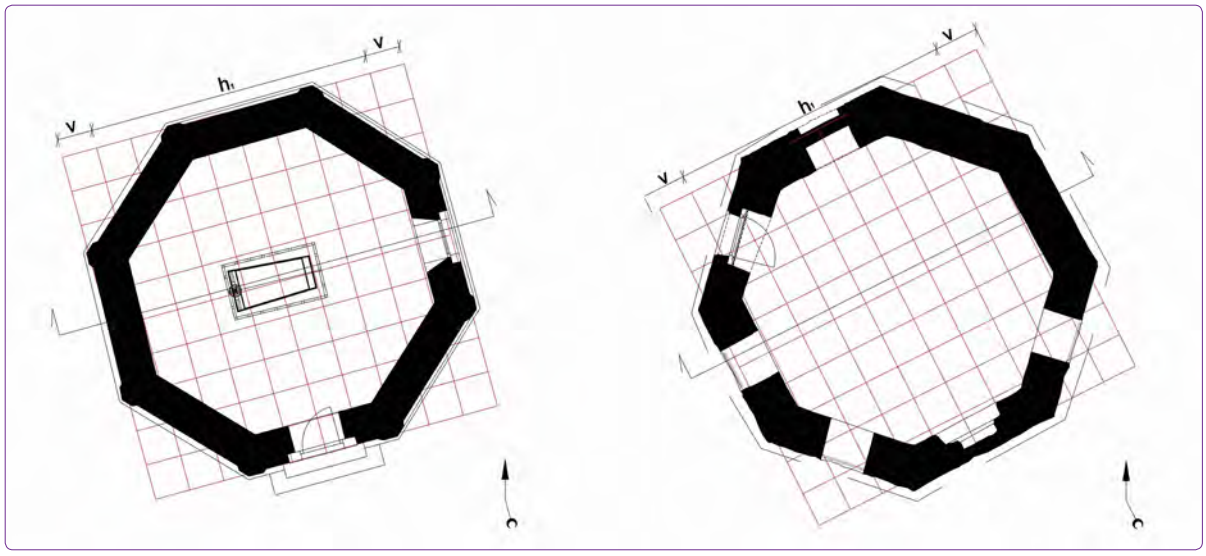

Figure 7. The surveyed plans of the *türbe* of Gül Baba (left) and the *türbe* of Idris Baba (right), juxtaposed with the 10 × 10 arşıns modular grid system. (The laser scanning was prepared by Krisztina Fehér and Gergő Máté Kovács; the drawings were prepared by Gergő Máté Kovács in 2018–2019.)

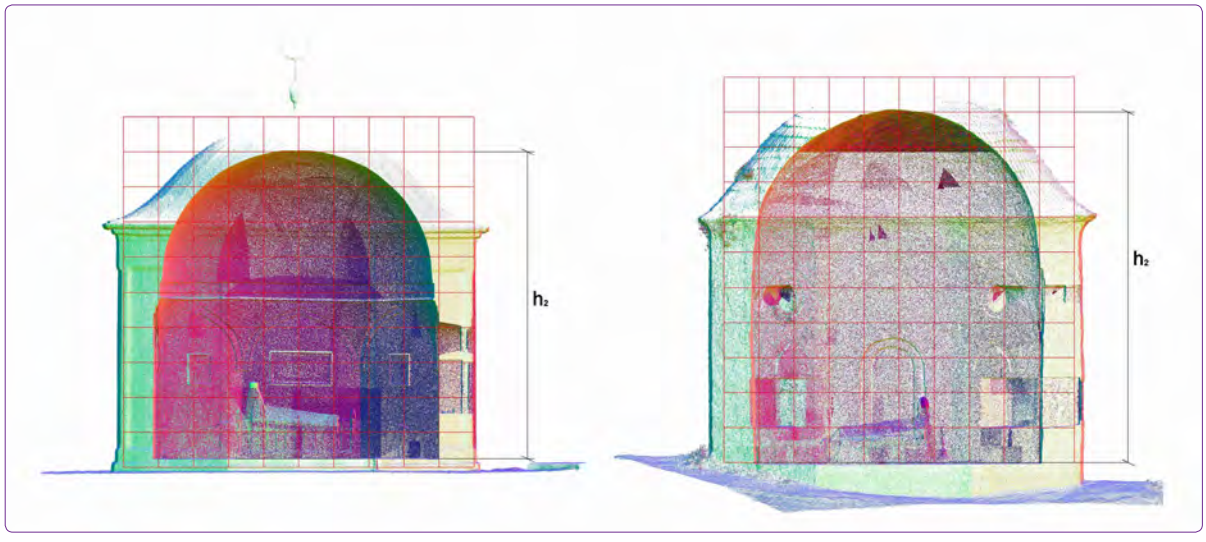

Figure 8. Cross sections of the *türbes* of Gül Baba (left) and Idris Baba (right), juxtaposed by the modular grid system. H2 marks the height of the interior in the symmetry axis of the buildings (The laser scanning was prepared by Krisztina Fehér and Gergő Máté Kovács; the drawings were prepared by Gergő Máté Kovács in 2018–2019.)

than 10 percent of the wall thickness; therefore, it can be concluded that it was not due to defective construction.

Notably, the size of the two *türbe's* interiors, according to the survey plans measured at the horizontal level of the first row of the windows (Figure 7/ h_1), are precisely the same. Both plans conform to the modular grid system of 8 × 8 *arşıns*, which means that the horizontal dimensions of the interior are identical. The difference exists only in the thickness of the walls (Figure 7/ v).

The characteristic thickness of wall (v), in the case of the *türbe* of Gül Baba is 1 *arşın*, while the wall of the *türbe* of Idris Baba is thicker by 130 mm. This difference can be expressed using *arşıns* (1/24 *arşın* = 1 *parmak*= 31.6 mm). That is, the average difference of 130 mm, equal to 4 *parmaks*, means that the thickness of the wall of the *türbe* of Idris Baba is 1 1/6 *arşıns* (Figure 7).

The vertical dimensions of the two buildings (Figure 8) reveal that in the case of Idris Baba, the height of the interior in the symmetry axis (h_2) is 10 *arşıns*.[45] In the case of the *türbe* of Gül Baba, the thickness of the floor construction is ¼ *arşın*, and the height of the interior (h_2) is 8 ¾ arşıns, equal to 8 *arşıns* and18 *parmaks*.[46] As for the

[45] The idea of the perfect symmetry had several important aspects since the architecture of Antiquity. See: Kiss, 2013, p. 184.

[46] The accuracy of the present floor level is highly questionable, especially because several modifications were made to the building following the Ottoman period.

external constructional dimensions of the two türbes, that of Idris Baba is a difficult question because the surrounding ground floor is not horizontal and may have been modified over time. However, the average thickness of the dome is 1 *arşın*; in relation to the interior, the total height of the building is 11 *arşıns*. In the case of the türbe of Gül Baba, the surrounding ground level is horizontal, and the external height measured from the footing is 10 *arşıns*. Namely, both the horizontal and vertical dimensions of this building are fitted with a square modular grid system of 10 × 10 *arşıns*.

In the case of the sections, one commonality is perceptible: in both cases, the height of the interior of the dome is 4 *arşıns*, and the level of the cornice in the interior is on 7 *arşıns*. In the case of the *türbe of Idris* Baba, the height of the parapets under the windows is 1 *arşın*, which is a noticeable height on the texture of the wall, since a line of stones is clearly visible. The height of the window's parapet on the Gül Baba's *türbe* is 1 ¼ *arşın*. Other, integral dimensions are not perceptible; however, in the case of the main constructional details, measurements in *arşıns* are apparent.[47]

It should be noted that of the fifteenth- and sixteenth-century buildings constructed at the peripheries of the empire, the examined shrines followed the official Ottoman standards only in their plans, while the constructional details often differed. The reason for this is that the drawings, if they existed, would have had only the main dimensions of the plans, without any horizontal sections *(taqsīm)*, and the details would have been designed by the local masters during the construction process.[48] Consequently, it might well have been the case with the Ottoman buildings in the territory of Hungary that the main dimensions were marked, but the details were not. As a result, the differences in the thickness of the walls of the two surviving *türbes* are likely to result of using different construction materials and the different heights of the buildings (Table 1).

The *türbe* of Gül Baba was constructed of regular, cuboid limestone masonry, whereas the *türbe* of Idris Baba features nonhomogeneous rubble stone walls with an irregular arrangement and surface and had horizontal courses of differing height. The *türbe* of Idris Baba is higher by 1 *arşın* than that of Gül Baba. The regular, cubic limestone construction can transmit the forces generated by the dome; thus, the higher and nonhomogeneous construction requires stronger and thicker walls. However, the difference follows *arşın* units, as the walls of the türbe of Idris Baba are thicker by ¼ *arşın* in comparison to the walls of the *türbe* of Gül Baba.

[47] The ʿālem, the copper finial covered with gold on the top of the dome of Gül Baba is not the original Ottoman construction, but the result of a twentieth century restoration.

[48] Necipoğlu, 2005, p. 174.

Conclusions

The *arşın* unit was a characteristic feature of Ottoman architecture in the sixteenth century. For instance, this unit was represented and used by a modular grid system that was recorded in the sixteenth-century plan versions of the *türbe* at Çorum.[49] The examination of the two *türbes* in the territory of Hungary that survive to date in adequate conditions reveals that their dimensions were determined following the *arşın* units. In addition, it appears that in the design of the *türbe* of Gül Baba, a modular grid system similar to the sixteenth-century türbe plan found in the Topkapı Palace Museum Archives may have been used, particularly because both the plan and vertical sections can be placed or fitted on a square modular grid system of 10 × 10 *arşıns*. In the case of the *türbe* of Idris Baba, both the horizontal plan and the vertical section deviate from the modular grid system, whereas the dimensions of the horizontal plan of the interior are the same (8 × 8 *arşıns*). The deviation can be defined in arşıns: the thickness of the wall is 1 1/6 arşın, and the height of the building is 11 *arşıns*.

The differences between the two buildings can be explained by the historical context as well as the context of the construction. The *türbe* of Idris Baba was constructed for a less prominent person in a peripheral location. Moreover, it is higher than that of Gül Baba, constructed of nonhomogeneous material, which logically resulted in the thicker walls. Nonetheless, it can be stated that during the sixteenth-century classical period of the Ottoman Empire, the construction and design method applied in the innermost areas of the empire can be noticed in border areas, albeit with some local variations, and their measurements correspond with the regular construction method of Ottoman commemorative buildings in Hungary.

Since the *arşın* unit was recorded in Ottoman written sources in the territory of Hungary (see Mustafa Pasha's *waqf-nāme*) and was visible in drawn documents (see Çorum, a drawing of the Bektashi shrine for Abdal Ata, Emir Seyyid, Receb, and Bermekan Dede, with the *arşın* grid system) as well as in Ottoman drawn documents also occasionally seen in the area of Hungary (see the command related to the Castle of Szigetvár), it can be assumed that the shrines were built according to central written or drawn commands in which the characteristic dimensions (structure and interior space) were recorded; these would also have provided guidance for local masters. Thus, the use of *arşın* units in structural and spatial dimensions, which can be observed in the true-to-form surveys, can be correlated with written commands, drawing documents, and architectural units used in the area of Ottoman-dominated Hungary. According to the surveys listed above

[49] Source: TKSM E.9495/11., published: Necipoğlu-Kafadar, 1986, p. 230.

as well as the written and drawn sources from the fifteenth and sixteenth centuries, it can be assumed that the shrines in the territory of Hungary were constructed according to written commands using the previously referred drawings.

The methodology presented above may provide a significant contribution to the identification, building archaeological research,[50] and theoretical reconstruction of other *türbes* that may come to light in the future. In other cases, this methodology may provide an example for surveying Ottoman buildings with different functions in Hungary, as well as other *mausolea* in different parts of the empire.

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[50] As the comprehensive overview of the major theoretical source of the method of building archaeology, see: Mader, 1989, pp. 11–31.; Schuller, 1990, pp. 168–223.; Krähling–Halmos–Fekete, 2006, pp. 5-55.

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