Historical Continuitiesfrom Bronze Age to the Present:
Local Architecture of the Akseki-İbradı Basin (Turkey)

Kemal Reha Kavas, GülşahÇelik

(Assist.Prof.Dr.Kemal Reha Kavas, Akdeniz University Department of Architecture, Antalya - Turkey, krkavas@gmail.com) (Res. Assist. GülşahÇelik, Middle East Technical University, Department of Architecture, Ankara - Turkey, gulcelik@gmail.com)

1 ABSTRACT

The Akseki-İbradı basin (Antalya, Turkey) is situated in southwestern Anatolia at the transitional geographical band between the Mediterranean coast and inland Anatolia.The Taurus Mountain chain passes through the basin. In this mountainous topography architecture has become the means for survival. Local architecture reveals how the available material sources have guided the emergence of a characteristic construction technique. This is a specific combination of timber and rubble stone masonry.The traditional settlements of the region are fabricated through the reproduction of an essential structural principle underlying this construction technique. Almost all constructions ranging between the simple retaining walls to the masonry of the dwellings, share the basic joint between timber and stone.

The structural system is composed of irregular units of rubbl e stone interlocked into each other without mortar. The system is reinforced, at every 50 cm. height, with a pair of timber runner-beams on the two faces of the wall. These runner-beams are connected to each other by tie-beams at horizontal intervals of 50 cm. As a result, rubble stone masonry is strengthened by inserting regular rows of runner-beams held in position by projecting cross-ties.

Archaeological reports concerned with the middle bronze age (2500 – 2000 B.C.) constructions in Beycesultan (Denizli, Turkey) reveal the deep-rooted historical background of the above-mentioned construction system. Although archaeological sources indicate the continuity of this architectural tradition throughout history, this issue has not yet been investigated in detail. The objective of this paper is to explore the available archaeological information in order to unfold historical continuities between the construction system in the Akseki-İbradı basin and the documented structures of the Bronze Age Anatolia.

Keywords: Tradition, Anatolia, Bronze Age, Timber, Rubble-Stone, Akseki-İbradı Basin

2 INTRODUCTION

2.1 Historical, Geographical and Socio-Economic Context

Akseki-İbradı basin is situated in a mountainous region where Taurus Mountains lying parallel to the Mediterranean coastline cuts across the ancient historical trade route between Konya (*Iconium*) and Alanya (*Korakesion*) **(Fig.1)**. Akseki-İbradı basin defines an intersection of three ancient regions of Asia Minor. Psidia at north, Cilicia at east and Pamphilia at southwest converge around the Akseki-İbradı basin (Ramsay, 1962: 370) **(Fig.2)**.The ancient river of Melas (Manavgat) flourishes from this basin**.** Due to the mountainous geography, in history the settlements of this region have been physically isolated from the political centers of Anatolia (İşkan and Çevik, 2000: 51).

There is a sharp contrast between the steep and rocky character of the Akseki-İbradı basin and the broadness of the fertile Manavgat plain lying beneath the Taurus Mountains.The region is situated on the Taurus Mountains – the Anatolian components of the broader Alp-Himalayan system – defining a transition between the south-western coastal zone and the inland territories of Anatolia. Therefore, concerning its location, the basin is both a constitutive element of the Mediterranean and a physical transition between contrasting sets of settlement patterns, climates, faunas and floras.The prevalent climate of the Akseki-İbradı basin is a composite one shifting between the effects of the cold and arid continental climate of the Konya plateau at the north and the hot and humid Mediterranean climate of the Manavgat plateau at the south.

The geographical character has had profound effects on social and economic structures developed throughout the history of the region. Agricultural income has been quite low due to the climatic irregularities and scarcity of fertile and plain land. In general, the dwellers of the region have been living on animal-breeding and the trade of hand-crafted goods. Today the traditional economic model does not exist. Due to the gradual replacement of handcrafts with mass production starting from the 1960s, the system has gradually disintegrated and the region underwent a serious economic degradation. Most of the inhabitants migrated to other parts of the country. The age average of the current population is quite high and most of the villages are abandoned. However the traditional built environment offers a very valuable cultural heritage which deserves scholarly analysis.

Fig. 1: Map of Turkey, Antalya and Akseki-ibradı Basin (highlighted by the authors, July 2008, www.antalyaportal.com.

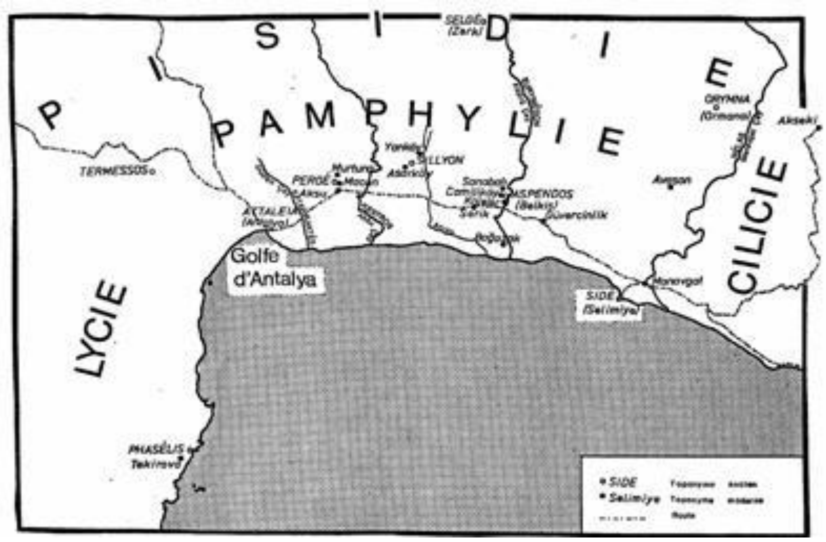

Fig. 2: Map of Antalya with ancient regions (Claude Brixhe. “La DialectaGrec De Pamphylie Documents et grammaire”.

2.2 Traditional Built Environment and the Principle of *Buttoning*[1]

The traditional vernacular architecture of the region has been shaped by geographical and socio-economic context. It may be considered as architecture of survival where the available sources of natural material have guided the creation of specific settlement patterns and construction techniques. The severity of the climate and the scarcity of cultivable land have stimulated the resolution of environmental problems and the perfection of craftsmanship related with architecture. The traditional built environment of the Akseki-İbradı basin is fabricated by an underlying architectural detail which is called *buttoning***(Fig.3)**.This constructional

[1]*Buttoning* is a term coined by K.R.Kavas in this article. The characteristic construction technique is composed of longitudinal and lateral timber beams. In Turkish the lateral timber beams are called *düğme*, which means *button.*Since these beams are essential elements of the structural system, it is proposed to name this system as *buttoning*. In another study (Kavas, 2011) the same system is defined as “timber reinforced rubble stone masonry.”

principle is the basis of coherence in the traditional environment. Sharing the same logic the retaining walls of the rural setting create a background for the masonry walls of the dwellings.

Fig. 3: *Buttoning*: The characteristic construction technique of the Akseki-İbradı Basin, İbradı - Antalya (Kavas, 2009)

The structural configuration of the typical local dwelling is visible **(Fig.4)**. The basic structural principle of *buttoning*, which will be explained in the next section,combines rubble stone and wood and thus facilitates the adaptation of materials into a variety of circumstances. Similar traditions may be observed in the neighboring regions of the Mediterranean Anatolia. However the composite structure that integrates timber and stone through the creation of the *buttons* is characteristic to the Akseki basin. This quality distinguishes *buttoning* from the conventional timber frame structures. The system is named after the *button*, whichis a projecting tie-beam which connects the runner lintels lying parallel to the interior and exterior surfaces of the wall**(Fig.5)**.The natives call the projectingtie-beams as *düğme*(Turkish word for *button*) or *piştuvan*.

Fig. 4: Municipality Guest House inOrmana (İbradı) , southeast façade, (Çelik, 2009)

In his comparative analysis of the Bronze Age Anatolian architecture traced in several archeological sites such as Beycesultan, AlacaHüyük and Kültepe, Seton Lloyd (1965) states that “the habit of strengthening stone or mud-brick walls by inserting at regular intervals rows of runner-beams, held in position by cross-ties goes back atBeycesultan to the first phase of the Early Bronze Age”**(Fig.6)**.The definition given by Lloyd coincides with the buttoning system that is encountered in the Akseki-İbradı basin today. This analysis of Lloyd together with other supplementary information stimulated this research for the historical continuity of traditional building materials and techniques in Anatolian architecture. The composite structures of mud-brick, stone and timber provided by the current archaeological knowledge going back to the Bronze Age Anatolian architecture indicate that the local building traditions of the Akseki-İbradı basin have a deep historical background. It is necessary to explore the structural patterns of this historical continuity.

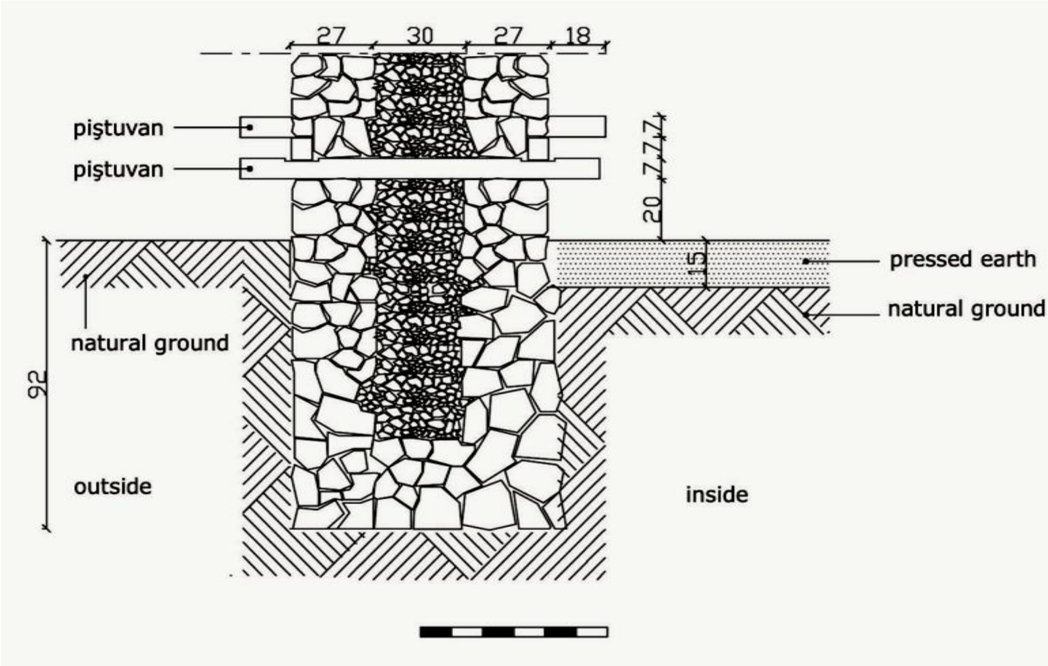

Fig. 5: Section describing the *buttoning* technique, detail of the foundation wall in Gümüşler House, Ormana (Çelik, 2009)

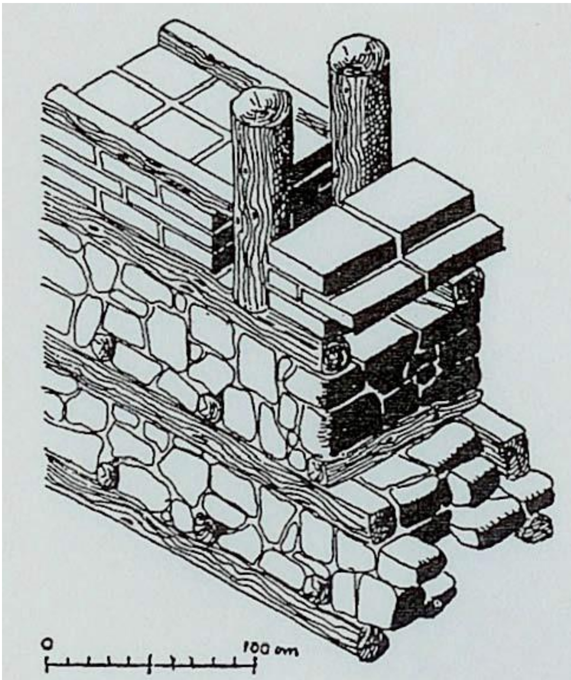

Fig. 6: Beycesultan: wall structure at the palace of Layer V. around 1900 B.C. (Naumann,1991: 87)

3 HISTORICAL CONTINUITIES

3.1 The Description of the Buttoning System and the Construction Process

In order to understand the principle of *buttoning*, it is necessary to appr eciate the role of the *button* within the construction process and the later performance of the structure. The placement of the *buttons* in a horizontal row coincides with the working rhythm of the builder. Each time the stone masonry reaches a height of 50 – 60cm., the builder installs a new course of *buttons* which are lateral lintels jutting vertically out of the wall. The *buttons* are installed with approximately 60 cm intervals and are connected to each other by alongitudinal lintel lying parallel to the masonry**(Fig 3, 5, 7)**.

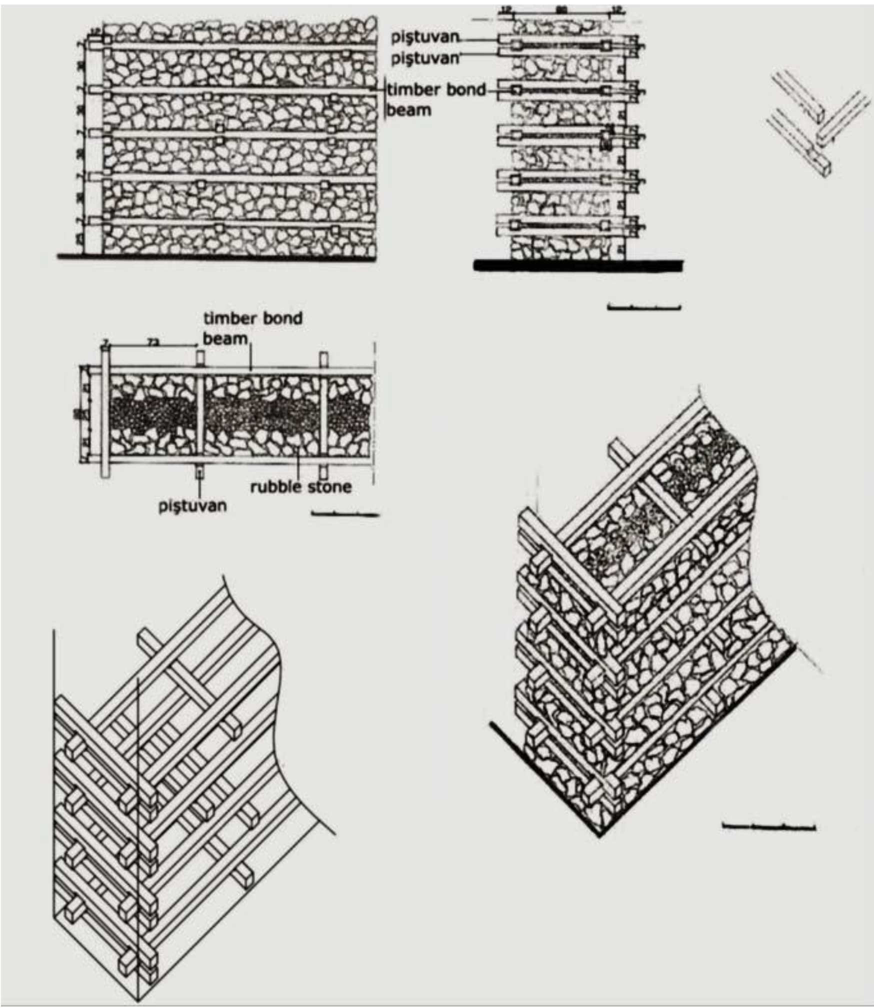

Fig. 7: Buttoning system of the Akseki-İbradı basin, descriptive drawings (Çelik,2009)

Each button juts out of the wall around 25 cm. by providing a built-in scaffolding which facilitates construction of higher structures through the reproduction of the new rows **(Fig.7)**. The configuration of *buttons* creates a texture effect which regulates the allocation of interior spaces as well as the window or door openings. Each element of the façade acquires a comparable scale with the overall façade consisting of a *buttoned* grid**(Fig.4)**. Therefore the button defines a proportional and structural unit and also creates a conceptual unity which may be practically reproduced **(Fig 8)**.

In the construction process, firstly the construction materials that will be used in the building are prepared. Wood and stone of highest quality are obtained and classified according to experience and customs.

According to the interview of the inhabitants and craftsmen, in Akseki-İbradı basin, the area has a comparatively rough and rocky character therefore inhabitants prefer rocky zones to build a dwelling (Çelik, 2009). In this way they can reserve more fields for agriculture. Also they use these rocky zones as strong foundations of the buildings.

The ground floor walls are built up on top of the rock, but if the ground is not homogeneous and the earth is inadequate the foundation pit where the building will be erected was excavated. According to the character of the ground the depth of the foundation pit varies. Afterwards the foundation walls are made by using stone. Foundation walling continues underneath the walls following the external contours of the structure**(Fig.5)**.

Walls are constructed with alternating rows of rubble stone and timber. Rubble stone is used without any mortar. This characteristic system is locally called *düğmeliduvar*which means *wall with buttons*. The structure consists of 60-80 cm thick double skin wall constructions. Two faces are constructed by high quality material and craftsmanship while the middle part is low quality infill **(Fig.5)**. Timber bond beams are horizontally placed at every 30-35 cm in two directions for the reinforcement of the wall. The timber beams which are used at short dimension of the wall called as *piştuvan*or *düğme*(*button*) and during the construction these*piştuvans* are used as built-in scaffolding (Kavas, 2011)**(Fig.8)**.

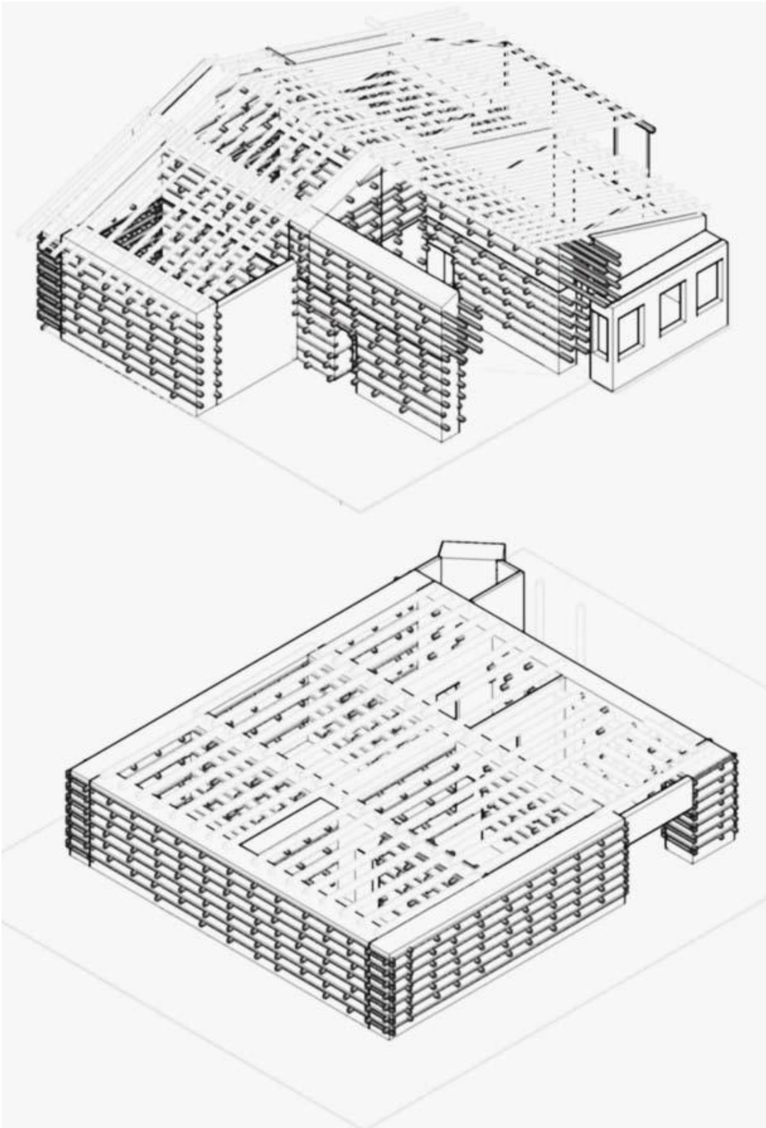

Fig. 8: Buttoning system of the Akseki-İbradı basin, axonometrics of a traditional dwelling (Çelik,2009)

If it is necessary to leave openings in the walls, first the timber elements are inserted at the sides of the openings, and then the framework of the openings is fixed at the edges. The timber lintels are five or six in number which are placed throughout the thickness of the wall. These lintels with a cross section of 7 x 7 cm were placed as spanning elements at the top of the opening. Bottom part of the opening is covered with timber boards. On top of the ground floor walls, the floor girders are placed usually parallel to the shorter side of the space below, in each 40-50 cm. Timber floors are constructed by placing the floor girders(having a circular cross section with 15 cm radius) on the timber sill plates.

If there is a projection above the ground floor, **(Fig.4)**structural elements of the projections are built together with the floor of the upp er storey; the beams of the projection are placed during the construction of the masonry walls. Afterwards the roof structure is completed. If the roof is gable, roof structure is constructed by setting on the top of the walls directly and rafters are placed regularly in each 50 cm, these girders are used as ceiling girders of the upper floor at the same time.

After the masonry walls, main structure of timber framed skeleton parts and the roof structure are finished, the window and door posts are completed. At the next stage timber framed sectionssuch as *ayazlık* (semi-closed space extending out from the common space of the interior), *şahnişin*(projecting common space around which the rooms are organized) and timber partition walls are set up**(Fig.4)**.

Afterwards the floor pavements are completed. The top of the floor girders are covered with the timber flooring boards (2x20 cm.) perpendicular to them. A timber plinth surrounds the edges of the space, where the flooring and the wall met. The ceilings of the spaces are covered and decorated after the floor pavement construction. Then according to the plan organization the interior partition walls are built by placing the posts around the doors and near the main walls of the spaces. Posts, which are located close to the main walls, are nailed to the *piştuvans*(*buttons*) of the masonry walls. One side of these timber frames is covered with 2x25 cm boards by nailing the posts, studs and lintels. If there is a built-in sitting platform (*seki*) in the space the short posts that carry the platform are set on the floor connected to each other with nails. The built in furniture of the spaces are set in their locations like windows, doors, niches, cupboards and fire places. Lastly the plastering and other finishing works are done to complete building.

The roughness of construction indicates variations in a multiplicity of examples. A finishing mortar may or may not be applied to the exterior surface of the masonry. Although the constructions are seemingly rough, they are underlined by a refined craftsmanship which is at the basis of the architectural tradition. A building component may indicate, at the same time, the structural, ornamental and functional usage of timber. The advanced use of timber depends on the abundance of material in a particular rural context and the necessity to construct lighter, less durable, demountable and replaceable projections**(Fig.4)**.

The craftsmanship embraces both the interior and exterior spaces which are strongly related with each other also by the continuity of the materials and techniques from inside to outside or vice versa. The *buttoned* wall or a three dimensional timber grid demarcates the limits of each property and create a micro-clima by incorporating the indigenous vegetation into the exterior space**(Fig.4)**.

The description of the *buttoning* system and the construction process indicates that the *piştuvans*(*buttons*) constitute a web system which regulates the spatial organization according to the human scale, acts as a built-in scaffolding and becomes the principle structural reinforcement during the completion of the building **(Fig.7, 8)**.

3.2 Archaeological Background of the Construction System

The archaeological reports of Beycesultan (Denizli, Turkey) provide substantial information about structural systems composed of mud-brick, rubble stone and wood.**Fig.6**illustrates the *buttons* which are clearly readable through the surfaces of the foundation wall. Lloyd (1965) states that, in the shrines of Beycesultan, "the foundations were built of solid undressed stone up to the level at which the walls emerged from the ground." At this point pairs of linked runner-beams formed a base for the brick upper structure. Interstices in the brickwork for upright posts occurred at maximum intervals of 1.50 m. and between them there were again runner-beams in the wall-face after every three courses of brick**(Fig.6)**(Lloyd, 1965: 41). In this exa mple, the burnt walls were preserved up to a maximum height of 1.50 m. Lloyd (1965: 64) states that "At Beycesultan, as elsewhere, the brick masses between the vertical posts are interrupt ed only by the horizontal timbers which occur after every few courses."

The definition of the *buttoning* system is made by Seton Lloyd in his following statement: "The habit of strengthening stone or mud-brick walls by inserting at regular intervals rows of runner-beams, held in position by cross-ties goes back at Beycesultan to the first phase of the Early Bronze Age."(Lloyd, 1965: 63).The timber grid relieves the total load applied on the stone base, makes a leveling and provides a transition (Lloyd, 1965: 86). The traces of the buttoning system can be read in other examples of the near east and the neighboring regions of Anatolia (**Fig. 9**).

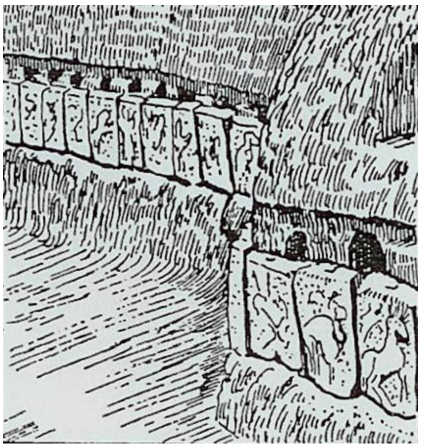

Fig. 9: Tell Halaf, the orthostates of the Temple-Palace (v.Oppenheim, plate 16), Naumann, p. 87, Fig. 69(9th century BC)

In the examples dated to the 2ndand 1stmillenniums B.C. such lintels are traceable through the holes and voids inside the walls**(Fig.9)**. There are cases where these longitudinal timber lintels running through the exterior sides of the masonry are joint using tie beams.

This system reminiscent of *buttoning* is described by Naumann (1991: 90) in detail:

"In the current domestic architecture of the region that we analyze a timber lintel mesh is installed into the broken stone masonry. When the wall is being constructed, the grid is placed almost every 1 m. This grid consists of two long tensile lintel and many little lateral lintels that continues inside the wall" **(Fig.10)**.

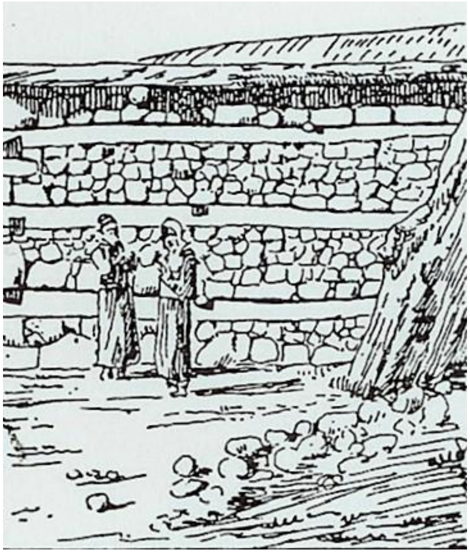

Fig. 10: A Traditional Dwellling on the Taurus (Groethe, MeineVorderasien Expedition II, fig.15), (Naumann, p. 87, Fig 72)

Fig.11is a variation of the timber fame-mud-brick infill system which is set up using the structural logic of *buttoning*.

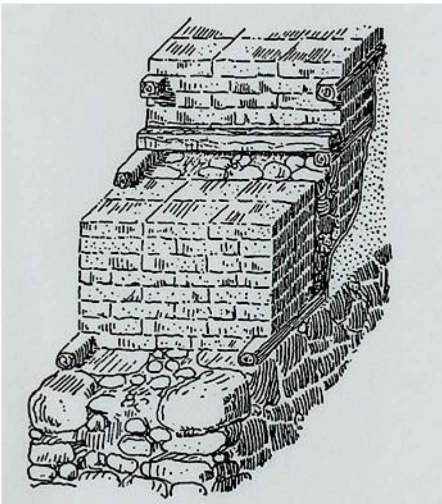

Fig. 11: Boğazköy, Building-E, a reconstruction of the mud-brick wall on stone foundations, Naumann, p.100, Fig.90

The *buttoning* principle exemplifying the structural requirement of a repetitive leveling is pinpointed in Megaron "A" of Beycesultan, reported by Lloyd as a structure where "The walls were of mud-brick, standing on a substantial stone foundation. Their average thickness was 60 cm." (Lloyd, 1962: 59) The revelation of the buttoning principle in the mud-brick construction is described by Lloyd as follows: "In the brickwork above, one was also able to examine the earliest example found at Beycesultan of timber 'frame' reinforcement. 'Runner-beams' were set in the face of the wall on either side and tied together at intervals by wooden cross-pieces."(Lloyd, 1962: 60).The use of *buttoning* in mud-brick masonry is also traceable in the sections of the palace of Beycesultan. **(Fig.12)**.

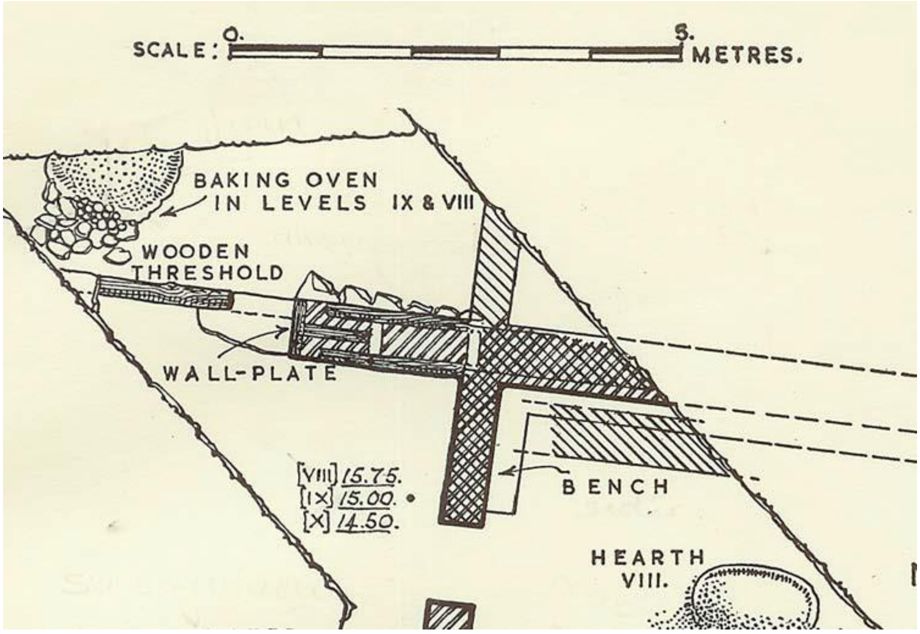

Fig. 12: Ground-plans of Levels X-VIII (Beycesultan Vol.1, Fig.22) Early Bronze Age

There is a range of usage from a simplified version of single or double runner beam(s) embedded in the stone masonry **(Fig.12)**to "heavily-reinforced" masonry involving up to four parallel runner beams**(Fig.13)**.Lloyd states that "The foundation has an average width of 1,25 m. and is built of undressed stones. Like such walls in later times (e.g. that in Trench "S", Level V), the stonework has an elaborate timber reinforcement, consisting of four parallel 'runner beams', tied together with cross-pieces at intervals of 1,40 m." (Lloyd, 1965: 27). In this exa mple, we encounter the "runner beams" that are conne cted to each other with lateral tie beams constituting a system reminiscent of the *buttoning*. Elsewhere Lloyd mentions stone foundations that "measured 1.30 m. in thickness and were reinforced with no less than four rows of runner-beams, tied together at intervals of 2 m"(Lloyd, 1965: 38)**(Fig.13)**.

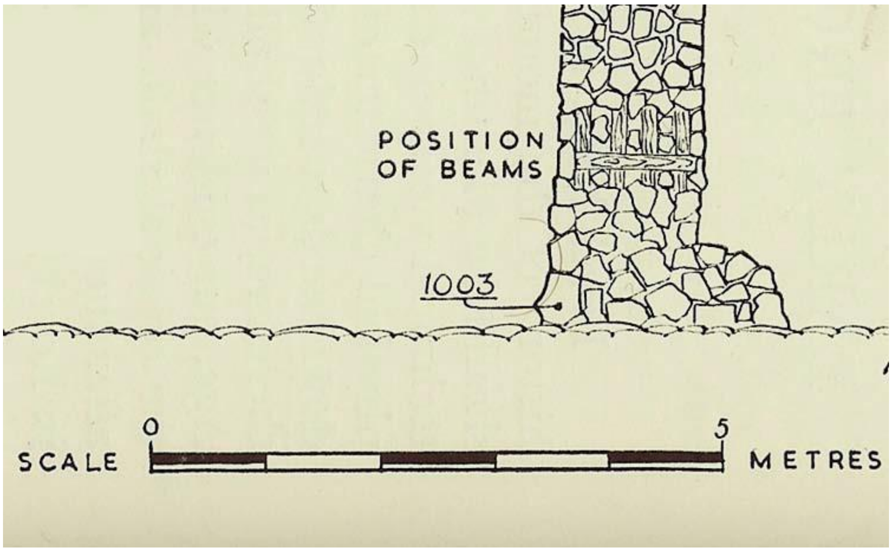

Fig. 13: Level XIX (Detail from: Beycesultan Vol.1, Fig.7, p.28) Early Bronze Age

Finally Akok's reconstruction of the composite wall **(Fig.14)**exemplifies the structural features of the *buttoned* wall. The only deviation is that as compared to the rubble stone used in the buttoning system, the stone units are more regular and massive in terms of their physical qualities.

This analysis indicates thatAnatolian archaeological sites provide substantial evidence for the recurrence of *buttoning* in different historical periods. The allocation of runner beams and the tie beams within the stone masonry suggests a layout in close similarity with the building practice in Akseki-İbradı basin**(Fig.6)**.

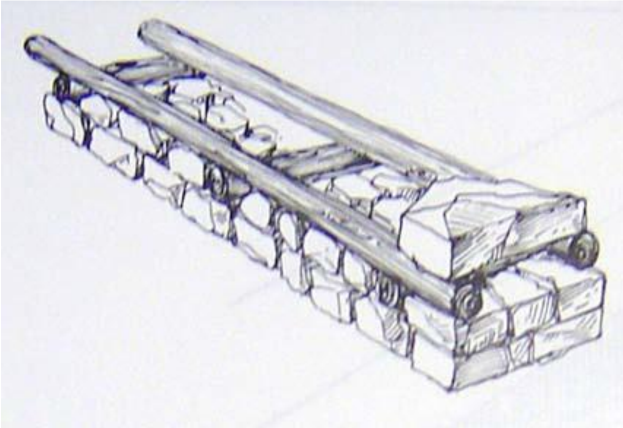

Fig. 13: Constructional Detail from a fragment of the enclosure wall: the Plan of Trench “S”, Level V, (Beycesultan Vol.2, Fig.A.15) Middle Bronze Age, first half of the Second Millenium BC.

4 CONCLUSION

Structural schemes given from various locations suggest common structural patterns and thusillustrate the historical contingency of the *buttoning* technique through alternating sections of rubble stone or mud-brick masonry **(Fig.6 – 14)**. Common structural configurations are found at the sites of Beycesultan, Boğazköy, AlacaHöyük and Troy over a period which covers the whole of the Second Millennium BC. Therefore, considering the broadness of the geographical and temporal dimensions embraced by the discussion, *buttoning* can be regarded as an underlying constructive principle encompassing a variety of materials.

The *buttoning* system incorporates several otherwise weak and perishable components into a resistant and permanent entity which clearly reflects the organizing constructive logic. Conceptually the system sets up *weavings* of natural materials through which structural elements interact in counterbalance. In this case stretches of rubble stone, timber and sometimes mud-brick are combined in such a manner. The rhythm as well as the consecutive steps of construction is traceable through a surface observation, however a comprehensive assessment of the system requires a deeper understanding. Therefore *buttoning* is not only a structural system but also an overarching mentality that embraces the whole landscape. The *buttoning* principle opens up spaces to dwell in the heart of the rocky terrain where the natural and the man-made intermingle. *Buttoning* system, which is revealed as a recurring structural principle in different archaeological sites of Anatolia, is a perfect example for the intimate relation between man and environment.

5 REFERENCES

ÇELİK,Gülşah: Construction Techniques of Four Traditional Ormana Houses (Unpublished Master Thesis), Middle East Technical University, Graduate Program in Restoration, Ankara, 2009.

İŞKAN, Havva and ÇEVİK,Nevzat: AksekiÇevresiArkeolojiveTarihi. In:SanatsalMozaik, ÇEKÜL. İstanbul :İstanbul, 2000.

KAVAS, Kemal: ThePatterns of EnvironmentalCoherence in theRuralArchitecturalTradition of Ürünlü (Akseki-İbradı Basin). In: METU Journal of theFaculty of Architecture, Vol. 28:1, pp.23-40. Ankara, 2011.

KOŞAY, Hamit and AKOK, Mahmut: Türk Tarih Kurumu Tarafından Yapılan Alacahöyük Kazısı 1940-1948’deki Çalışmalara ve Keşiflere ait İlk Rapor, Türk Tarih Kurumu. Ankara, 1966.

LLOYD Setonand MELLAART James: Beycesultan Vol.1, The British Institute of Archaeology at Ankara. London, 1962.

LLOYD Setonand MELLAART James: Beycesultan Vol.2, The British Institute of Archaeology at Ankara. London, 1965.

NAUMANN, Rudolf: Eski Anadolu Mimarlığı (ArchitekturKleinasiens), Türk Tarih Kurumu. Ankara, 1991.

ÖZGÜÇ, Tahsin: Kültepe Kazısı Raporu 1948, Türk Tarih Kurumu. Ankara, 1950.

RAMSAY, W.M.: The Historical Geography of Asia Minor, Adolf M. Hakkert Publisher. Amsterdam, 1962.