

A STUDY ON THE USE OF BRICKBONDS IN ANATOLIAN SELJUK ARCHITECTURE*

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Ö. BAKIRER, *Selçuklu Öncesi ve Selçuklu
Dönemi Anadolu Mimarlığında Tuğla
Kullanımı*, Ankara: ODTÜ Yayınları: 1981

1. A.U. POPE, *Islamic Architecture,
Introduction, A Survey of Persian Art*,
ed. A.U. Pope, Oxford: University Press,
1967 (1939), pp. 901-902, 916-918.

2. This new style in architecture
where the brick surfaces are exposed
is usually referred as the 'naked
brick style'. For its origin and
development a number of hypothesis
have been put forward. See:
A.U. POPE, *Islamic Architecture,
Introduction, A Survey of Persian Art*,
ed. A.U. Pope, Oxford: University Press,
1967 (1939), pp. 916-918.

A.U. POPE, *Persian Architecture*, London:
Thames and Hudson, 1965, p. 139

A.U. POPE, *Persian Brickwork, Country
Life*, v. 72, 1932, pp. 742-747.

E. SCHROEDER, *Islamic Architecture, The
First Period, A Survey of Persian Art*,
ed. A.U. Pope, Oxford: University Press,
1967 (1939), pp. 954-963.

E. SCHROEDER, *Islamic Architecture, The
Seljuk Period, A Survey of Persian Art*,
ed. A.U. Pope, Oxford: University Press,
1967 (1939), pp. 981-989.

E. SCHROEDER, *Brickwork of the First and
Second Periods, A Survey of Persian Art*,
Oxford: University Press, 1967 (1939),
pp. 1036-1040.

3. Studies on the standing monuments in
Khurasan, Turkestan, Iran and Iraq are
abundant. These will be given in
relation to the single buildings
mentioned in the text and in the general
bibliography.

4. A.U. POPE, *Islamic Architecture,
Introduction, A Survey of Persian Art*,
ed. A.U. Pope, Oxford: University Press,
1967 (1932), pp. 916-917.
A.U. POPE, *Persian Brickwork, Country
Life*, v. 72, p. 744.

In Near Eastern architecture the use of brick as the principle building material, goes far back into history, where it was first employed from necessity and later from preference.¹ Until the tenth century, however, brick surfaces were usually concealed under specially prepared revetments, either for reasons of protection or for special decorative effects. Standing monuments help to settle that, during the tenth century, deliberately planned brickbonds, resulting from constructive arrangements of brick units, have started to attract the attention of builders and have initiated an interest in exposed brick surfaces.² Eventhough, the country of origin for this new style in brick building is debatable, primary specimens as well as the gradual development into maturity took place in Khurasan under the Samanid's and Chaznavid's respectively, and in Turkestan under the Kharakhanid's. It was evolved in Central Iran first by the Buyayhid's and later by the Seljuk's. Similar trends were practiced in Iraq during the period of the Zengid's.³

During the Seljuk period in Iran, builders surpassed all others both in unadorned and in ornamental brickwork.⁴ Besides the lower structures of religious buildings, owing to its solid and bulky qualities, unadorned brickwork was confined to secular architecture of any type. Decorative brickwork, on the other hand, exalted in development with distinctive increase in its decorative qualities, in Mosques and but especially in Tomb Towers and Minarets. Most of these were built from the mid tenth, until the thirteenth century.

Seljuk's carried this tradition of building in brick to Anatolia, where it was practised from the second half of the twelfth, until the end of the thirteenth century with achievements comparable to earlier practices. However, since the principle building material of the Seljuk period in Anatolia was stone, overall brick construction was limited to small sized Masjids and Tomb Towers, as well as to Minarets. In larger edifices, built of stone, brick was employed in a selective attitude, usually for the upper structures and rarely for the interior wall surfaces of some special spaces, displaying a preference in its utilization.

Starting from the tenth century onwards, decorative brickwork has developed in two lines varying both in technique and in the final product. Firstly, there are the *Brickbonds*, that are constructive and laid-up directly during the structural process. Secondly, there are the *Brick Revetments*, that are assembled from precast sections. The process of production and the types of the bricks used, differ to a great extent for these two types of brickwork. Even so, both share a common aspect, which is their dependence on geometry. With brickbonds, patterns are delineated through modular geometry with the arrangement of standart shaped brick units, whereas the patterns delineated on brick revetments are pre-designed, according to geometric principles and assembled with especially cut bricks.

Both techniques were utilized in Anatolia, during the period under consideration. Yet, as in the Eastern Islamic World,⁵ it is not possible to trace a coherent chronological development, and signify which one of these two techniques was developed from the other. This brief study will simply deal with the brickbonds utilized in Anatolia during the period of the Early Principalities and the Seljuk's, with an attempt to point out characteristics, that may help to determine a rough chronological evolution at least for the brickbonds.⁶

USE OF BRICK: GEOGRAPHIC DISTRIBUTION

The geographical distribution of Anatolian brickwork, during the period of the Early Principalities and the Seljuk's, is recorded on MAP: 1.

The few standing monuments from the period of the Early Principalities are dated to the second half of the twelfth and the early thirteenth century. These buildings, which are scattered in a number of towns, do not help in a regional grouping. The earliest existing examples are the Tomb of Mengücek Çazi in Kemah, near Erzincan and the Tomb of Melik Gazi in Pınarbaşı, near Kayseri. (Pl.1) These two early structures, entirely built in brick, except for their foundations, lack inscription panels.

5. R. HILLENBRANT, Seljuk Monuments in Iran, The Pir Mausoleum at Takistan, Iran, v.10, 1972, p. 50.

6. The brick revetments which are not included in this article, are studied in:

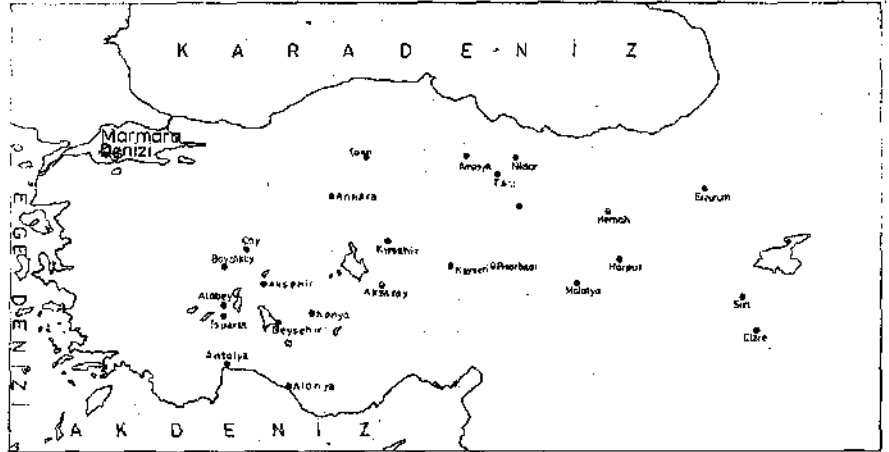
Ö. BAKIRER, Selçuklu Öncesi ve Selçuklu Dönemi Anadolu Mimarisinde Tuğla Kullanımı, Ankara: ODTÜ Yayınları, 1981, in print.

Ö. BAKIRER, Harput Ulu Camii Minaresi, Abdrettin Çömert'e Armağan, Hacettepe Üniversitesi, Sosyal ve İdari Bilimler Fakültesi, Başeri Bilimler Dergisi, Özel Sayı, 1980, s. 375-395.

Ö. BAKIRER, Erken Dönem Tuğla Süslemesinde Geometrik Düzün Denemesi, VIIth. Turkish Congress of History, Ankara, Sept. 1976, papers in print.

Ö. BAKIRER, Decorative Brick Revetments in Anatolian Seljuk Architecture, VIth. International Congress of Turkish Art, Munich, Sept. 1979, papers in print.

Ö. BAKIRER, Geometric Aspects of Brickbonds and Brick Revetments in Islamic Architecture, International Symposium on Islamic Architecture and Urbanism, Dammam, Jan. 1980, papers in print.



Map 1. Geographic distribution of brickwork in Anatolia.

7. A. KEMALİ, *Erzincan Tarihi*, İstanbul: 1932, s. 330.
 T. ÖZGÜÇ and M. AKOK, Mengüçeklere ait bir Türbe, *I. Türk Sanatları Kongresi*, Ankara: 1959, Tebliğler, Ankara: 1962, s. 326.
 T. ÖZGÜÇ and M. AKOK, Melik Gazi Türbesi ve Kalesi, *Belleken*, c. 18, s. 71, 1954, s. 334.
 R. H. ÜNAL, Monuments Saltaquides de Kemah, *Revue des Études Islamiques*, v. 35, 1967 (1968), p. 149-172.
 O. ARİK, Erken Devir Anadolu Türk Mimarisinde Türbe Biçimleri, *Anadolu (Anatolia)*, c. 11, 1967, ss. 67-68.
 O. C. TÜNGER, Anadolu'nun İlk Dört Selçuklu Kumandanı ve Yapırdığı Yapıların Özellikleri, *Vakıflar Dergisi*, c. 12, 1978, s. 137-162.

8. O. ARİK, Erken Devir Anadolu Türk Mimarisinde Türbe Biçimleri, *Anadolu (Anatolia)*, c. 11, 1969, s. 67-68.
 Z. BAYBURTLUOĞLU, Niğde-Aksaray Selime Köyü Türbesi, *Onasya*, c. 6, s. 65, 1971, s. 14-15.
 I. H. KONYALI, *Abideleri ve Kitabeleri ile Konya-Aksaray Tarihi*, c. 2, İstanbul, 1974, s. 1416-1419.
 O. C. TÜNGER, Anadolu'nun İlk Dört Selçuklu Kumandanı ve Yapırdığı Yapıların Özellikleri, *Vakıflar Dergisi*, c. 12, 1978, s. 143.
 A. DURUKAN, Selimeköy'deki Türbe ve Anadolu Türk Sanatı'ndaki Yeri, *Bedrettin Çömert'e Armağan*, Hacettepe Üniversitesi, Sosyal ve İdari Bilimler Fakültesi, *Beşeri Bilimler Dergisi*, Özel Sayı, 1980, s. 397-409; In this study the building is given a later date.

9. Ü. BAKIRER, *Selçuklu Öncesi ve Selçuklu Dönemi Anadolu Mimarisinde Tuğla Kullanımı*, Ankara: ODTÜ Yayınları, 1981, in print; the catalogue comprises detailed analysis of the brickwork recorded in each building mentioned in this text. In order not to lengthen the notes, studies related to the dating of the buildings are given in the general bibliography of this article.

However, they are attributed to the first arriving commanders and dated, on historic and stylistic criteria, to the second half of the twelfth century.⁷ The Behramşah Tomb, again in Kemah, is contemporary with Mengüçek Gazi Tomb. In this case brick is employed merely at the monumental entrance.

The Tomb Towers in Kemah and Pınarbaşı are followed by two other slightly later ones in Aksaray. The Tomb of Bekar Sultan in Neneziköy is entirely constructed in brick, while the Anonymous Tomb in Selimeköy is built partly in stone and partly in brick. Both buildings are dated between the late twelfth and the early thirteenth century.⁸ These four buildings, reveal that while the exposed brick style was falling out of fashion in its country of origin, its preliminary specimens started to be constructed on the Anatolian plateau, the new land of the Seljuk's.

When the brickwork of the Seljuk period, during the thirteenth century, is evaluated in regard of the buildings documented in this study, Central Anatolia and especially the cities of Konya and Akşehir come forward. Thirty buildings entirely built in brick, are recorded from the capital Konya and the settlements nearby. These are usually small sized Masjids and Tomb Towers, equally distributed in number, through the first and the second halves of the century. In Akşehir, six small Masjid's and Tomb Towers from the first half of the century, are followed by only two from the second half, probably indicating that the style was more reputed during the early period. In Aksaray, a Masjid, the so called Darphane and two Minarets, now standing besides later buildings, are distributed within the century. In other Central Anatolian cities such as Ankara, Kırşehir and Kayseri brickwork is usually limited to the Minarets which stand besides stone edifices. While in Çankırı it is utilized in a single building and for certain parts of the interior only.⁹

Considering quantity, cities in the North Eastern region succeed those in Central Anatolia. In Tokat, against the single building, the Tomb of Ebul Kasım Ali Tusi, from the first half of the century, there are five from the second half, comprising a Tomb Tower, two Masjids, a Madrasa and a Zaviyah. All six of these are small sized constructions on which brick is employed with reservation. Whereas the single brick building in Niksar, the Kırkkızlar Tomb dating from the first quarter of the century, is built entirely in brick. In Sivas, the single monumental building from the first half of the century is the Kaykavus Hospital, dated between H.614-620/1217-1220 A.D. During the second half of the century, however, brick is utilized in three other monumental Madrasas, the Gök Madrasa, the Çifte Minareli Madrasa and the Buruciye Madrasa, all dated to H.671/1271-1272 A.D. In the Kaykavus Hospital, brickwork covers the interior wall surfaces, transition elements and the upper structure, while on the other three Madrasas it is utilized merely for the upper structures and the Minarets. All four of these buildings in Sivas and the Minaret of the Great Mosque can be recorded as the outstanding manifestations of brick architecture in Anatolia. The Gök Madrasa in Amasya, is the unique building for brickwork in this city and it is dated to the second half of the thirteenth century. It presents brickwork on the upper structures of both the main building and especially the Tomb. Thus, eventhough, the cities in the North Eastern region of Anatolia come after the ones in Central Anatolia in quantity, in the quality of their workmanship they are comparable and even superior to the former.

Ançalya and Alanya in South Anatolia, Harput, Cizre and Siirt in South East Anatolia and Erzurum in East Anatolia are the few cities which present one or two examples of brick architecture from the Seljuk period. The Great Mosque in Malatya is again an exceptional building displaying on its transition and upper structure a rich variety of brickbonds. The Minaret of the same building, besides two other Minarets nearby may well indicate that probably this was one of the important brick production centers during the thirteenth century. Harput, Cizre, Siirt and Erzurum present brick Minarets constructed besides stone edifices and each with specific particularities of their own.

The regional distribution of brickwork during the thirteenth century then, shows that, in Central Anatolia, demonstrations of brick are more abundant than any other region. Thus, it appears that the link with the old building traditions continued in Central Anatolia the longest and the strongest. Whereas the manifestations in other Seljuk cities, such as Malatya, Sivas, Amasya and Erzurum are few in number, yet noteworthy in quality which may suggest that brick is utilized with a selective preference alongside the rapid development of stone architecture.

USE OF BRICK: DISTRIBUTION ON THE BUILDINGS

When the disposition of brickwork is studied from the point of the *function* and the *size* of the buildings, it seems that the size of the buildings, rather than their function, controls over the selection of brick as the primary or the secondary building material. During the period of the Early Principalities and the Seljuk's, while the exposed brick style prevailed in Anatolia as an extension of older tradition, ordinarily small sized buildings were constructed entirely in brick. The functions of these small edifices, as Masjids and Tomb Towers, is probably a less contingent factor on the selection of the material. On larger edifices on the other hand, except the İplikçi Mosque in Konya, brick is not utilized by itself, but together with stone. In these buildings the lower structures are stone, while brick is confined to the transition elements and the upper structures. Only rarely, it covers interior wall surfaces as well. This preference could call into mind a consideration of solidity and endurance, since stone is a better preserving material than brick. The importance of solidity and the selection of stone to reach this aim, is best recorded in the architecture of Hans and Caravanserai. During the period under study none of the Hans and Caravanserai are constructed entirely or partially in brick. Only in two examples, brick is meagerly utilized. These are the Horozlu Han between Konya-Ankara, with a small brick dome over the crossing, and the Çay Han in Çay with brick arches and transition elements.¹⁰

10. K. ERDMANN, *Das Anatolische Karavansaray des 13. Jahrhunderts* Berlin, 1961, s. 147-149.

The domination of size over function is thus, what has most probably influenced the selection of brick for the construction of the entire edifice or parts of it.

The distribution of brickwork on the buildings constructed during the period of the Early Principalities and the Seljuk's is recorded on TABLE: 1. Due to technical reasons Tables 1-5 are placed at the end of the Journal. In this Table, the 84 buildings, documented in this study are arranged in chronological order, without a differentiation of function or size.

The use of brick on their lower structures, transition zones, upper structures and Minarets is recorded in the first four vertical columns.

This listing shows that, the lower structures of 42 buildings, out of the 84, are constructed in brick.¹¹ Furthermore, in the same edifices, the transition zones and the upper structures are also in brick. These 42 buildings, completely built in brick, are small Masjid's and Tomb Towers. The rest of buildings listed in Table:1, have stone for their lower structures and brick for their upper structures. Only in five buildings, the Alaaddin Mosque in Konya, the Great Mosque in Malatya, the Keykavus Hospital in Sivas, the İnce Minareli and the Küçük Karatay Madrasas in Konya, brick is employed for the interior wall surfaces or the carrying elements while the

11. TABLE: 1, numbers: 3, 5, 7, 8, 9, 12, 15, 16, 17-20, 22, 23, 26, 28, 31-33, 36-43, 47, 49, 50, 57, 66-70, 72-74.

exterior wall surfaces are constructed with stone. On these buildings the use of brick is carried to the transition zones and upper structures as well. The fourth item of the documentation, the Minaret, is sometimes placed besides a small Masjid built entirely in brick, but more often it stands besides a stone edifice, singly or in pairs, flanking a monumental portal. The Hoca Hasan and Zemburi Masjids in Konya illustrate the first possibility, while the Great Mosque and the Sahip Ata Mosque in Konya; Gök Madrasa and the Çifte Minareli Madrasa in Sivas and the Çifte Minareli Madrasa in Erzurum can be mentioned as examples for the second possibility.

Following this general documentation, Table: 1 goes into detail, and records in twenty vertical columns, the types of the bonds applied on the specific parts of the buildings and the types of the bricks used in these bonds. After this listing it becomes possible to point out that in the 84 buildings studied, simple bonds are more often selected for the lower structures and decorative bonds cover the transition zones and upper structures.

In the following pages the brick units and the brickbonds are studied in detail, in order to determine the widespread types in Anatolian architecture during the period under study.

TYPES OF BRICKS

The brickbonds are initiated with the relationship of three materials. These are the brick units, which are normally unglazed but glazed for certain special bonds; the glazed-end-plugs and the mortar, filling-in the joints.

The unglazed brick units, which are the fundamental material of the brickbonds, are manufactured from red fire clay with standard shapes but with variations in their sizes. On wall surfaces, square shaped *whole bricks*, rectangular shaped *half bricks* and small, square shaped *quarter bricks*, are used. Compass or radial shaped *minaret bricks* are employed in order to fit the semicircular surfaces of the cylindrical minaret shafts.

It is already stated that, for Khurasan, Turkestan and Central Iran, to insist on a chronological development based on brick sizes is invalid, because the sizes show variations in relation to local practice and the purpose for which they are to be used.¹² The same statement is acceptable for Anatolia for the period under study, since here too the sizes of the standard shaped brick units show variations depending on the types of the bonds and the specific shapes of the surfaces they are to be applied. Below, for each shape the most often recurring sizes are grouped in order to indicate the variety in sizes.

12. D.N. WILBER, *The Architecture of Islamic Iran, the Il-Khanid Period*, Princeton: Greenwood Press Publishers, 1955, p. 47.
 A.U. POPE, *Islamic Architecture, Introduction, A Survey of Persian Art*, ed. A.U. Pope, Oxford: University Press, 1967 (1939), p. 916.
 E. SCHROEDER, *Islamic Architecture, the First Period, A Survey of Persian Art*, ed. A.U. Pope, Oxford: University Press 1967 (1939), pp. 950.n.5.
 H. WULFF, *Traditional Crafts of Persia*, Cambridge, Mass: M.I.T. Press, 1966, p. 112.

WHOLE BRICKS:

The whole bricks have the same measurements on both sides. The whole bricks utilized in Anatolia fall into three major groups as follows:¹³

1. Both sides measure 23-25 cm., the thickness varies between 5-6.5 cm.
2. Both sides measure 21-22 cm., the thickness varies between 3.5-4.5 cm., it rarely reaches 5.5-6 cm.
3. Both sides measuring 20-21 cm., the thickness varies between 3.5-4 cm., it rarely reaches 5 cm.

Whole bricks with both sides measuring 21-22 and 20-21 cm. are most abundantly used, however, it is not possible to trace any chronological or local preference in their utilization (Fig. 1).

HALF BRICKS:

Half bricks are rectangular in shape, and the ones used in Anatolia fall into five groups, when the long side is taken as a guide.

1. The long side measures 20-22 cm., the short side varies between 9-11 cm., and the thickness between 3.5-4.5 cm. In some examples the short side falls to 8-8.5 cm., or goes up to 14 cm., while in some examples the thickness reaches 5-5.5 cm.
2. The long side measures 18-20 cm., the short side varies between 9.5-10.5-11 cm., the thickness varies between 4-4.5 cm. Only rarely the short side measures 12-13 cm.
3. The long side measures 14-16 cm., the short side varies between 9-10 cm., and the thickness varies between 4-4.5 cm. In two examples only, the short side falls to 5 cm., or to 8 cm.
4. The long side measures 13-14 cm., the short side varies between 9-10 cm., and the thickness varies between 4-4.5 cm.
5. This type is rarely used. In the few examples encountered, the long side measures between 10-13 cm., the short side varies between 9-10 cm., and the thickness varies between 3.5-4 cm.

Half bricks, with their long sides measuring 20-22 cm., and 18-20 cm., are most common during this period. The following three groups with smaller measurements are usually employed together with the first two groups and at certain parts of the bonds when smaller sized bricks become a necessity in order to adjust to the patterns (Figs. 2,3, 5-8).

13. Ö. BAKIRER, *Selçuklu Öncesi ve Selçuklu Dönemi Anadolu Mimarisinde Tuğla Kullanımı*, Ankara; ÖDTÜ yayınları 1981, Tables 3 and 4 list the buildings according to the sizes of the whole and half bricks.

QUARTER BRICKS:

Quarter bricks usually measure 4x4 cm., or 5x5 cm. on both sides and in most cases their thickness is in conformity with the measurements of their sides. Quarter bricks are never used by themselves. At times they are employed as end-plugs when glazed-end-plugs are not in use, and at other times, similar to the utilization of the small sized half bricks, they have their particular spaces in certain complicated bonds.

MINARET BRICKS:

The minaret bricks taper in one direction and are used for building circular shapes such as the cylindrical or segmented minaret shafts. The minaret bricks employed in Anatolia, fall into four groups as follows (Pl. 8).¹⁴

1. The front face measures 23-25 cm., the measurements of the sides vary between 23-24 and 20-21 cm., and the thickness between 4.5-5 cm.
2. The front face measures 21-22 cm., the measurements of the sides between 19-21 cm., and the thickness between 3.5-4.5 cm. With only one example, the measurements of the sides fall to 16 cm.
3. The front face measures 20-21 cm., the measurements of the sides vary between 19-20 cm., and the thickness varies between 4-4.5 cm.
4. The front face measures 19-20 cm., the measurements of the sides vary between 18-20 cm., and the thickness varies between 4.5-5 cm.

The selection of size, for the minaret bricks, depends on the diameter of the circular shaft where the bricks will be utilized, Thus the size increases or decreases in relation to the diameter of the shaft. As a result, all four groups have been utilized without any particular preference (Fig. 5).

As mentioned above, the unglazed brick units are the fundamental material of the brickbonds. The glazed units and the glazed-end-plugs are usually employed together with the unglazed ones in order to delineate a variety of patterns. The glazed bricks are regular half bricks, which are glazed only on one side and this is the side to be exposed. The glazed-end-plugs are similar in shape to the quarter bricks. However, they are made of white clay and glazed on their front sides. (Pl. 4,7,8)

TYPES OF BRICKBONDS

The brickbonds are produced by means of the structural arrangement of the brick units. Diversity in the bonds, primarily depends on surface-unit relationship, which initiates from the spatial orientation of the brick units on the surface. That is, the direction of the units, their orderly repetition within the same course and in

14. Ö. BAKIRER, *Selçuklu Öncesi ve Selçuklu Dönemi Anadolu Mimarisinde Tuğla Kullanımı*, Ankara: ODTÜ Yayınları 1981, Table 5 lists the buildings according to the sizes of the minaret bricks.

15. In previous studies, the terminology adopted to define the bond types is as follows: Plain Bond, Common Bond, Basket Bond or Einfache Ketttenbindung for the Horizontal Bond, Diaper Bond, Diagonal Bond, and Hazaarbas for the Horizontal/Vertical Bond, Chevron Bond, Herringbone Bond and Raking Bond for the Diagonal Bond. Yet, since this series of definitions have the tendency to be somewhat subjective, and may even be misunderstood respectively, a safer method is selected in this study. The Bonds are referred according to the geometric relation of the brick units with the surface. For a definition of the bond types see:
D.N. WILBER, *The Architecture of Islamic Iran, The Il-Khanid Period*, Princeton: Greenwood Press Publishers, 1955, pp. 50-51.

16. Similar to the Bond types, terminology used to define the joints is also varied. In this case the most common terminology, is adopted. Vertical joints initiating between two brick units, set side by side, are usually referred as Rising or Cross joints. Horizontal joints, initiating between two bricks on top of each other are referred as Bed joints. Diagonal joints, follow the angle of the bricks, that are laid at an angle to the horizontal line.

successive or alternative courses determines the bond types. Starting from the tenth century, three principal types of brickbonds have been utilized in Khurasan, Turkestan, Iran and Iraq. The same is valid for Anatolia, where again three specific bond types can be recorded during the Seljuk period.¹⁵

1. The Horizontal Bond: In this bond whole or half bricks are set flat as stretchers only. On minaret shafts, the same bond is applied with minaret bricks.
2. The Horizontal/Vertical Bond: In this bond whole or half bricks are set alternatively flat and upright as stretchers and headers. The application of this bond with minaret bricks is not recorded.
3. The Diagonal Bond: In this bond usually whole bricks are utilized and are set obliquely, with an angle of 45 to the horizontal. The application of this bond with minaret bricks is not recorded.

The surface-unit relationship, also creates the vertical/rising, horizontal/bed and diagonal joints between the brick units.¹⁶ Subgroups of these three principal types of brickbonds, depend firstly on the variations effected by methods of staggering; secondly on the variations in the fabric of the units; and thirdly on the special treatments of the joints. While the Horizontal and the Horizontal/Vertical Bonds have numerous subgroups, those for the Diagonal Bond are very limited. Through the application of these divergent bonds, plain bricks are arranged into well organized designs.

HORIZONTAL BOND:

As specified above, in this bond the courses are set entirely of stretchers, defining a rythmical repetition of uniform units in horizontal registers. This bond has two essential variations, based on the method of staggering in successive courses. In the first group the stretcher bricks are staggered half-a-brick length in each horizontal course. In the second group, they are staggered one-fourth or one-fifth of a brick length in each horizontal course.

HORIZONTAL BOND: BRICK UNITS ARE STAGGERED HALF-A-BRICK LENGTH (Table: 2)

When the stretchers are staggered half-a-brick length, the rising joints will meet at the centers of the brick units in successive courses, and on the same vertical axis in alternative courses. In such a basic setting, the resulting bond exhibits a symmetrical and rythmical arrangement of uniform brick units, where the rising and bed joints are of analogous widths and slightly raked (Fig. 1, Pl. 2).

Considering all other brickbonds, this bond has a more structural character in application, and it has been one of the most extensively used bonds in Turkestan, Khurasan and

17. E.DIEZ, *Persien, Islamische Baukunst in Chuzasan*, Darmstadt: 1923, pp. 73, 110, 117, 153, 167.
 E.DIEZ, *Chuzasanische Baudenkmäler*, v.1, Berlin: 1918, pp. 39-43, Pl. xv/1, v/1. 2, 3, 4.
 E.SCHROEDER, *Islamic Architecture, The First Period, A Survey of Persian Art*, ed. A.U.Pope, Oxford: University Press 1967 (1939), pp. 967-974.
 E.SCHROEDER, *Islamic Architecture, The Seljuk Period, A Survey of Persian Art*, ed. A.U.Pope, Oxford: University Press 1967 (1939), p. 1022, Pl. 337, 338 A, B, C, D.
 C.GRABAR, *The Earliest Commemorative Structures*, *Ars Orientalis*, v. 6, 1966, pp. 22, n. 27.

18. A.GODARD, *Les Anciennes Mosques de l'Iran*, *Athar-e-Iran*, v.1, n.2, 1936, pp. 187-210, Fig. 134, 135, 138, 140.
 A.GODARD, *Historique du Masjid-i Djuma d'Isfahan*, *Athar-e-Iran*, v.2, n.1, 1937, Fig. 145, 149, 150.
 A.U.POPE, (ed.) *A Survey of Persian Art*, Oxford: University Press 1967 (1939), Pl. 270 A, 271, 275, 276, 277 A, 278-280, 306.
 O.ASLANAPA, *Türk Sanatı*, c.1, İstanbul: Milli Eğitim Basımevi, 1972, Pl. 75, 76.
 A.U.POPE, *Persian Architecture*, London: Thames and Hudson, 1965, p.129, Pl.148.

Central Iran, before getting adopted in Anatolia. To record, but only a few examples: the Gunbad-ı Qabus at Gurgan (H.375/1007 A.D.),¹⁷ the Seljuk period sections of the Masjid-i Djuma's at Ardistan (H.447-50/1055-58 A.D.), Gulpayagan (H.498-512/1104-18 A.D.), and Kazvin (H.507-9/1113-19 A.D.), and the Ribat-ı Malik at Turkestan (H.470/1078 A.D.) are some of the most effective accomplishment.¹⁸ On these edifices, the bond is used either by itself to cover large wall surfaces, or together with other types of bonds in alternative registers, especially when executed on minaret shafts.

Likewise in Anatolia, this bond is used individually or together with other types throughout the thirteenth century. Due to the abundant number of the examples, Table:2/Column 1, gives only a select listing of the buildings, where this basic type of the bond was used.

According to the distribution of the brickwork, the buildings in the above list can be studied in two groups. Those in the first group comprise small Masjids and Tomb Towers, where the bond covers the entire edifice. These are the Şekerfuruş, Zemburi, Sahip Ata and Sakahane Masjid's in Konya; Altın Kalem and Güdük Minare Masjid's in Akşehir. Other buildings which exhibit the same characteristics, but which could not be included in the Table are the Hoca Hasan and Abdülmumin Masjids in Konya; Tac-ül-Vezir, Ulaş Baba, Kalender Baba and Gömeç Hatun Tombs in Konya and the Emir Yaltaş Tomb in Akşehir.

The buildings in the second group comprise, larger edifices like Madrasas and Mosques as listed in the Table. On these, brick is used only for certain sections such as the exterior and interior wall surfaces, blind niches; intrados or extrados faces of door and window arches, jambs and transition elements, domes; minaret bases, plinths and minaret shafts. The only large sized edifice, where the same bond covers the entire edifice is the İplikçi Mosque in Konya, constructed within the first decade of the thirteenth century (Pl. 2). Unfortunately except the South wall, the original brickwork has been renewed during restorations.

This simple Horizontal Bond, composed of plain bricks with slightly raked narrow joints, does not bring forth a pattern. Even so it is still possible to create decorative schemes with it through special treatments of the rising and the bed joints, whereby the bond will still have a rythmical arrangement with the joints displaying varieties. Another possibility is the utilization of plain fired bricks together with glazed brick units. This change in the fabric, is another contribution to enrich the Horizontal Bond. Chronologically, examples of the first likelihood are earlier, than the second, and they originate, firstly, from the widening of the rising, and/or the bed joints.

Wide Rising Joints and Narrow Bed Joints:

Ordinarily, both rising or bed joints are ca. 1-1.5 cm. wide, and either flush or slightly raked beds of mortar. When these joints are widened to 5-6 or even 7-8 cm., it becomes possible to rake or to slant down all wide rising joints deeper than usual, and thus, recessed cavities are created which alternate with brick units (Fig. 2, Pl. 3).

As it can be observed on Table: 2/Column 3, in Anatolia from the late twelfth until the mid thirteenth century this type of brick bonding appears to have been favoured especially on minaret shafts. Yet, no examples can be recorded for the same bond from the second half of the thirteenth century. Earliest utilization from the second half of the twelfth century is on the cylindrical shaft of the Tepsi Minare, in Erzurum. Chronologically Tepsi Minare is followed by the three minarets in Malatya, and the Kızıl Minare, in Aksaray. While the joints are slanted on the Ak Minare, and on the Hötüm Dede Minare in Malatya, on all others, they appear as recessed cavities (Fig. 2, Pl. 3).

Earlier examples of this same brickbond start from the first quarter of the 11th. century. On the Tomb of Mil-i Radkan, at Radkan (H.407-411/1016-20 A.D.),¹⁹ on the Tombs of Laçım (H.413/1022 A.D.), and Resget (H.397-466/1006-1073 A.D.) at Mazandaran, the wide rising joints are roughly raked-out. In central Iran, the Tombs of Pir-i Alemdar (H.418/1027 A.D.), and Chihil Dukhtaran (H.448/1056 A.D.), at Damghan, the minaret of Masjid-i Maide, at Sava (H.453/1061 A.D.),²⁰ and the minaret of Masjid-i Djuma, at Barsian (H.491/1097 A.D.),²¹ are, but a few examples, where the rising joints are roughly raked or slanted-down, comparable to the minarets in Malatya.

The second variation, depending on the widening of the rising joints, is the case when only certain rising joints are raked deeper, in order to outline a predesigned pattern. As listed on Table: 2/Column 4, this bond is utilized once on a minaret during the first quarter of the thirteenth century, and repeated again only at the very end of the century, on the shafts of two other minarets. At Aksaray, Kızıl Minare, deeply raked joints delineate zigzag lines rising on the vertical axis, whereas on the shafts of Alaca Masjid, and Garipler Mosque, in Tokat, they outline stepped lozenges (Pl. 4). While the application of this brickbond is quite rare in Anatolia, corresponding comments can be made concerning its earlier utilization in Central Iran. Even though, there it does cover a longer time-span, and the patterns are more varied. The earliest recorded example, is the facade of the Masjid-i Djuma, at Nayriz (H.363/973-974 A.D.),²² where stepped lozenges are outlined. At the Demavend Tomb, dated to late 11th. century, recessed joints outline eight-cornered-stars, concentric-hexagons, squares, and stepped lozenges.²³ The Masjid-i Ali, minaret, and the Saraban Minaret,²⁴ at Isfahan, are again from the late 11th. century, and display similar arrangements.

19. E.DIEZ, *Churasanische Baudenkmaeler*, v.1, Berlin: 1918, Pl. I/1, II/1-4.
E.DIEZ, *Persien Islamische Baukunst in Churasan*, Darmstadt: 1923, pp. 11, 42, 51, 73, 108, 110, Pl. 12, 13.
E.SCHROEDER, *Brickwork of the First and Second Periods, A Survey of Persian Art*, ed. A.U.Pope, Oxford: University Press, 1967 (1939), p. 1022, Pl. 339 A.

20. F.SARRE, *Denkmaeler Persischer Baukunst*, Berlin: 1900-1910, pp. 114-115.
A.GODARD, *Les Tours de Ladjim et de Resget, Athar-e-Iran*, v.1, n.1, 1936, pp. 59-60, 78, 109-121, Fig. 74, 76, 79, 80, 199, 212.
A.U.POPE, (Ed.) *A Survey of Persian Art*, Oxford: University Press, 1967 (1939), Pl. 339 A, B, 340 A.
O.GRABAR, *Islamic Architecture and Its Decoration*, London: Faber and Faber, 1967, p. 59, Pl. 198.

21. M.B. SMITH, *Material for a Corpus of Early Iranian Islamic Architecture*, *Art Islamica*, v.4, 1937, p. 16, Fig. C, Pl. 10.

22. E.SCHROEDER, *Islamic Architecture, The First Period, A Survey of Persian Art*, ed. A.U.Pope, Oxford: University Press, 1967 (1939), p. 939.
A.GODARD, *Les Anciennes Mosques de l'Iran, Athar-e-Iran*, v.1, n.2, 1936, Fig. 115.
D.STRONACK and T.C.YOUNG, *Three Seljuk Tomb Towers, Iran*, v.4, 1966, p. 4.

23. D.STRONACK and T.C.YOUNG, *Three Seljuk Tomb Towers, Iran*, v.4, 1966, Pl. Ib, Iib, Ivd, Ivc.

24. M.B.SMITH, *Monars of Isfahan, Athar-e-Iran*, v.1, 1936, p. 334, Fig. 223, 224.
F.SARRE, *Denkmaeler Persischer Baukunst*, Berlin: 1900-1910, p. 75.
A.U.POPE, (ed.) *A Survey of Persian Art*, Oxford: University Press, 1967 (1939), Pl. 362 A, B.

25. E. SCHROEDER, *Brickwork of the First and Second Periods, A Survey of Persian Art*, ed. A.U. Pope, Oxford: University Press, 1967 (1939), pp. 1040-1042.

Starting with the domes of the Masjid-i Djuma, at Isfahan, Seljuk bricklayers in Iran, experimented an innovation which received much favour, and attained a certain measure of perfection, throughout the twelfth century. The practice was to insert carved or stamped plaster-end-plugs into certain wide rising joints of the Horizontal brick lay. Furthermore, a variety of patterns were developed for such molded or carved plugs. While in Central Iran, plaster-end-plugs were more in use, in the East, the Khurasan area, terra-cotta end-plugs were more in favour.²⁵ In Anatolia, on the other hand, this same brickbond does not show a wide use. What is more, it exhibits a change of technique in its formation. Here, instead of inserting plaster-end-plugs into the wide rising joints, a decorative flush pointing is achieved by-stamping or chiselling patterns directly on mortar beds. (Fig. 3). Joints are first filled flush with a plaster-lime mortar, and evened with the brick units. On these joints, patterns are then stamped with a mold or incised with a pointed implement. Thus, instead of inserting patterned plaster-end-plugs, patterns are directly created on the body of mortar joints.

As shown on Table: 2/Column 5 the earliest building, where this bond is used in Anatolia, is the Mengücek Gazi Tomb in Kemah where the surface of the central pier at the crypta is covered with this bond. The same is utilized during the first quarter of the thirteenth century, at the Keykavus Hospital in Sivas, where it covers the walls of the North iwan. On these walls, plaited bands, 'S' curves, small scrolls, and inscriptions are stamped on the joints, according to a number of pre-set geometric arrangements (Fig. 3).

The rather selective use of decorative flush pointing in Anatolia, appears to be related to the extensive use of turquoise glazed-end-plugs instead.

Again, Table: 2/Column 5 shows that, starting from the first quarter of the thirteenth century, horizontal bonding with glazed-end-plugs in the wide rising joints is an extensive practice in Anatolian Seljuk edifices. It either appears on minaret bases, plinths, shafts or on the surfaces of interior walls, and arches. The earliest building, where this bond is used, is the Great Mosque, in Malatya dated to the first quarter of the thirteenth century (Pl. 5). It covers the walls of the domed section, and the lower parts of the piers on the Eastern wing of the Courtyard. Although most of the glazed units have now fallen off, the minaret of the Akşebe Sultan Masjid, in Alanya, where this same layout is evident on the upper part of the shaft, is slightly later and dated to 1230 A.D. Seven other minarets from the second half of the century, follow the Akşebe Masjid minaret. On these, the bond is applied, either on the base, the plinth or the shaft. Ince Minareli Madrasa, in Konya, on the other hand, is another example from the second half of the century. Here the bond is

selected for interior application, and covers the surface of the iwan arch. (Fig. 4, Pl. 6)

As emphasized above, examples of the Horizontal Bond with glazed-end-plugs, are quite rare, prior to their abundant utilization in Anatolia. On the other hand, turquoise glazed units cut in divergent geometric shapes, such as hexagons and stars, arranged in narrow bands were used abundantly, starting around H.450/1058 A.D. at the Masjid-i Djuma of Demavend. This utilization has increased in numbers, during the later parts of the eleventh century.²⁶ On the contrary, the insertion of small glazed-end-plugs within the rising joints is not practised much. The exterior of the Tomb in Kioy, in the Azarbeyjan Region, dated to the early thirteenth century, can be pointed out as an early example.²⁷ This allows for the statement that, the insertion of glazed-end-plugs within the rising joints has been practised more in Anatolia, than elsewhere.

A further variation of this bond is tried, only once at the Gök Madrasa, in Tokat, where besides inserting glazed-end-plugs into the wide rising joints, turquoise glazed-narrow-bands are inserted into the bed joints. The result achieved is complete concealment of mortar beds, as one observes the alternative repetition of bricks, glazed units and glazed bands.

Narrow Rising Joints and Wide Bed Joints:

The examples of Horizontal Bond with half-a-brick staggering, and widening of bed joints, instead of rising joints, are listed down in Table: 2/Columns 6 and 7. As displayed on this Table, this bond does not seem to have a wide practise throughout the thirteenth century. Its variation with flush pointing is applied to the exterior of Mengücek Gazi Tomb, in Kemah, where it covers the surfaces of one brick wide corner pilasters (Pl. 7). It appears once again only in H.671/1271-72 A.D., on the minarets of Gök Madrasa, and the Çifte Minareli Madrasa, in Sivas. But this time, instead of flush pointing the bed joints are filled with turquoise glazed-narrow-bands, as comparable to Gök Madrasa, in Tokat, and yet with the exception that, here the glazed-end-plugs are lacking. Thus, the bond is perceived as alternating horizontal layers of bricks, and glazed bands.

On Table: 2/Column 2, one last variation of the Horizontal Bond with half-a-brick staggering is listed. This alternation is not due to the special treatment given to the joints, but it initiates through the change of fabric. Instead of utilizing only plain bricks, alternative courses of plain, and glazed bricks have been employed with narrow rising and bed joints between them. Glazed units are sorted in order to outline a pattern, which is usually composed of stepped lozenges. This bond starts to be practiced during the second half of the

26. D.N.WILBER, The Development of Mosaic Faience in Islamic Architecture in Iran, *Ars Islamica*, v.6, 1939, p. 31.

27. A.U.POPE, (Ed.), *A Survey Of Persian Art*, Oxford: University Press, 1967 (1939), Pl. 343.

28. A few examples to these are the minarets of the Isa Bey Mosque at Seljuk, the Great Mosque at Elzi and the Great Mosque at Manisa.

thirteenth century, and actually, is the only brick lay in Anatolia, which continued well into the fourteenth century. Its earliest utilization, is on the transition zone of the Tomb chamber, at the Taş Madrasa, in Akşehir where lozenges are spread out on the surfaces of the Turkish triangles. Following this earliest application, the bond has covered either the bases the plinths or the shafts of five more minarets until the end of the thirteenth century, and later, continued to be practiced again, during the fourteenth century on minaret shafts.²⁸

HORIZONTAL BOND: BRICK UNITS STAGGERED ONE-FOURTH OR ONE-FIFTH OF ONE-BRICK LENGTH: (Table: 3)

Prevailing contrast of this bond, from the previous type, as described above, is due to staggering the bricks one-fourth or one-fifth of one-brick length- instead of one half of a brick length along each successive horizontal course. As a result, rising joints will meet on the same vertical axis, only at every fourth or fifth horizontal course. Contrary to the first group, in this bond, the method of staggering the units, grants the possibility of delineating patterns, and diversity in the treatment of the joints help to emphasize these patterns.

Subgrouping of this bond relies on the direction of staggering. The units may be staggered, in one direction alone, delineating parallel-diagonal lines, emphasized with glazed-end-plugs or glazed-bands inserted within the joints. No examples are recorded akin to this group, where the wide rising joints are left as recessed cavities.

Diagonal lines set forth with turquoise glazed-end-plugs were first employed to cover the inner dome surface of the Great Mosque, in Malatya (Pl. 8). As listed on Table: 3/Column 1, this bond is used on the shafts of two minarets, and a Tomb, during the second half of the century. At Akşehir, Taş Madrasa, this bond covers a large register on the cylindrical shaft, and at Erzurum, Çifte Minareli Madrasa, the shaft of one of the double minarets, is covered with the same bond. Both on this last one, and on the gadrooned drum of Seyyid Mahmud Tomb, in Akşehir, the bond conforms with the gadroons, perfectly (Fig. 5).

A slight variation is made on the transition zone of the Tomb chamber, at the Buruciye Madrasa, in Sivas, and on the dome of the Eşrefoğlu Mosque, in Beyşehir, as listed in Table: 3/Column 2. This variation is based upon the glazed-bands inserted in the bed joints, in addition to the glazed-end-plugs, inserted in the rising joints (Fig. 6).

The second subgroup of the bond initiates, from staggering the units in both directions, and changing directions at certain horizontal courses. This method allows for the possibility of delineating zigzag, and lozenge patterns,

and even, inscriptions, which are again emphasized with the treatment of the joints (pl. 10). Rising joints may be left as recessed cavities or brick-end-plugs, glazed-end-plugs may be inserted within them, and/or glazed-bands may be inserted within the bed joints.

Table: 3/Columns 3-to-10, give these variations, and furthermore, point out that, utilization of brick-end-plugs were practiced only during the first half of the century, while glazed-end-plugs, and/or glazed-bands are inserted in the joints of all examples from the second half of the century onwards. At times, variations of this bond are used in series on the same building, as it is practiced on the drum of Seyyid Mahmud Tomb, in Akşehir, for instance, where zigzag, and lozenge patterns, emphasized with glazed-end-plugs, alternate at regular intervals on the surfaces of the gadroons. Likewise, at the Çifte Minareli Madrasa, in Erzurum, horizontal bond with zigzag patterns covers the plinth, while lozenge patterned bond appears on the second minaret shaft (Pl. 9). Sivas Gök Madrasa, comprises a triple variety. On the transition zone of the masjid, the surfaces of alternating triangles are covered with zigzag, and lozenge patterns, where the rising joints have glazed-end-plug insets, and the bed joints have glazed-band-insets. On the shafts of the double minarets, of the same building, lozenge patterns are lined on the vertical axis. On this minaret, and on the shaft of the İnce Minareli Madrasa, in Konya, where the same pattern was used earlier, the shapes of the glazed-end-plugs show a variation, and instead of the simple rectangular units, those with a pyramidal shape have been employed (Pl. 10).²⁹

29. The dimensions of these units are similar to the dimensions of the glazed-end plugs. However, their front faces are not flat but have a pyramidal projection.

Inscriptions, which are another variation of the Horizontal Bond, along with the one-fourth or one-fifth brick length staggering, have been employed, only on the cylindrical shafts of the double minarets of Çifte Minareli Madrasa, in Sivas. (Pl. 11)

The above classifications of the Horizontal Bond, verify that, variations based on methods of staggering, and the widening, deep raking or pointing of the rising or bed joints, seem to be more in practice until the middle of the thirteenth century. While the examples with glazed-end-plug, and/or glazed-band inserts, seem to start as of the second quarter of the century, and reveal an improvement, both in quality, and in quantity, during the second half of the century.

HORIZONTAL/VERTICAL BOND (Table 4)

In this bond, courses of stretchers, and headers are arranged alternatively, emphasizing the longitudinal character of the brick units. Horizontal/Vertical Bond, demonstrates two primary subgroups, originating from the method of staggering. In the first group the stretchers, and headers are lined in series without staggering. While in the second group, the brick units are staggered, one

brick thickness + the width of one rising joint. The final product is effected by the course of staggering, depending whether the units are staggered in one or both directions.

HORIZONTAL/VERTICAL BOND: BRICK UNITS ARE NOT STAGGERED:

In the Horizontal/Vertical Bond, when stretchers, and headers are set without staggering, two variations can be recorded which are the single, and the triple arrangements based on the number of vertical and horizontal units. Usually, the bond is composed of plain bricks only, and arranged in narrow bands. However, both in the Anatolian Seljuk period, and earlier, this bond has received limited interest. In Anatolia the recorded applications of single, and triple variations are on the base of the minaret, at the Great Mosque, in Harput.³⁰ This leading practice, which has taken place during the second half of twelfth century, is repeated again in a number of early thirteenth century buildings, recorded on Table: 4/Column 1 (Pl. 3, 12). Only in one example, on the minaret of the late thirteenth century, Alaca Masjid, in Tokat, an arrangement of three horizontal units alternating with three vertical units encircles the upper section of the shaft. (Pl. 3)

HORIZONTAL/VERTICAL BOND: BRICK UNITS ARE STAGGERED:

In this bond the stretchers, and headers are staggered, one brick thickness + the width of one vertical joint. Thus, creating the so called, 'diaper bond', where the headers rise in short steps, in each course with narrow rising, and bed-joints. Generally, half-bricks with dimensions similar to those employed in the Horizontal Bond, have been utilized for this bond. In addition, quarter bricks, and some off-sized units are inserted, in order to fulfill the requirements of patterns, and occupy the gaps, that arise between units, especially when lozenges are outlined.

Even during the Sasanid period, certain brickbonds that originated from the Horizontal/Vertical lay were used, except, that these were devised not for design, but for greater security. This was because the alternation of headers, and stretchers produced a greater cohesion in the mass, and minimized the danger of any internal movement of the components.³¹ The Sasanian tradition was repeated in the upright lay of bricks, on the Tari-Khane piers, at Damghan. Analogous bonds followed in early Islamic buildings in Iraq, appearing as early as in the eighth century.³² The oldest building known, from this region is, the Place of Ukhaidir, near Bagdat, dated around to (H.104-184/720-800 A.D.) and the Bagdat Gate, at Rakka, dated to (H.156/772 A.D.).³³ These are followed by the Caravanserai of Atshan, and Kufa,³⁴ the Qunbad-ı Qabus, at Gurgan, (H.375/1007 A.D.).³⁵ Succeeding these early practices, varieties of Horizontal/Vertical Bond were adopted in Khurasan, Turkestan, and Central Iran, as of the tenth century on, and since it resembled 'weaving'

30. Ö. BAKIRER, Harput Ulu Camii, Minaresi, Bedrettin Cömert'e Armağan, Hacettepe Üniversitesi Sosyal ve İdari Bilimler Fakültesi, *Begeri Bilimler Dergisi*, Özel Sayı, 1980, s. 375-395.

31. A.U. POPE, (Ed.) *A Survey of Persian Art*, Oxford: University Press, 1967 (1939) pp. 1267-68.

32. E. SCHROEDER, *Brickwork of the First and Second Periods, A Survey of Persian Art*, ed. A.U. Pope, Oxford: 1967 (1939), p. 1036.

H. WULFF, *Traditional Crafts in Persia*, Cambridge, Mass: M.I.T. Press, 1966, p. 118.

33. F. SARRE and E. HERZFELD, *Archaeologische Reise in Euphrat und Tigris Gebiet*, Berlin: 1911-1920, p. 233.

G.L. BELL, *The Palace and Mosque at Ukhaidir*, Oxford: 1914, p. 22, 41-43.
K.A.C. CRESWELL, *Early Muslim Architecture*, Oxford: Clarendon Press, 1932-40, pp. 185, 197, 201, Fig. 39 a.
H. WULFF, *Traditional Crafts in Persia*, Cambridge, Mass: M.I.T. Press, 1966, p. 118

34. G.L. BELL, *The Palace and Mosque at Ukhaidir*, Oxford: 1914, p. 41-43.
K.A.C. CRESWELL, *Early Muslim Architecture*, Oxford: Clarendon Press, 1932-40, pp. 185-201.

35. See above note 17.

36. F. SARRE and E. HERZFELD,
*Archaeologische Reise im Euphrat und
 Tigris Gebiet*, Berlin: 1911-1920,
 pp. 228-234]

E. DIEZ, *Persien, Islamische Baukunst in
 Churassan*, Darmstadt: 1923, p. 125.
 G. L. BELL, *The Palace and Mosque at
 Orkhaider*, Oxford: 1914, pp. 26, 41-43.
 H. WULFF, *Traditional Crafts in Persia*,
 Cambridge, Mass: M.I.T. Press, 1966,
 p. 118.

patterns, this bond was locally named, "Hazarbaf" - meaning, 'a thousand interweavings'.³⁶

Besides its ability of providing strength, and security in the bricklay, Horizontal/Vertical Bond is more attune for creating patterns, than the Horizontal Bond. Variations in methods of staggering, and changing the directions of headers at regular intervals, play a predominant part in the creation of patterns with this bond. Relying on this selfsame principle; single diagonal, single zigzag, and lozenge patterns, and furthermore, combined zigzag-lozenge patterns, and inscriptions can be created during the process of laying the bricks. (Fig. 7)

Furthermore, variations in the fabric of the units, contributes more predominantly to the delineation of patterns, than in the Horizontal Bond, While, usually stretchers are of plain bricks, headers are turquoise glazed tiles. At first glance, the finished lay may remind the small glazed-end-plugs, used with the Horizontal Bond. Yet, there is one basic difference, between these two. Glazed-end-plugs are, but small units, filling rising joints, and extending only halfway to the bed joints (Fig. 4-6). Whereas, the glazed units ensueing the Horizontal/Vertical Bond, replace the headers, and extant for two or three horizontal courses, effecting the method of staggering (Fig. 8-9). What is more, these glazed units are set flush with the brick units, again contrary to the glazed-end-plugs, which are almost always recessed from the brick surfaces, and are usually flush with the joints (Fig. 4-6, 8, 9). The employment of contrasting materials, as brick with glazed units, highlights the exposure of the bond type, and the patterns delineated with it, even from a distance.

In this bond, the widths of rising or bed joints have almost no effect in the delineation of patterns. This factor again is totally unconforming with the Horizontal Bond, which depends on the widening of joints, in order that foreign material may be inserted to cut the monotony.

Horizontal/Vertical Bond, even when laid with plain bricks alone, is full of movement, and keeps the eye moving up, and down, in order to perceive the lines that rise, change directions, and create geometric patterns (Fig. 7, Pl. 13-16). Especially this aspect is in contrast, with the half-a-brick staggered, Horizontal Bond with glazed-end-plugs inserted in the joints. With this bond, the eye continuously discerns the rythmical alternation of two recurring modules.

On the other hand, asserting the resultant patterns, Horizontal/Vertical Bond has a profound resemblance to the one-fourth or one-fifth brick staggered Horizontal Bond. Here too, depending on the methods of staggering the brick units, diagonal, zigzag, lozenge patterns, and inscriptions are delineated.

The Brick Units are Staggered in One Direction:

When stretchers, and headers are staggered in one direction, in the Horizontal/Vertical Bond, they emphasize parallel, diagonal lines, that extend continuously, and are limited only with the width of the surfaces, that they cover (Pl. 13). As can be seen on Table 4/Column 2, examples of this bond have been recorded, exclusively with plain bricks, and are on the exteriors of a number of small Masjids, and Tombs, dating from the second half of the twelfth until the first quarter of the thirteenth century. One exception, outside these date lines is, the minaret of Alaca Masjid, in Tokat, constructed at the very end of the century. Here the bond is placed in a narrow band, encircling the upper section of the shaft. (Pl. 4)

The Brick Units are Staggered in Both Directions:

This next variation of the Horizontal/Vertical Bond, resulting from staggering the brick units in both directions, provides a possibility for creating a large repertoire of diaper bonds. By staggering or changing directions, at predetermined intervals, bricklayers have practised single zigzag, lozenge, and combined zigzag-lozenge patterns, and even, inscriptions on the flat, concave or convex surfaces, they were intending to cover (Pl. 14-16). Such bonds, are sometimes placed in series within narrow registers, at other times they appear individually, spreading upon larger areas.

Zigzag diaper bond, delineated with plain bricks, is adopted in a group of buildings, starting from the second half of the twelfth, until the late thirteenth century, which are listed in Table 4/Column 4. In the earlier ones, except for Melik Gazi Tomb, at Pınarbaşı, the bond is employed on the exteriors of either the buildings themselves, as with the Great Mosque, in Cizre, and the Anonymous Tomb, in Selimeköy or on the base or shafts of minarets, as in the minarets of the Great Mosques, in Harput, and Akşehir. Melik Gazi Tomb, dated to the second half of the twelfth century, is the first building, where zigzag diaper bond is transmitted into the interior spaces. It covers the transition zone of the Masjid room, and the vault of the crypta (Fig. 7). This new application is continued on the transition zones or domes of five other buildings, dated from the first half until the middle of thirteenth century, and repeated in two others, from the later part of the same century. Chronologically, the examples are, the Great Mosque in Malatya, the so called Darphane in Aksaray, the İç Karaaslan and Sırçalı Masjids in Konya, the Horozlu Han between Konya-Ankara and the Sahip Ata and Beyhekim Masjids again in Konya. When used on dome surfaces, the bond is organized in concentric circles, diminishing towards the center. On the other surfaces, it will extend on the horizontal or the vertical axis.

37. A.U. POPE, (Ed.) *A Survey of Persian Art*, ed. A.U. Pope, Oxford: University Press, 1967 (1939), Pl. 325.

38. A. GODARD, *Historique du Masjid-é-Djuma d'Ispahan, Athar-é-Iran*, v. 2, 1937, Fig. 153.

39. A. GODARD, *Khorasan, Athar-é-Iran*, v. 4, n. 1, 1949, Fig. 4, 40.

40. A. GODARD, *Les Coupoles, Athar-é-Iran*, v. 4, n. 1, 1949, Fig. 338.
D.N. WILBER, *The Development of Mosaic Faience in Islamic Architecture in Iran, Ars Islamica*, v. 6, 1939, Fig. 3.

41. A. GODARD, *Khorasan, Athar-é-Iran*, v. 4, n. 2, 1949, Fig. 6.

42. O. GRABAR, *Islamic Architecture and Its Decoration*, London: Faber and Faber 1967, p. 55, Fig. 123.

43. E. COHN-WIENER, *Turan Islamische Baukunst in Churasan*, Berlin: 1930, Pl. X.
J. SOURDEL-THOMINE, *Deux Minarets d'époque Seljoukide en Afghanistan, Revue Syria*, v. 30, 1953, pp. 133- n.6.
O. ASLANAPA, *Türk Sanatı*, c. 1, Istanbul: Milli Eğitim Basımevi, 1972, s. 22, Res. 34.

44. A.U. POPE, (Ed.) *A Survey of Persian Art*, Oxford: University Press, 1967 (1939), Pl. 359 A, B.

45. M.B. SMITH, *Material for a Corpus of Early Iranian Islamic Architecture, Ars Islamica*, v. 4, 1937, Pl. 44, 45.

46. E. DIEZ, *Churasanische Baudenkmäler*, Berlin: 1918, pp. 50-51, Pl. II/1, 2, 3, x/3.

E. DIEZ, *Persien, Islamische Baukunst in Khurasan*, Darmstadt: 1923, pp. 166-167, Pl. 18, 38.

O. GRABAR, *Islamic Architecture and Its Decoration*, London: Faber and Faber, 1967, p. 68, pl. 563.

Melik Gazi Tomb, is also noteworthy for the early utilization of lozenge diaper, delineated with plain bricks (Pl. 14, 15). A more basic version of the bond covers the surfaces of narrow pilasters on the entrance facade. Again on the same facade, the surface of the large blind niche exhibits, the lozenge diaper in its most developed format, comparable to the upper section of the shaft, at Erzurum Tépsi Minare. Slight differences between the two are, the recessed rising joints, alternating with the brick units at Melik Gazi Tomb, which make the lozenge stand-out. (Pl. 15)

Earlier examples of zigzag, and lozenge diapers, can be recorded in a large group of buildings, in Khurasan, Turkestan, and Central Iran. To list, but a few in their chronological sequence: The squinches of the Masjid-i Djuma, at Ardistan (H. 447-50/1055-58 A.D.);³⁷ several vaults, and squinches on the transition zone, of the North Dome, at the Masjid-i Djuma, of Isfahan (H. 473/1080 A.D.);³⁸ squinches at the Caravanserai of Ribat-i Sharif, between Mashad, and Saraks (H. 508-9/1114-15 A.D.);³⁹ the Haydariya Tomb (H. 565/1110 A.D.);⁴⁰ and the Masjid-i Gunbad, at Sanjan (H. 535-36/1140-41 A.D.);⁴¹ the Kharahanid Tomb of Husayin, at Tirmiz (ca. towards twelfth century),⁴² and a number of minarets, few of which are those, at Uzgend,⁴³ the minaret of Tari-Khane, at Damghan, (H. 417-20/1026-29 A.D.),⁴⁴ that of the Masjid-i Djuma, at Barsian (H. 491/1098 A.D.),⁴⁵ and the Firuzabad minaret (late 12th. century).⁴⁶

The above analogies make it apparent that, the Tomb of Melik Gazi, is an explicitly small structure in Anatolia, which carries forward the closest link with the earlier tradition, and brings forth variations of the Horizontal/Vertical Bond, used either on exterior or interior surfaces. (Table 4/Column 3, 4, and 8). As already pointed out, the same building comprises variations of the Horizontal Bond, as well. (Table 2/Column 1 and 2) (Pl. 1, 13-15)

The Great Mosque, at Malatya, is one other building, which presents five variations of the Horizontal/Vertical Bond, delineated either with bricks alone or with bricks, and glazed units together, staggered in unison, with glazed units. (Pl. 16, 18, 19). Here, then we encounter for the second earliest instance, the incorporation of glazed units with unglazed ones, during the performance of the Horizontal/Vertical Bond. As should be recalled, another first instance with this edifice, is the introduction of glazed-end-plugs into the Horizontal Bond. (Table 1/Column 6)

As seen along the Table 4/Columns 4, and 7, at the Great Mosque, in Malatya, single zigzag, and lozenge diapers, arranged with plain bricks cover the concave surfaces of the squinches, and the blind niches, on the transition zone of the domed section. (Pl. 16) The character of the bond here, has close analogies with the Masjid-i Djuma's,

47. See notes 45, 46 above.

at Ardistan, and also Isfahan.⁴⁷ Single zigzag, and lozenge diapers, also combined zigzag-lozenge diapers, delineated together with plain bricks, and glazed units are used alternately on the intrados faces of arches, on the West side of the courtyard, and the half dome of the iwan, as listed in Table 4/Column 6-9-10 (Fig. 8, 9, Pl. 19). The zigzag, and lozenge patterns are distributed in balanced compositions, fitting the shapes, and dimensions of the surfaces they cover, perfectly. As recorded in Table 4/Column 6, after its primary application at the Great Mosque, in Malatya, the zigzag diaper set with bricks, and glazed units, is selected for the domes of Ayasofya Masjid, and Tac-ül-Vezir Tomb, in Konya, constructed during the first half of the 13th century. Consequently, it reappears again on two domes, from the later part of the century, which are, the masjid dome of Taş Madrasa, at Çay, and the large central dome of Sahip Ata Hanikah, in Konya. (Pl. 17).

Concurrently, Table 4/Column 9, shows that, after its introduction at the Great Mosque, in Malatya, the lozenge diaper with plain, and glazed units, is much favoured until the end of thirteenth century, not only for the interior surfaces, but also for the minarets. At the GÜDÜK Minare, in Akşehir, the blind niches on the plinth, also the gadrooned shaft of the Seyyid Mahmud Tomb, in Akşehir, display variations of the lozenge diaper. While the same bond covers the surfaces of the vaults in Sırçalı Madrasa, and Sahip Ata Masjid, in Konya.

Combined zigzag-lozenge diapers delineated with plain stretchers, and glazed headers, is the preliminary composition employed on the upper structure of the iwan, at the Great Mosque, in Malatya. (Pl. 18) As seen in Table 4/Column 10, this bond is not used for another building, during the first half of the century, but reappears, during the second half, on domes, covering large central spaces, such as, at Konya İnce Minaralı Madrasa, and Çay Taş Madrasa. (Pl. 20) Its latest application is on the plinths of the double minarets, at the Çifte Minareli Madrasa, in Erzurum. As seen in Table 4/Column 11, inscription patterns, the last variant of the Horizontal/Vertical Bond, where the units are staggered in both directions, are represented in sufficiently large groups in Anatolian Seljuk buildings, both during the first, and second halves of the century. Such compositions, outlining single words are comparable to those put forth with the Horizontal Bond. (Table 3/Column 10) Inscriptions designed with plain, and glazed units make their preliminary appearance at Sivas, Kaykavus Hospital, where they cover the upper section of the entrance facade, of the Tomb chamber.

The Sırçalı, and the Küçük Karatay Madrasas and the Sahip Ata Tomb, in Konya, are followers, where the bond covers interior surfaces. Only at Sahip Ata Mosque, it is employed for the plinths of the double minarets, which flank the two sides of the portal.

The above classification of the Horizontal/Vertical Bond shows that, this is the second type of brickbond in Anatolia, but not the second best. Just like the Horizontal Bond, examples of the Horizontal/Vertical Bond, start during the second half of the twelfth century, and continue until the end of the thirteenth century. The variations of patterns delineated with this bond depend primarily on the method of staggering. The change in the fabric of the units, which starts to be practiced during the second quarter of the century, and continues till the end, does not seem to effect the construction of bonds during the structural process.

The variations of the Horizontal/Vertical Bond put forth with plain bricks alone, find their earlier counterparts, in the native land of the 'naked brick style'. Yet, no parallels for variations, where plain bricks, and glazed bricks are staggered together, have been recorded. This aspect, probably once more indicates that, the preference for adding glazed units to brickbonds, has been developed in Anatolia.

THE DIAGONAL BOND (Table: 5)

The diagonal Bond initiates from staggering the brick units with an angle of ca. 45° , to the horizontal line, thus creating the so called 'chevron bond', with diagonal joints emerging between the units. Almost always, square whole bricks are utilized, and in the first, course the units are slanted to one direction, while in the next course, to the opposite direction (Fig. 10, Pl. 21) The Diagonal Bond, differs from the Horizontal, and the Horizontal/Vertical Bond, primarily because of this method of laying, and secondly, because of the shape of the joints emerging between the units.

This bond has no dependancy on methods of staggering, since the bricks are always placed in the same slanting position without staggering. As a result, this bond does not give the possibility of practising a variety of patterns, depending on methods of staggering. Changes can be made, merely by using plain bricks, and glazed units alternatively, each filling their own course. Thus, this bond has only two subgroups, depending on the change of fabric.

As seen in Table 5/Column 1, the Diagonal Bond, where plain bricks alone are utilized, usually appears on the domes of small sized edifices. The dome of the Masjid room, at the Tomb of Melik Gazi, in Fınarbaşı, is the earliest example in Anatolia, where this bond has been employed. (Fig. 10, Pl. 21) Following this, during the thirteenth century, it covers the central domes of Başarabey, Karatay, and Hoca Hasan Masjids, and the Sahip Ata Tomb, in Konya. Karatay Masjid displays the

Diagonal Bond, both for exterior, and for interior use. At Ertokuş Madrased, in Atabey, and Karatay Madrasa, in Konya, the same bond is used for the domes of the small rooms, flanking the iwan.

48. E. DIEZ, *Churasanische Baudenkmäler*, Berlin: 1918, Pl. 14-16.
A. U. POPE: (Ed.), *A Survey of Persian Art*, ed. A. D. Pope, Oxford: University Press, 1967 (1939), Pl. 260 B, C.
O. GRABAR, *Islamic Architecture and Its Decoration*, London: Faber and Faber, 1967, Pl. 169, 170.

Before its adoption in Anatolia, the Diagonal Bond has been delineated on the surface of domes, examples of which start, from the early part of eleventh century. It appears for the first time, on a Ghaznavid structure, the Arslan Jadhīb, Tomb in Sangbast (H. 376-419/997-1028 A.D.)⁴⁸ and during the later part of the century it spreads on the domes of two Karragan Tomb Towers, dated (H. 460/1067-68 A.D. - H. 486/1093 A.D.), and the Demavend Tomb Tower, dated to the late eleventh century.⁴⁹

49. D. STRONACK and T. C. YOUNG, *Three Seljuk Tomb Towers, Iran*, v. 4, 1966, Pl. IIIc.

The second subgroup of the Diagonal Bond, where alternating courses are composed of glazed units, is practised only twice in Anatolia, during the last quarter of the century. At the Çifte Minare Madrasa, in Sivas, the bond covers the back face of both plinths, and at Sahip Ata Tomb, it is placed in a square panel over the entrance.

The above classification of the Diagonal Bond shows that, this bond was not as celebrated as the Horizontal, and the Horizontal/Vertical Bonds, and its utilization was particularly favourable for the domes of rather small sized spaces.

Summing up this brief account of decorative brickbonds in Anatolian Seljuk architecture makes it possible to point-out that, the exposed brick style was carried to Anatolia, during the period when it had started going out of fashion in Khurasan, Turkestan, and Central Iran, leaving its place to stucco revetments. In Anatolia, on the other hand, even though this was not the only building material, brick has found a new enthusiasm, leading to endless trials, and new creations. Both with the Horizontal, and Horizontal/Vertical Bonds, besides continuing the earlier patterns, new ones were initiated, especially with the addition of glazed units, which seem to be an innovation much developed in Anatolian brickwork of the Seljuk period.

In this summary of the brickbonds, three buildings deserve special attention. Chronologically speaking, these are the Melik Gazi Tomb, in Fınarbaşı, the Keykavus Hospital, in Sivas, and the Great Mosque, in Malatya. The Melik Gazi Tomb exhibits, on exterior, and interior surfaces, a variety of bonds set with bricks alone. Thus it establishes the first link with more than a century early examples in Khurasan, Turkestan, and Central Iran, especially with the two Anonymous Tomb Towers at Kharragan and the one at Demavend.

At the Keykavus Hospital, in Sivas, and the Great Mosque, in Malatya, which are both cut stone edifices, brick is employed for the interior wall-surfaces, for transition zones, and the upper structures.

The Keykavus Hospital exhibits, probably the earliest use of glazed units in brickbonds, while the Great Mosque, in Malatya, brings forth a large collection of them. This building shows close analogies to the Isfahan Masjid-i Djuma, with the zigzag, and lozenge diapers, delineated in bricks alone. Furthermore, it introduces new variations of similar bonds executed with bricks, and glazed units together. Thus, the Great Mosque, in Malatya, presents a unision of older tradition with new experiments.

If we were to discuss, also the devorative brick revetments utilized in Anatolian Seljuk architecture, we could give a special mention again to the Keykavus Hospital, and the Malatya Great Mosque. Since, both buildings display, well advanced examples of this second technique, as well.

ANADOLU SELÇUKLU MİMARİSİNDE TUĞLA ÖRGÜLERİN KULLANIMI

ÖZET

Onuncu yüzyıldan başlayarak, Onikinci yüzyılın sonlarına kadar Türkistan, Horasan, Gazne ve Orta İran bölgelerinde benimsenen ve tuğla duvar yüzeylerinin herhangi bir malzeme altında gizlenmeyip çıplak bırakılmalarına dayanan yapı geleneği, Zengiler döneminde de Irak'ta yaygınlaşmış ve giderek Anadolu'ya da taşınmıştır. Erken Beylikler ve Anadolu Selçukluları dönemlerinde ve tarih olarak da Onikinci yüzyılın ikinci yarısından Onüçüncü yüzyılın sonuna kadar, Anadolu mimarisinde taş birinci derecede bir yapı malzemesi olarak benimsenirken, tuğla ile de sayıca az ancak nitelik açısından önceki örneklerle karşılaştırılabilir uygulamalar gerçekleştirilmiştir.

Harita: 1'de bu dönem mimarisinde tuğla kullanımının coğrafi dağılımı gösterilmekte, Tablo: 1'de ise yapı türlerinde ve yapıların farklı bölümlerindeki dağılımının öskümü verilmektedir. Öncelikle coğrafi dağılıma bakıldığında; Onikinci yüzyılın ikinci yarısından kalan örneklerin sayıca azlığı coğrafi dağılım için bir genelleme yapmaya olanak vermemektedir. Onüçüncü yüzyılda ise Orta Anadolu'da Konya, Akşehir ve çevresinde tuğlanın yaygın bir yapı malzemesi olarak kullanıldığı ve bu kullanımın Sivas, Tokat, Amasya şehirlerine de yayılarak ulaştığı söylenebilmektedir.

Yapı türlerindeki dağılıma bakılırsa, genellikle küçük ölçekli Mescid ve Türbelerde tüm yapı tuğladan inşa edilirken, büyük ölçekli yapılarda aynı malzeme geçiş ve üst örtüye kısıtlanmakta, az olarak da dış yapısı taş olan bazı yapılarda iç duvar yüzeylerinin de tuğla ile

kaplandıkları izlenmektedir. Bu gözlem, malzeme seçiminin yapı türünden çok ölçükle bağımlı olduğu sonucunu getirmektedir.

Onuncu yüzyıldan başlamak üzere gelişen tuğla yapı geleneğinde birincisi tuğla örgüler, ikincisi tuğla kaplamalar olmak üzere birbirinden farklı iki teknik uygulanmış ve bunların niteliklerine uygun tuğla birimleri üretilmiştir. Bu yazıda ayrıntalı olarak incelenen tuğla örgüler, tek tuğla birimlerinin yapım sürecinde yanyana sıralanmaları ile oluşmaktadır. Bu sıralamada istif, kaydırma ve malzeme farklılığı yapılarak farklı örgü türleri oluşturmak olasıdır. İstif farklılığı üç temel örgü türünü oluşturmaktadır ki, bunlarda tek tuğla birimlerinin yüzeyle olan ilişkileri ile bağımlı olarak Yatay, Yatay/Düşey ve Eğik olmak üzere sınıflanabilir. Bu temel örgü türlerinin her biri kendi içinde ayrıca kaydırma düzeni ile bağımlı, derz aralarının özel durumları ile bağımlı ve farklı malzeme kullanımı ile bağımlı olmak üzere alt gruplara ayrılabilir. Tablo: 2'de Yatay istifte yarım tuğla boyu kaydırma yapılması sonucu gerçekleştirilen örgü türleri; Tablo: 3'de yine Yatay istifte bir tuğlanın uzun kenarının 1/4, 1/5'i oranında kaydırma yapılması sonucu gerçekleştirilen örgü türleri ele alınmış ve derz araları ve malzeme farklılığına dayanan çeşitlemeler sıralanmıştır. Tablo: 4'te ise Eğik istifin çeşitlemeleri sıralanmakta ve her biri için Anadolu'daki örnekler verilmektedir. Bu örneklerle de ön örnekler arasında karşılaştırmalar yapılarak hangilerinin tuğla geleneğinin doğrudan devamı, hangilerinin de Anadolu'ya özgü yenilikler olduğu saptanmaya çalışılmaktadır.

Örgülerin yapılardaki dağılımı incelendiğinde, erken tarihli bazı örnekler dışında, genellikle alt yapıda daha sade ve yalnız sırsız tuğla birimleri ile gerçekleştirilen örgü çeşitlemelerinin seçildiği; üst yapıda ise tuğla ve sırlı birimlerin yanyana getirildikleri örgü çeşitlemelerine yer verildiği izlenmektedir. Bu tür örgülerin yaygın olarak kullanıldığı minareler ise bazen tamamı tuğladan inşa edilen yapılar yanında, bazen de taştan inşa edilen yapılar yanında ya da bu yapıların taç kapıları üzerinde yükselmektedir.

BIBLIOGRAPHY

- ALTUN, A. Harput Ulu Camii'nin Durumu, *Sanat Tarihi Yıllığı*, c.5, 1972-1973, 1973, c.49-60.
- ALTUN, A. *Anadolu'da Artuklu Devri Türk Mimarisinin Gelişimi*, İstanbul: Milli Eğitim Basımevi, 1978.
- ARIK, O. Malatya Ulu Camii'nin Asli Planı ve Tarihi Hakkında *Vakıflar Dergisi*, c.8, 1969, s. 141-149.
- ARIK, O. Erken Devir Anadolu Türk Mimarisinde Türbe Biçimleri, *Anadolu (Anatolia)*, c.11, 1960, s.57-100.
- ASLANAPA, O. *Türk Sanatı*, c. 1, 2, İstanbul: Milli Eğitim Basımevi, 1972, 1973.
- BAKIRER, Ö. Anadolu'da XIII. Yüzyıl Tuğla Minarelerinin Konum, Şekil, Malzeme ve Tezyinat Özellikleri, *Vakıflar Dergisi*, c.9, 1971, s. 337-367.
- BAKIRER, Ö. Anadolu Selçuklularında Tuğla İşçiliği, *Malazgirt Armağanı*, Ankara: 1972, s. 187-203.
- BAKIRER, Ö. Harput Ulu Camii Minaresi, *Bedrettin Cömert'e Armağan*, Hacettepe Üniversitesi, Sosyal ve İdari Bilimler Fakültesi, *Beşeri Bilimler Dergisi*, Özel Sayı, 1980, s. 375-395.
- BAKIRER, Ö. *Selçuklu Öncesi ve Selçuklu Dönemi Anadolu Mimarisinde Tuğla Kullanımı*, Ankara: ODTÜ Yayınları, 1981 (in print)
- BAKIRER, Ö. Erken Dönem Tuğla Süslemesinde Geometrik Düzen Denemesi, *VIII.th Turkish Congress of History*, Ankara: Sept. 1976 (papers in print).
- BAKIRER, Ö. Decorative Brick Revetments in Anatolian Seljuk Architecture, *VI.th International Congress of Turkish Art*, Munich, Sept. 1979, (papers in print).
- BAKIRER, Ö. Geometric Aspects of Brickbonds and Brick Revetments in Islamic Architecture, *International Symposium on Islamic Architecture and Urbanism*, Damman: Jan. 1980 (papers in print).
- BAYBURTLUOĞLU, Z. Niğde-Aksaray Selime Köyü Türbesi, *Önasya*, c.6, s.65, 1970, s. 14-15.
- BELL, G. *The Palace and Mosque at Ukhaidir*, Oxford: 1914.
- BEYGU, A.Ş. *Erzurum Tarihi, Anıtlar ve Kitabeleri*, İstanbul: 1936.
- CLEVENGER, W.M. Some Minor Monuments in Khurasan, *Iran*, v.6, 1968, pp. 57-64.

- COHN-WIENER, E. *Turan, Islamische Baukunst in Mittelasien*, Berlin: 1930.
- CRESWELL, K.A.C. *Early Muslim Architecture*, Oxford: Clarendon Press, 1932.
- DIEZ, E. *Churasanische Baudenkmaeler*, I, Berlin: 1918.
- DURUKAN, A. Selime'deki Türbe ve Anadolu Türk Sanatı'ndaki Yeri, *Bedrettin Cömert'e Armağan*, Hacettepe Üniversitesi, Sosyal ve İdari Bilimler Fakültesi, *Beşeri Bilimler Dergisi*, Özel Sayı, 1980, s. 397-409.
- ERDMANN, K. *Das Anatolische Karavansaray des 13. Jahrhunderts*, Berlin: 1961.
- GABRIEL, A. *Monuments Turc d'Anatolié*, v. I, II, Paris: 1930-1934.
- GABRIEL, A. *Voyages Archéologiques dans la Turquie Orientale*, v.1, Paris, 1940.
- GODARD, A. Les Anciennes Mosqueés de l'Iran, *Athar-é-Iran*, v.1, n.2, 1936, p. 187-210.
- GODARD, A. Les Tours Ladjim et de Resget, *Athar-é-Iran*, v.1, n.1, 1936, p. 109-115.
- GODARD, A. Historiqué du Masjid-i Djuma d'Isfahan, *Athar-é-Iran*, v.2, n.1, 1937, p. 10-45.
- GODARD, A. Khurasan, *Athar-é-Iran*, v.4, n.1, 1949, p.7-150.
- GRABAR, O. *Islamic Architecture and Its Decoration*, London: Faber and Faber, 1967.
- GRABAR, O. The Earliest Commemorative Structures, *Ars Orientalis*, v.6, 1966, p.7-47.
- HILLENBRANDT, R. Seljuk Monuments in Iran, The Pir Mausoleum at Takistan, *Iran*, v.10, 1972, pp. 45-55.
- JACOPSTAHL, E. *Mittelalterliche Backsteinbauten zu Nachtschevan im Arexesthale*, Berlin: 1899.
- KEMALİ, A. *Erzincan Tarihi*, İstanbul: 1932.
- KONYALI, İ.H., *Abideleri ve Kitabeleri ile Konya Tarihi*, Konya. 1964.
- KONYALI, İ.H. *Abideleri ve Kitabeleri ile Niğde-Aksaray Tarihi*, c.1,2,3, İstanbul: 1974-1975.
- KURAN, A. *Anadolu Medreseleri*, c.1, Ankara: ODTÜ Yayınları, 1969.
- MEINECKE, M. *Fayencedekorationen seldschukischer Sakralbauten in Kleinasien*, v.1, 2, Tübingen: 1976.
- ÖNEY, G. Akşehir Ulu Camisi, *Anadolu (Anatolia)*, c.9, 1967, s. 171-179.

- ÖNEY, G. *Anadolu Selçuklu Mimarisinde Süsleme ve El Sanatları*, Ankara: T. İş Bankası Yayınları, 1978.
- ÖZGÜÇ, T. and AKOK, M. Melik Gazi Türbesi ve Kalesi, *Belleten*, c.18, n.71, 1954, s. 331-336.
- ÖZGÜÇ, T. and AKOK, M. Mengüceklere Ait Bir Türbe, *I. Türk Sanatları Kongresi*, Ankara, 1959, *Tebliğler*, Ankara: 1962, s.325-327.
- POPE, A.U. (ed.) *A Survey of Persian Art*, Oxford: University Press, 1967 (1939).
- POPE, A.U. Persian Brickwork, *Country Life*, v.72, 1932, s. 742-747.
- POPE, A.U. *Persian Architecture*, London: Thames and Hudson, 1965.
- SARRE, F. *Denkmäler Persischer Baukunst*, Berlin: 1900-1910
- SARRE, F. and HERZFELD, E. *Archaeologische Reise im Euphrat und Tigris Gebiet*, Berlin: 1911-1920.
- SMITH, M.B. Material For a Corpus of Early Iranian Islamic Architecture, II, Masjid-i Djuma Barsian, *Ars Islamica*, v.4, 1937, s. 7-47.
- SOURDEL-THOMINE, J. Deux Minarets d'epoque Seljoukide en Afganistan, *Revue Syria*, v.30, 1953, p. 108-136.
- STRONACK, D and YOUNG, T.C. Three Seljuk Tomb Towers, *Iran*, v.4, 1966, s. 1-20.
- ÜLGEN, A.S. Kırşehir'de Türk Eserleri, *Vakıflar Dergisi*, c.2, 1942, s.253-263.
- ÜLGEN, A.S. Siirt Ulu Camii, *Vakıflar Dergisi*, c.5, 1962, s.153-155.
- WILBER, D.N., The Development of Mosaic Faience in Islamic Architecture in Iran; *Ars Islamica*, v.6, 1939, p. 18-33
- ÜNAL, R.H. *Les Monuments Islamiques Anciens de la Ville d'Erzurum et de sa Région*, Paris: 1967.
- ÜNAL, R.H. Monuments Saltuquides de Kemah, Anatolie Orientale, *Revue des Etudes Islamiques*, v.35, 1968, s. 149-172.
- WULFF, H. *Traditional Crafts of Persia*, Cambridge, Mass: M.I.T. Press, 1966.
- YETKİN, S.K. The Türbeh of Gömeç Hatun, A Seljuk Monument, *Ars Orientalis*, v.4, 1961, p. 357-360.
- YETKİN, Ş. *Anadolu'da Türk Çini Sanatının Gelişmesi*, İstanbul: 1973.

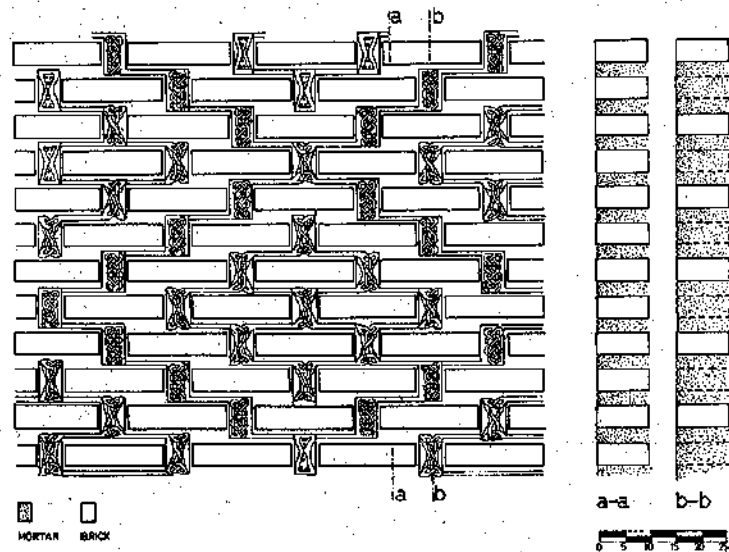
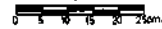
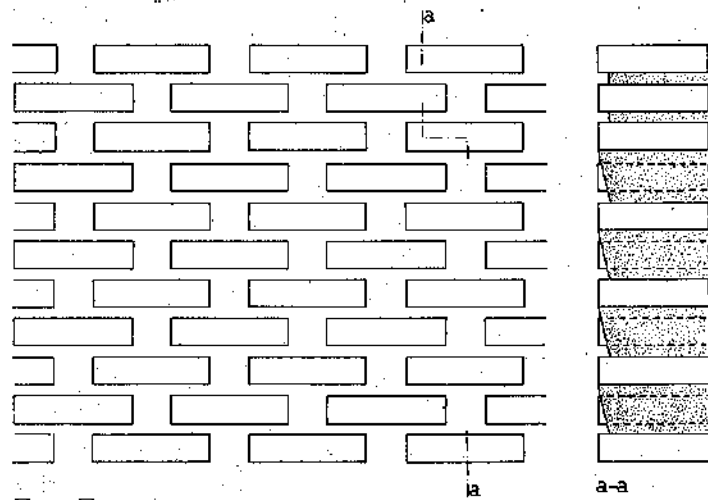
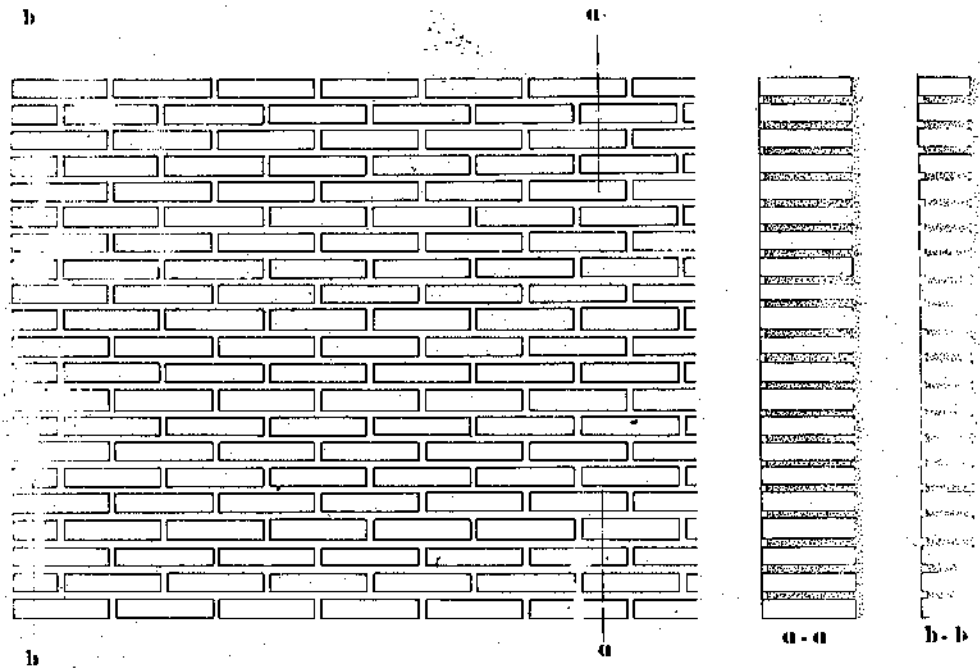


Fig. 1. Horizontal Bond, half brick staggering, narrow rising and bed joints.

Fig. 2. Horizontal Bond, half brick, staggering with wide rising joints. Joints raked. Malatya, Nûtûm Dedé Minaret, shaft.

Fig. 3. Horizontal Bond, half brick staggering with wide rising joints. Decorative Flush pointing, Sivas, Keykavus Hoospital, North iwan walls.

A STUDY ON THE USE OF BRICKBONDS IN ANATOLIAN SELJUK ARCHITECTURE

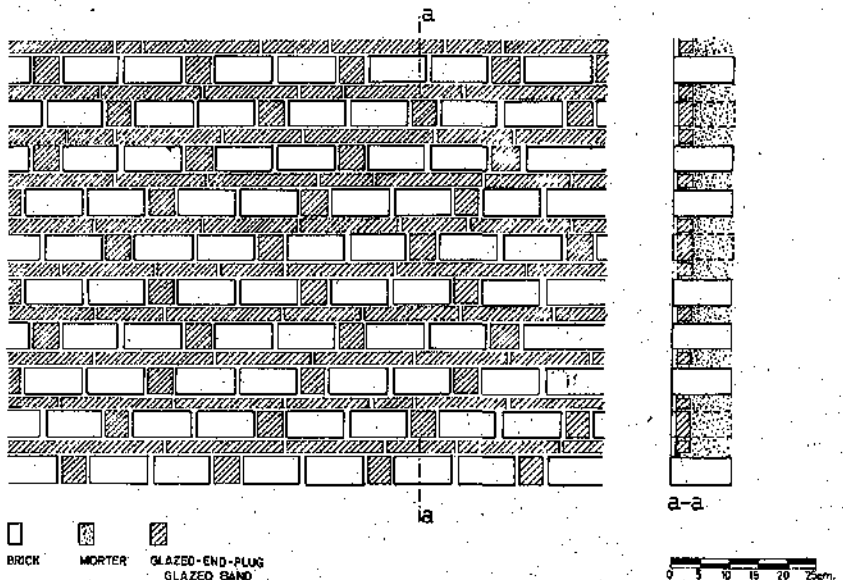
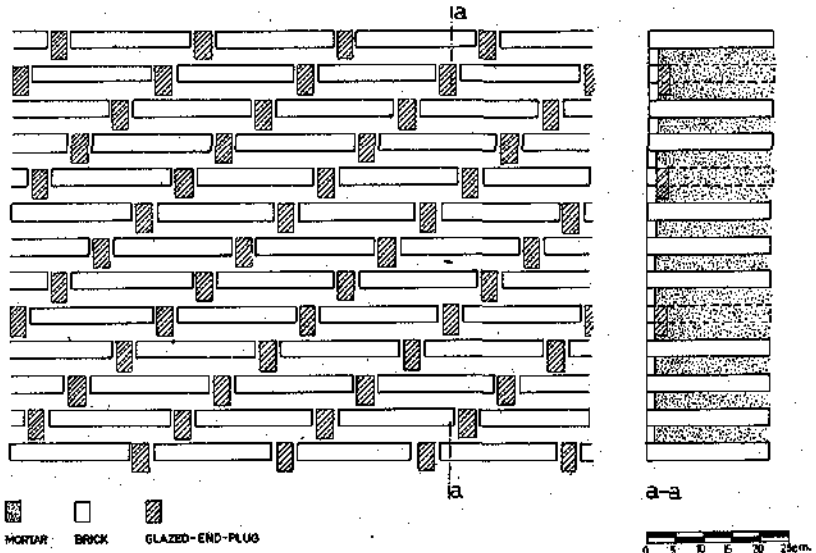
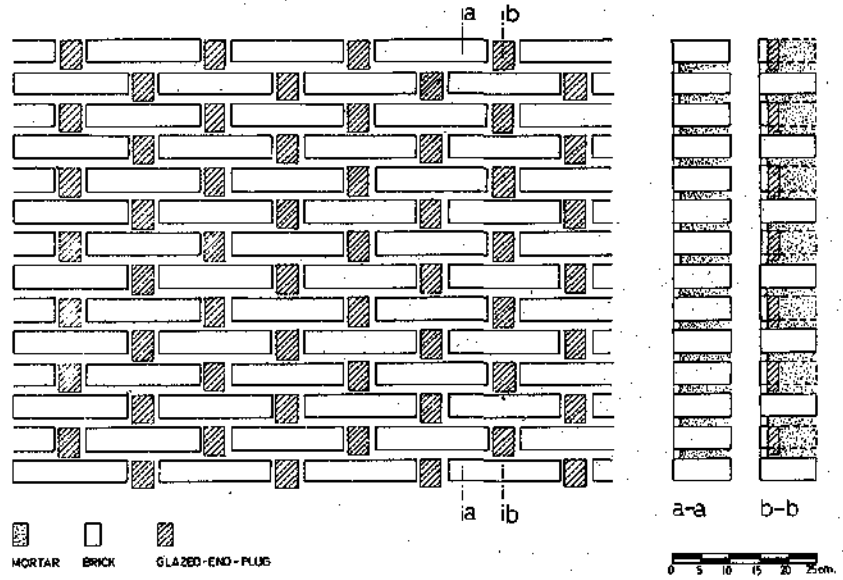


Fig. 4. Horizontal Bond, half brick staggering with glazed-end-plugs. Konya İnce Minareli Madrasa, iwan arch.

Fig. 5. Horizontal Bond, 1/4 or 1/5th of a brick staggering. Akşehir, Taş Madrasa, minaret shaft.

Fig. 6. Horizontal Bond, 1/4 or 1/5th of a brick staggering. Glazed-end-plugs in wide rising joints, glazed-bands in bed joints. Sivas, Buruciye Madrasa, transition zone.

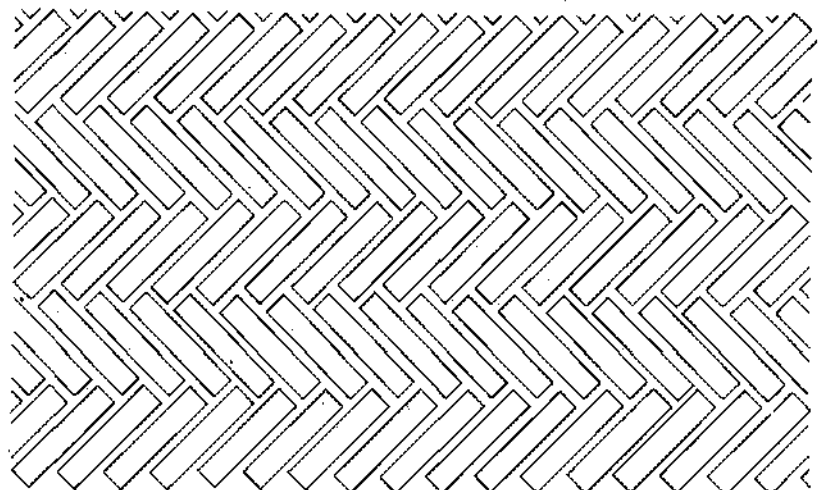
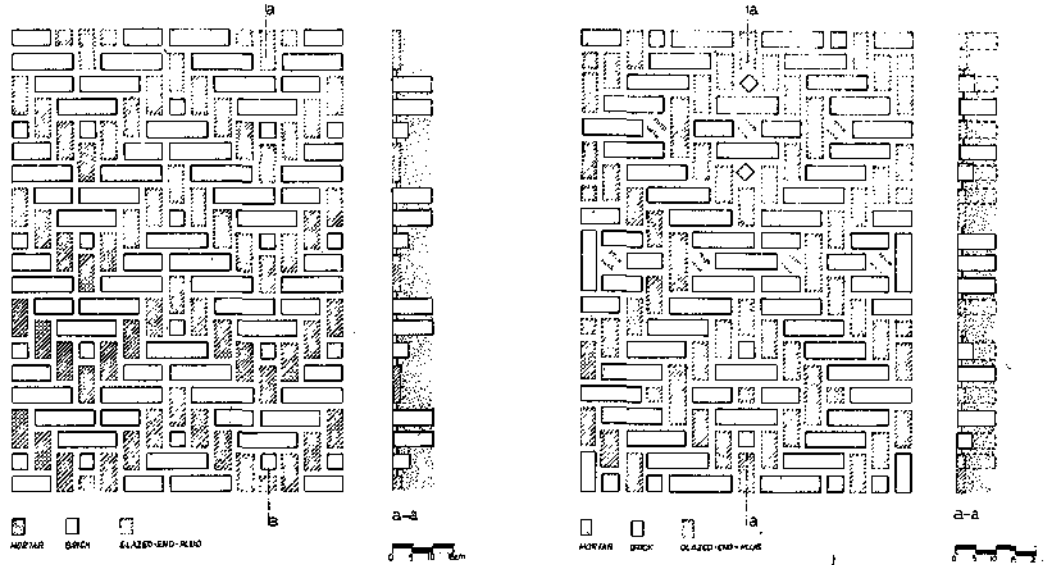
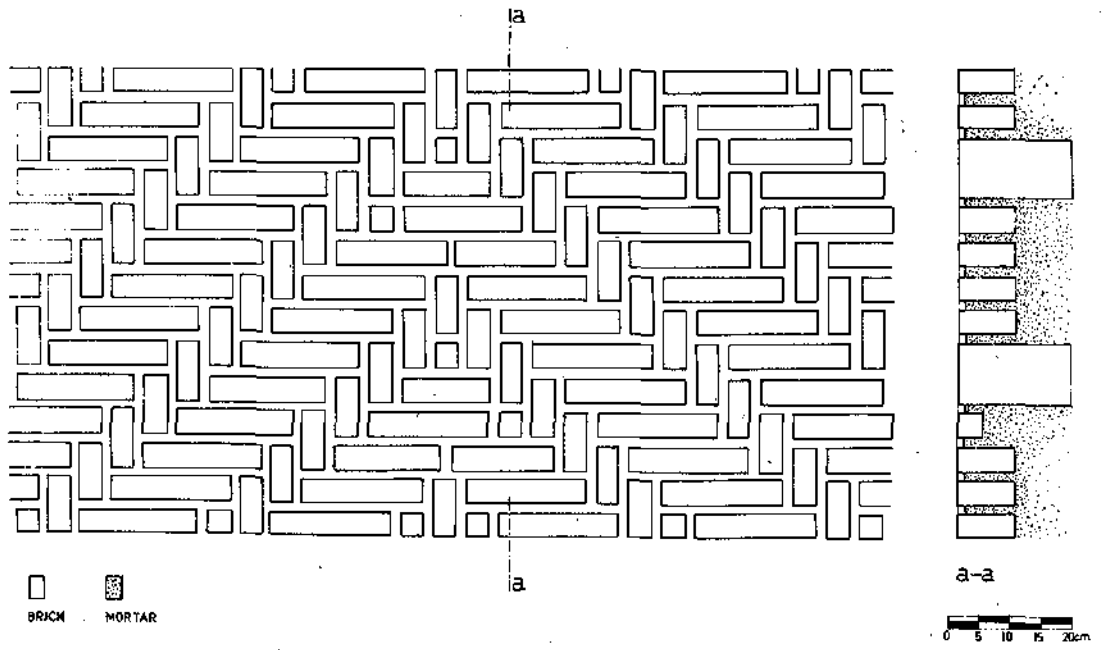


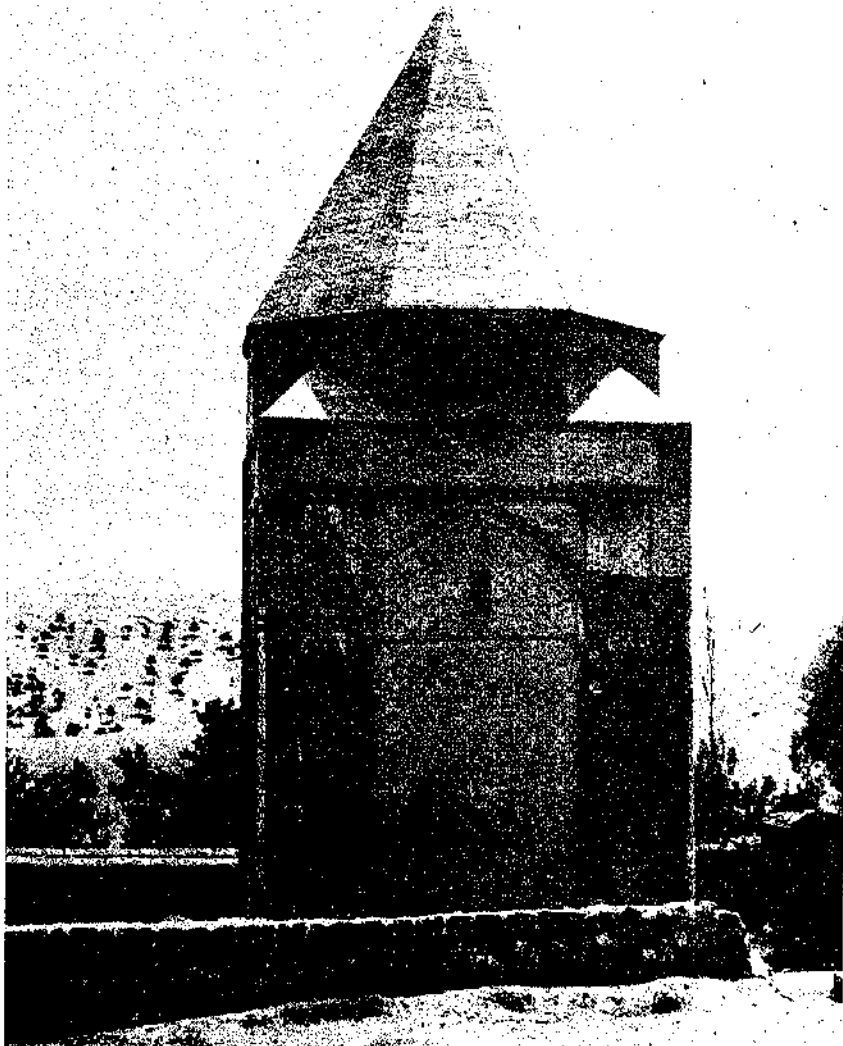
Fig. 7. Horizontal/Vertical Bond with half bricks. Pınarbaşı, Melik Gazi Tomb, Interior transition zone, squinches.

Fig. 8. Horizontal/Vertical Bond, brick stretchers and glazed headers, zigzag diaper. Malatya, Great Mosque, West side of courtyard, arches.

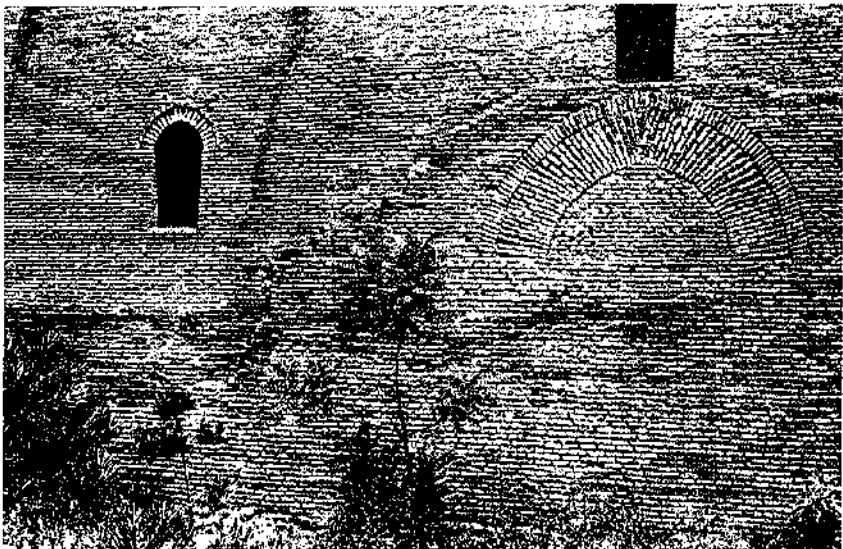
Fig. 9. Horizontal/Vertical Bond, brick stretchers and glazed headers, lozenge diaper. Malatya, Great Mosque, West side of Courtyard, arches.

Fig. 10. Diagonal Bond with unglazed brick units, Pınarbaşı Melik Gazi Tomb, Interior, squinches and dome.



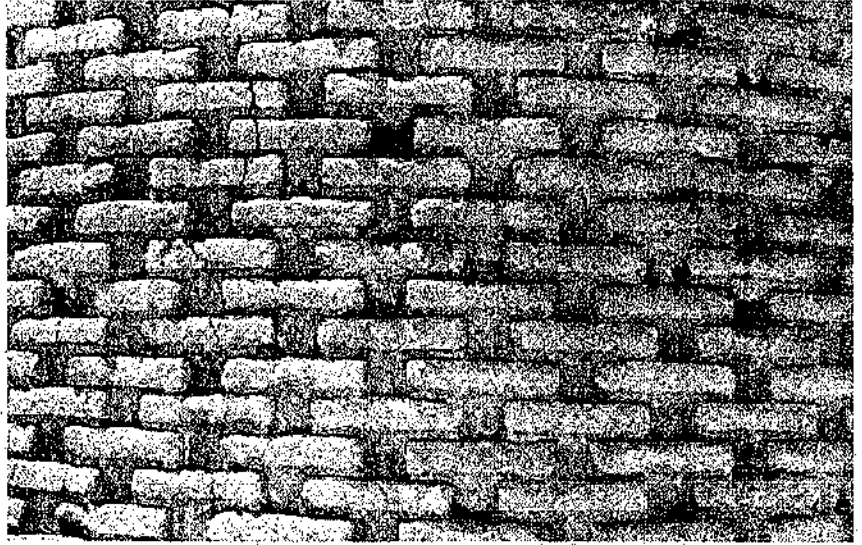


Pl. 1. Fınarbaşı, Melik Gazi Tomb,
General view.

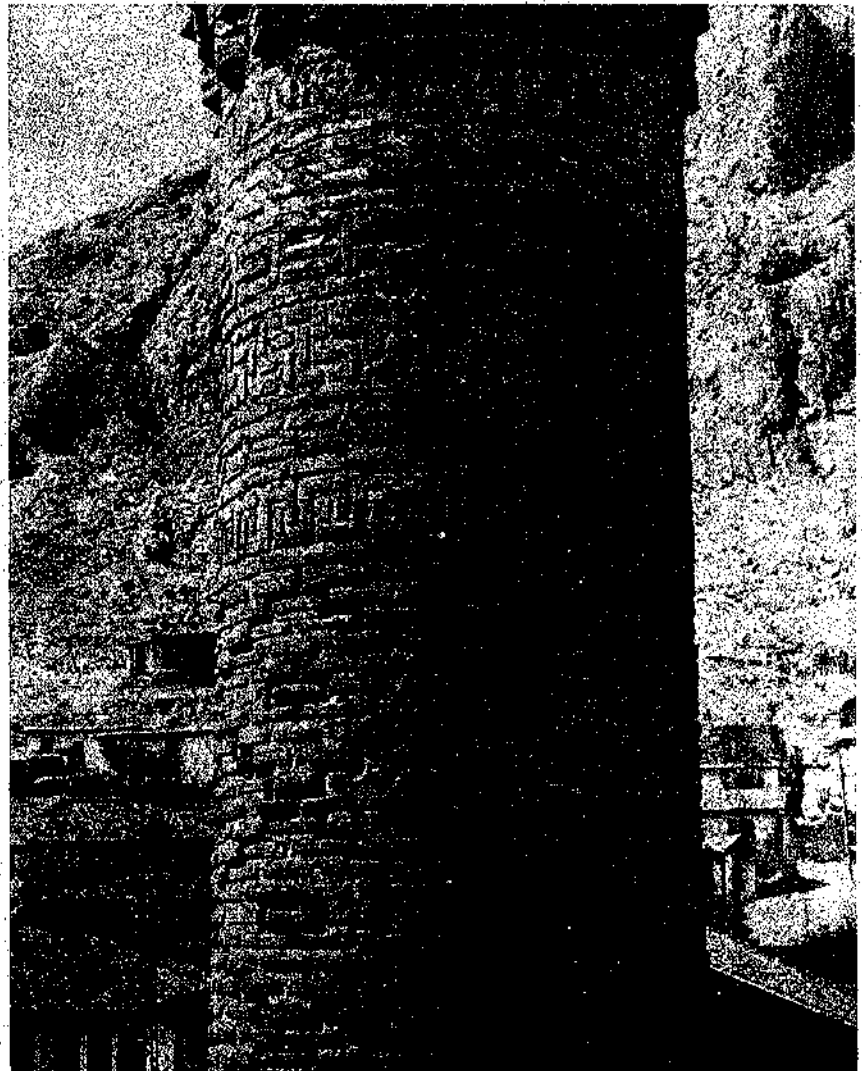


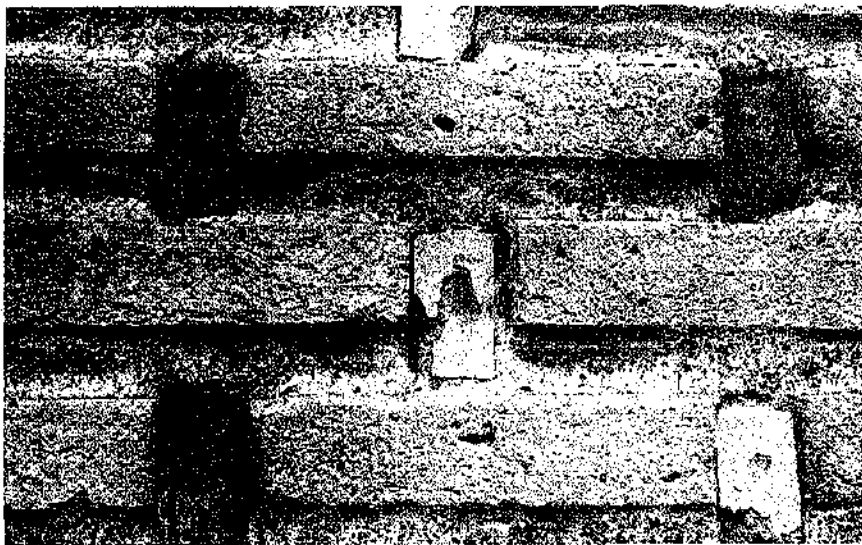
Pl. 2. Konya, Iplikçi Mosque, South
wall, original brickwork.

Pl. 3. Malatya, Höcüm Dede Minaret,
shaft.

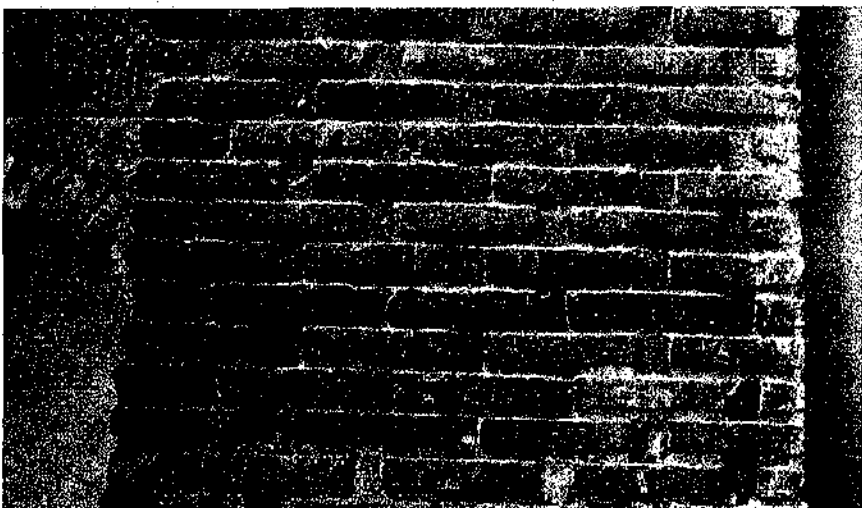


Pl. 4. Tokat, Alaca Masjid, shaft of
the minaret.





Pl. 5. Malatya, Great Mosque, West side of courtyard.

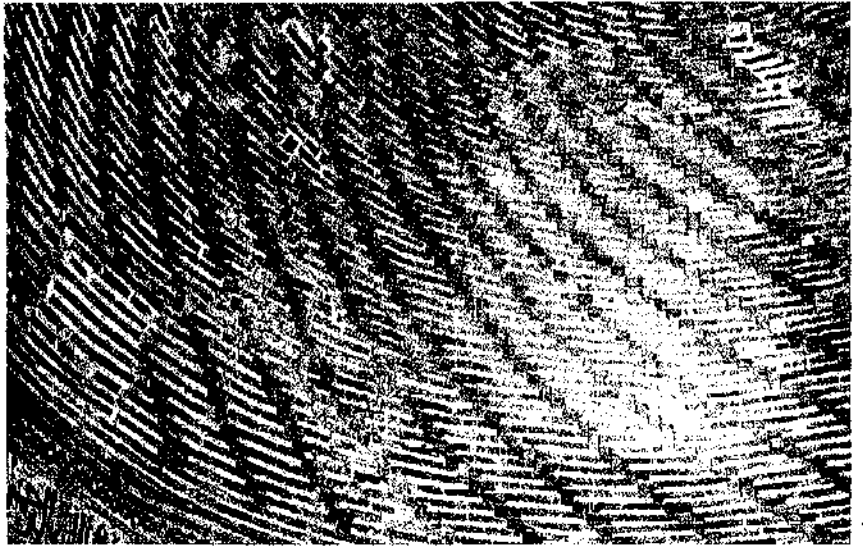


Pl. 6. Konya, Ince Minareli Madrasa, Interior, iwan arch.

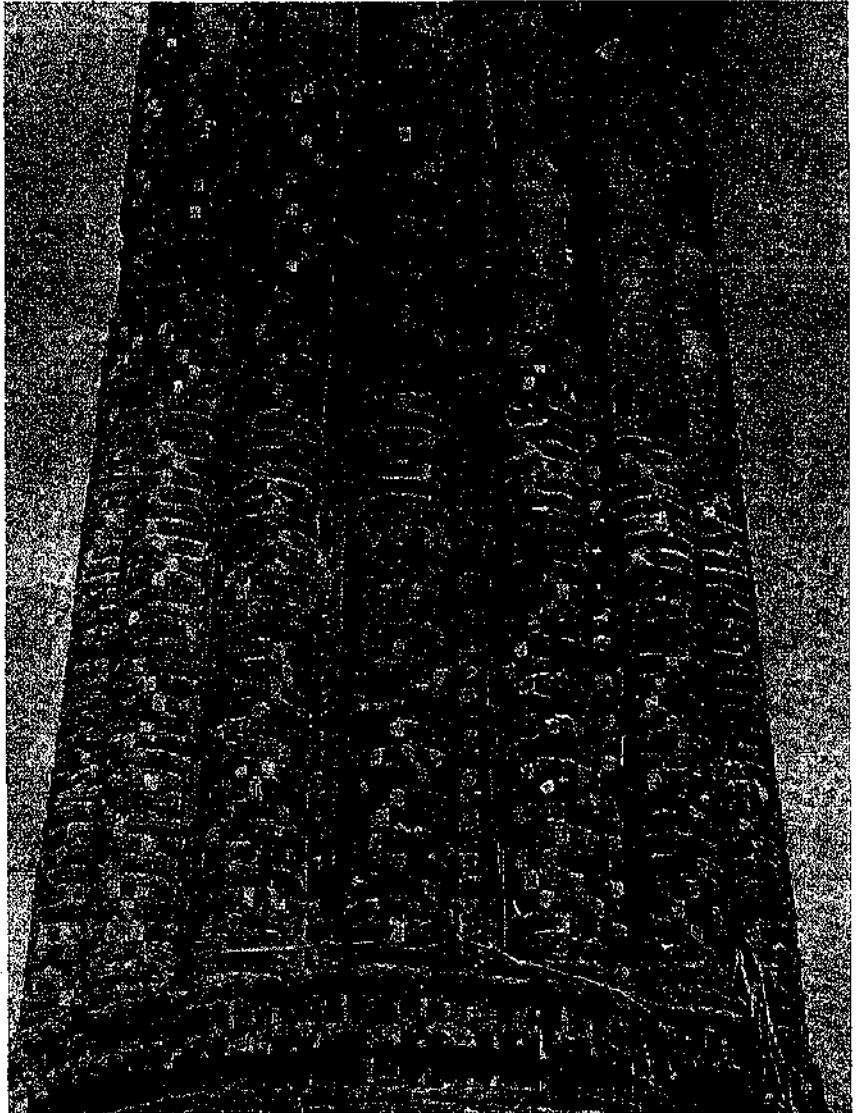


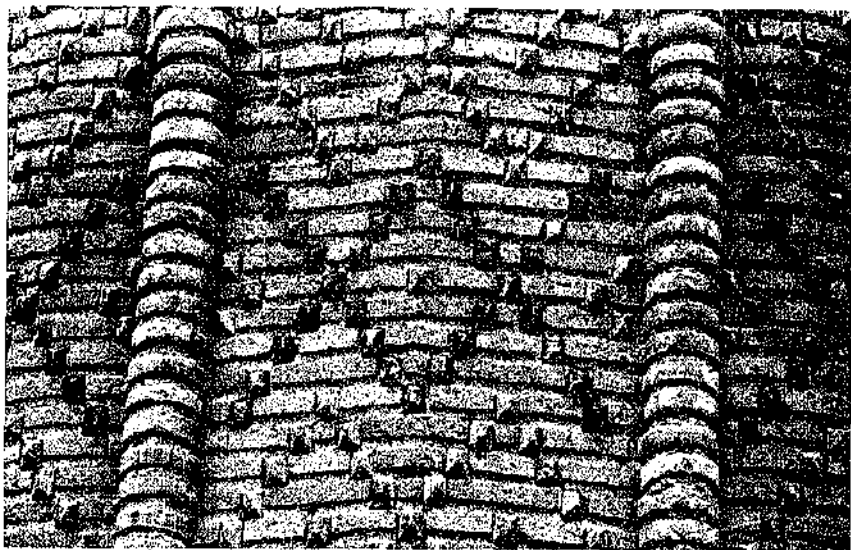
Pl. 7. Kemaş, Mengücek Gazi Tomb, exterior walls.

Pl. 8. Malatya, Great Mosque, detail
from the main dome.

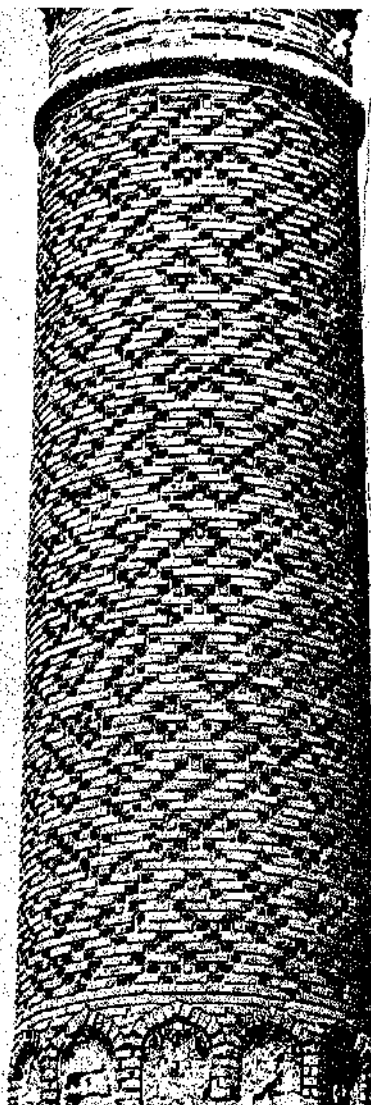


Pl. 9. Erzurum, Çifte Minareli Madrasa,
shaft of one of the minarets.





Pl. 10. Konya, İnce Minareli Madrasa,
detail from the shaft of the
minaret.

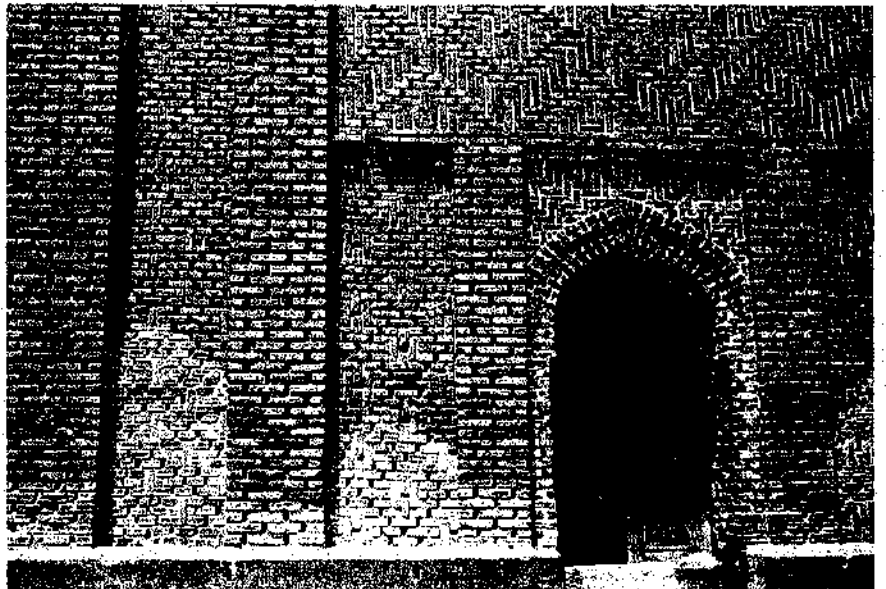


Pl. 11. Sivas, Çifre Minareli Madrasa,
shaft of one of the minarets.



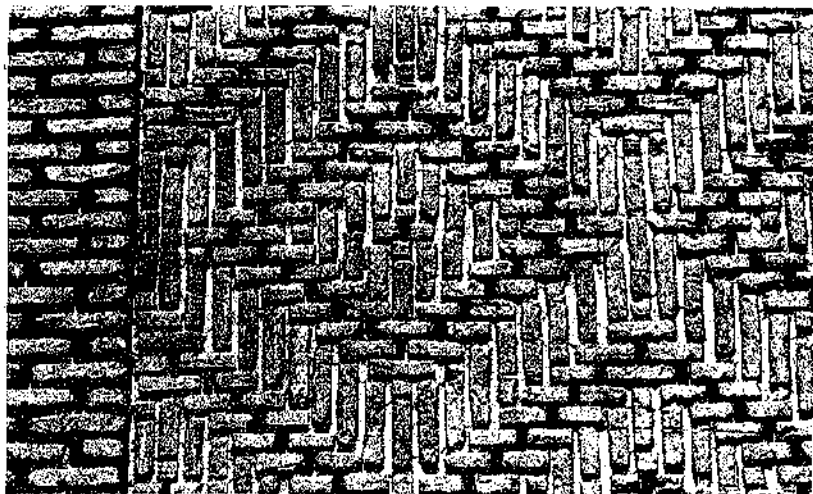
Pl. 12. Sivas, Keykavus Hospital,
Interior, a window.

Pl. 13. Pınarbaşı, Melik Gazi Tomb,
detail from the entrance facade.



Pl. 14. Pınarbaşı, Melik Gazi Tomb,
detail from the entrance facade.

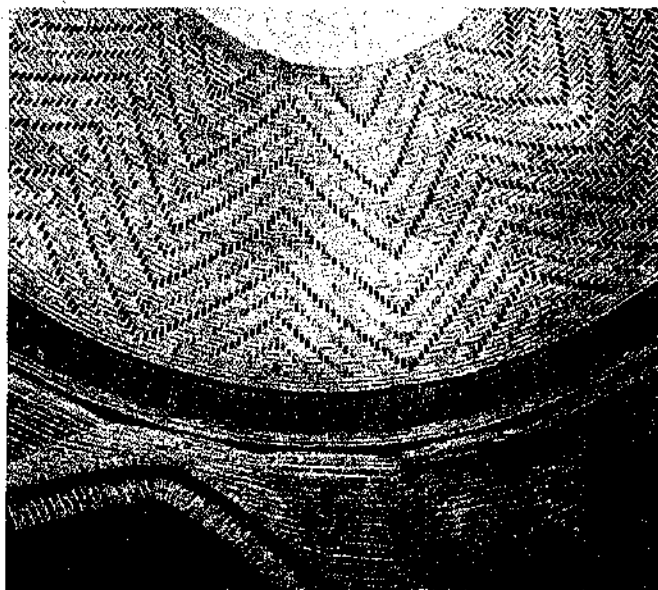
Pl. 15. Pınarbaşı, Melik Gazi Tomb,
detail from the upper section of
the entrance facade.

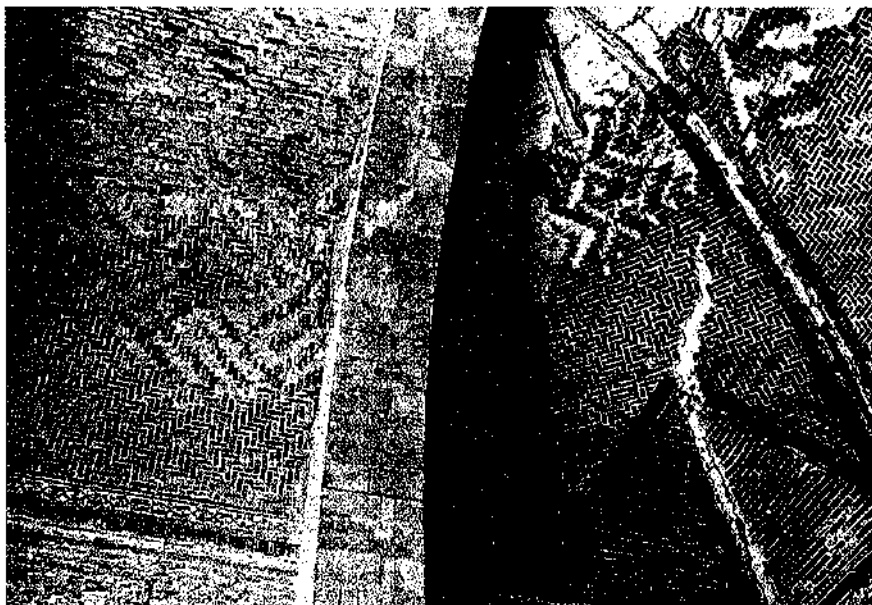


Pl. 16. Malatya, Great Mosque,
Interior, transition to the main
dome.

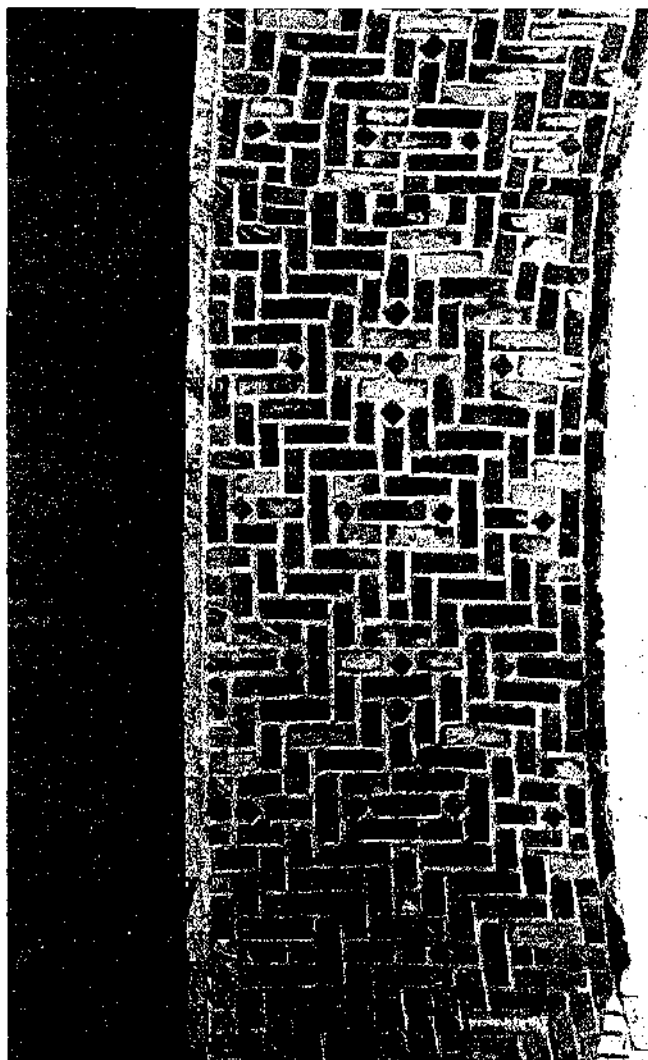


Pl. 17. Konya, Sahip Ata Hanikah,
detail from the main dome.

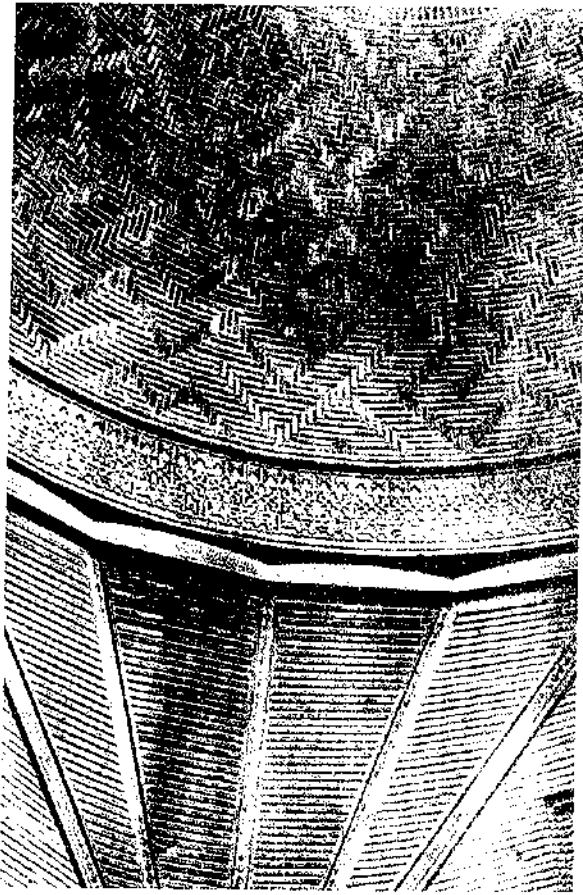




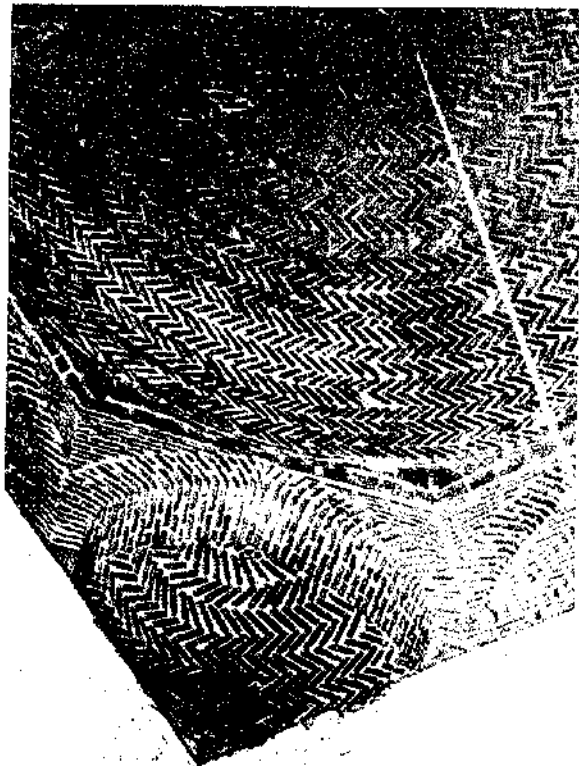
Pl. 18. Malatya, Great Mosque, detail from the half dome of the iwan.



Pl. 19. Malatya, Great Mosque West side of courtyard, detail of second arch.



Pl. 20. Konya, Ince Minareli Madrasa,
detail from the transition zone and
main dome.



Pl. 21. Pınarbaşı, Melik Gazi Tomb,
Interior of Masjid, squinches and
dome.

TABLE 2		H O R I Z O N T A L B O N D						ABBREVIATIONS:	
		H A L F B R I C K S T A G G E R I N G						Mos. : Mosque	To. : Tomb
								Mad. : Madrasa	Hos. : Hospital
								Ma. : Masjid	Min. : Minaret
DATE	B R I C K	BRICK, GLAZED BRICK	B R I C K				N A R R O W	B R I C K	
			R I S I N G J O I N T S W I D E, B O R D J O I N T S		R I S I N G J O I N T S N A R R O W, D R D J O I N T S W I D E				
			ALL BENTLY RAKED	RAKED TO A PATTERN	FLUSH POINTING	GLAZED END-PLUGS	GLAZED BANDS	FLUSH POINTING	GLAZED BANDS
1150	√	KONYA, Kiliç Aelan Ki. HARPUT, Great Mos.	ERZURUM, Tepel Min. Minaret, shaft. late 12th.c.						
		FIRARBAŞI, Melik Gazi To	PINARBAŞI, Melik Gazi To Ext. walls. second half, 12th.c.						
1200	√	KEMAN, Mengücek Gazi To KAYSERİ, Great Mos.	KEMAN, Mengücek Gazi To Ext. walls. late 12th.c.		KEMAN, Mengücek Gazi To Int. crypta, pier. late 12th.c.			KEMAN, Mengücek Gazi To Ext. pilasters late 12th.c.	
		SIVAS, Great Mos. AKŞEHİR, Great Mos.							
		KONYA, Başarabey Ma. SIVAS, Keykavus Hos.	SIVAS, Great Mos. Minaret, base, shaft. early 13th.c.						
		MİRSAR, Kırkkızlar To. MALATYA, Great Mos.	SIVAS, Keykavus Hos. Int. walls. 1217-1220		SIVAS, Keykavus Hos. Courtyard, iwan, walls 1217-1220				
		KONYA, Çekirge Ma. AKŞEHİR, Altın Yalın Ma.	MALATYA, Great Mos. Minaret, shaft. ca. 1224			MALATYA, Great Mos. Domed Section, walls. ca. 1224			
		AKŞEHİR, Ferruhşah Ma. KONYA, Zamburi Ma.	MALATYA, Ak Min. Minaret, shaft. first quarter, 13th.c.						
		AKŞEHİR, Güçük Min. Ma. KONYA, Hatuniye Ma.	MALATYA, Hatun Lede Min. Minaret, shaft. first quarter, 13th.c.						
		ALANYA, Akgebe Ma. AKSARAY, Kazal Min.	AKSARAY, Kazal Min. Minaret, shaft. first half, 13th.c.	AKSARAY, Kazal Min. Minaret, shaft. first half, 13th.c.		ALANYA, Akgebe Ma. Minaret, shaft. 1230			
		KONYA, Sarçalı Mad. KONYA, Karatay Mad.	KONYA, Sarçalı Mad. Int. walls. 1242-1243			KONYA, Hatuniye Ma. Minaret, shaft. first half, 13th.c.			
1250	√	AKŞEHİR, Taş Mad. ANFALYA, Yivli Min. SİİRT, Great Mos.	AKŞEHİR, Taş Mad. To Int. transition. 1250			ANFALYA, Yivli Min. Minaret, shaft. ca. 1260			
		KONYA, İnce Min. Mad. ANASTA, Gök Mad. Mos.	KONYA, İnce Min. Mad. Minaret, plinth. ca. 1264			KONYA, İnce Min. Mad. Int. iwan, arch. ca. 1264			
		AKŞEHİR, Seyid Mahmud To				AKŞEHİR, Seyid Mahmud To Ext. shaft. ca. 1269	TOKAT, Gök Mad. Courtyard, arches. second half, 13th.c.		
		SIVAS, Gök Mad. SIVAS, Buruciye Mad.				SIVAS, Gök Mad. Minaret, base. 1271-1272		SIVAS, Gök Mad. Minaret, plinth. 1271-1272	
		KONYA, Şahip Ata To. KONYA, Şahip Ata Ma.				SIVAS, Çifte Min. Mad. Minaret, plinth. 1271-1272		SIVAS, Çifte Min. Mad. Minaret, plinth. 1271-1272	
		KONYA, Sakahane Ma. KONYA, Gök Hatun To	AFYON, Great Mos. Minaret, shaft. late 12th.c.			KIRŞEHİR, Çakırcı Mad. Minaret, shaft. 1272-1273			
		KONYA, Beyhekim Ma. ERZURUM, Çifte Min. Mad.	AFYON, Kuyulu Ma. Minaret, shaft. late 12th.c.			ERZURUM, Çifte Min. Mad. Minaret, base. late 13th.c.			
		KONYA, Buldur Tekke Ma. TOKAT, Seydekar To.			TOKAT, Alaça Ma. Minaret, shaft. ca. 1300				
1300	(1)	ANKARA, Aslanhane Mos.	TOKAT, Garipler Mos. Minaret, shaft. ca. 1300		TOKAT, Garipler Mos. Minaret, shaft. ca. 1300				

(1) Due to limited space, a select group of buildings are listed in this column.
Position of brickbond in the building and dates have not been included.

TABLE 3 H O R I Z O N T A L B O N D

ABBREVIATIONS: Mos. : Mosque To. : Tomb
Mad. : Madrasa Min. : Minaret

1/4 OR 1/5 OF A B R I C K S T A G G E R I N G

DATE	D I A G O N A L P A T T E R N S		Z I G Z A G P A T T E R N S				L O Z E N G E P A T T E R N S			INSCRIPTIONS
	B R I C K	B R I C K	B R I C K	B R I C K	B R I C K	B R I C K	B R I C K	B R I C K	B R I C K	B R I C K
1150	GLAZED-END-PLUGS	GLAZED-END-PLUGS, GLAZED-BANDS	RISING WIDE, HORIZONTAL NARROW - BOTH RICKED	BRICK-ENDS-PLUGS	GLAZED-END-PLUGS	GLAZED-END-PLUGS, GLAZED-BANDS	BRICK-END-PLUGS	GLAZED-END-PLUGS	GLAZED-END-PLUGS, GLAZED-BANDS	GLAZED-END-PLUGS GLAZED-BANDS
1200										
	MALATYA, Great Mos. Int. dome. ca. 1224									
				AKSARAY, Darphane Int. vault, end wall. 1st. half, 13th. c.			AKSARAY, Darphane Int. vault, end wall. 1st. half, 13th. c.			
				AKSARAY, Yakık Min. Minaret, shaft. 1st. half, 13th. c.						
1250	AKSEHIR, Taş Mad. Minaret, shaft. 1250							AKSEHIR, Taş Mad. Minaret, shaft. 1250		
								KONYA, İnce Min. Mad. Minaret, shaft. ca. 1264		
	AKSEHIR, Seyid Mahmud To. Ext. shaft. ca. 1269				AKSEHIR, Seyid Mahmud To. Ext. shaft. ca. 1269			AKSEHIR, Seyid Mahmud To. Ext. shaft. ca. 1269		
		SIVAS, Buruciye Mad. Int. transition zone 1271-1272	KIRSEHIR, Cacabey Mad. Minaret, shaft. 1272-1273			SIVAS, Gök Mad. Ma. Int. transition. 1271-1272		SIVAS, Gök Mad. Ma. Int. dome. 1271-1272	SIVAS, Gök Mad. Ma. Int. transition 1271-1272	SIVAS, Çifte Min. Mad. Minaret, shaft. 1271-1272
						SIVAS, Buruciye Mad. To. Int. transition. 1271-1272				
	ERZURUM, Çifte Min. Mad. Minaret, shaft. late 13th. c.				ERZURUM, Çifte Min. Mad. Minaret, plinth. late 13th. c.			ERZURUM, Çifte Min. Mad. Minaret, shaft. late 13th. c.		
1300		BEYSEHIR, Eşrefoğlu Mos. Int. dome. 1297-1299				BEYSEHIR, Eşrefoğlu Mos. Int. dome, transition 1297-1299			BEYSEHIR, Eşrefoğlu Mos. Int. dome. 1297-1299	

TABLE 4 HORIZONTAL/VERTICAL BOND											ABBREVIATIONS: Nos. : Noque To. : Tomb Mad. : Madrasa Nos. : Hospital Ma. : Masjid Min. : Minaret Gl. : Glazed	
DATE	NO STAGGERING		STAGGERING TO ONE DIRECTION	STAGGERING TO BOTH DIRECTIONS							INSCRIPTIONS	
	SINGLE ARRANGEMENT	TRIPPLE ARRANGEMENT	DIAGONAL PATTERNS	ZIGZAG PATTERNS			LOZENGE PATTERNS		ZIGZAG-LOZENGE PATTERNS			
	BRICK	BRICK	BRICK	BRICK	BRICK	BRICK	BRICK GL. UNIT	BRICK	BRICK	BRICK GL. UNIT		
	JOINT DIMENSIONS VARY, JOINTS SLIGHTLY RAKED.	JOINT DIMENSIONS VARY, JOINTS SLIGHTLY RAKED.	BOTH JOINTS NARROW, JOINTS SLIGHTLY RAKED.	BOTH JOINTS NARROW, JOINTS SLIGHTLY RAKED.	RISING JOINTS WIDE, RED JOINTS NARROW, JOINTS SLIGHTLY RAKED.	BOTH JOINTS NARROW, JOINTS SLIGHTLY RAKED.	BOTH JOINTS NARROW, JOINTS SLIGHTLY RAKED.	RISING JOINTS WIDE, RED JOINTS NARROW, JOINTS SLIGHTLY RAKED.	BOTH JOINTS NARROW, JOINTS SLIGHTLY RAKED.	BOTH JOINTS NARROW, JOINTS SLIGHTLY RAKED.		
1150				CIZRE, Great Mos. Ext.ivan, vault. ca. 1155								
	HARPUT, Great Mos. Minaret, base. second half, 12th.c.	HARPUT, Great Mos. Minaret, base. second half, 12th.c.		HARPUT, Great Mos. Minaret, shaft. second half, 12th.c.	KONYA, Kiliç Aşlan Ki. remains of vault. 1156-1192			KONYA, Kiliç Aşlan Ki. remains of vault. 1156-1192				
1200			PINARBAŞI, Melik Cazi To. Ext. blind niche second half, 12th.c.	PINARBAŞI, Melik Cazi To. Int. transition, vault second half, 12th.c.				PINARBAŞI, Melik Cazi To. Ext. entrance.				
			SULİMEYİ, Anon. To. Ext. entrance. early 13th.c.	SULİMEYİ, Anon. To. Ext. quoins. early 13th.c.			ERZURUM, Çepsi Min. Minaret, shaft. late 12th.c.					
			KONYA, İğarabey Ma. Int. window, spandrel. 1213-1219	AKŞEHİR, Great Mos. Minaret, plinth. 1213			AKŞEHİR, Great Mos. Minaret, plinth. 1213					
	SIVAS, Kaykavus Hos. Courtyard, window. 1217-1220									SIVAS, Kaykavus Hos. To. Ext. entrance. 1217-1220		
	NİKSAR, Kırkkaslar To. Ext. window, lunette 1217-1220		NİKSAR, Kırkkaslar To. Ext. window, lunette. 1217-1220									
	AKŞEHİR, Ferruhgah Ma. Ext. window, spandrel. 1224		AKŞEHİR, Ferruhgah Ma. Ext. window, spandrel. 1224		NALATYA, Great Mos. Int. transition zone. ca. 1224		NALATYA, Great Mos. Courtyard, arches. ca. 1224	NALATYA, Great Mos. Int. transition zone ca. 1224	NALATYA, Great Mos. Courtyard, arches. ca. 1224	NALATYA, Great Mos. Iwan, half dome. ca. 1224		
				AKŞEHİR, Darphane Int. vault, end wall first half, 13th.c.					AKŞEHİR, Ösdukk Min. Ma. Minaret, plinth. 1226			
				KONYA, İğ Karaman Ma. Int. dome. first half, 13th.c.			AKŞEHİR, Ayasofya Ma. Int. dome. 1235					
	AKŞEHİR, Kızıl Min. Minaret, shaft. first half, 13th.c.			KONYA, Sarçalı Ma. Int. dome. first half, 13th.c.			KONYA, Tac-ül-Vezir To. Int. dome. 1239-1240		ÇANKIRI, Ferruhgah To. Int. platform. 1242			
									KONYA, Sarçalı Ma. To. Int. vault. 1242-1243	KONYA, Sarçalı Ma. Entrance, vault. 1242-1243		
1230				KONYA, Horozlu Han Int. dome. 1246-1249						KONYA, Kışık Karatay Mad. Int. Iwan, vault. 1240		
									AMASYA, Ösk Mad. Nos. To. Int. vault. ca. 1266-1267	KONYA, İnce Min. Mad. Int. dome. ca. 1264	KONYA, Sahip Ata Mos. Minaret, plinth. 1258	
							ÇAY, Tay Mad. Ma. Int. dome. 1278			ÇAY, Tay Mad. Int. dome. 1278		
				KONYA, Sahip Ata Ma. Int. dome. late 13th.c.			KONYA, Sahip Ata Ma. Int. dome. 1279-1280		KONYA, Sahip Ata Ma. To. Int. vault. late 13th.c.	ERZURUM, Çifte Min. Mad. Minaret, plinth. late 13th.c.	KONYA, Sahip Ata To. Int. East wall. 1283	
				KONYA, Loyhelin Ma. Int. dome. late 13th.c.								
1300		TOKAT, Alaca Ma. Minaret, shaft. ca. 1300	TOKAT, Alaca Ma. Minaret, shaft. ca. 1300									

TABLE 5

DIAGONAL BOND

DATE	B R I C K	B R I C K Gl. U N I T
√	BOTH JOINTS NARROW JOINTS RAKED	
1150 √	PINARBAŞI, Melik Gazi To. Ma. Int. dome. second half, 12th. c.	
1200 √	KONYA, Başarabey Ma. Int. dome, spandrels 1213-1219	
	ATABEY, Ertokuş Mad. Int. domes. 1224	
1250 √	KONYA, Karatay Ma. Int. Ext. dome. ca. 1248	
	KONYA, Karatay Mad. To. Int. dome. 1258	
	KONYA, Hoca Hasan Ma. Int. dome. ca. 1260	
		SİVAS, Çifte Min. Mad. Min. plinth. 1271-1272
	KONYA, Sahip Ata To. Int. dome. 1283	KONYA, Sahip Ata To. Int. walls. 1283
1300		