

PAPER • OPEN ACCESS

The Role of Brick in Determining Features of Iraqi Architecture

To cite this article: Fawzia Irhayyim Al-Assadi and Mumtaz Hazim Al-Dewachi 2020 *IOP Conf. Ser.: Mater. Sci. Eng.* **881** 012018

View the [article online](#) for updates and enhancements.



ECS **240th ECS Meeting**
Digital Meeting, Oct 10-14, 2021
We are going fully digital!
Attendees register for free!
REGISTER NOW

The Role of Brick in Determining Features of Iraqi Architecture

Fawzia Irhayyim Al-Assadi ¹, Mumtaz Hazim Al-Dewachi ²

¹Dept. Architecture .Eng. College, University of Baghdad

²Architecture Department, Faculty of Engineering, University of Mosul

*E-mail: fawziaasadi@coeng.uobaghdad.edu.iq

Abstract. The issue of local architectural identity remains an urgent need especially in the era of globalization . Factors that have significant contribution in determining identity include the potentiality of local building materials due to their influence on architectural works through ages based on the fact that building materials were produced from natural resources which are highly related to locational and environmental circumstances.

The brick was the most dominant material in Iraqi architecture since the ancient Mesopotamian achievements. This came from brick's aesthetic and expressive aspects inherent in its content. The brick, with its regular structure and measurements, was the main means of creating a variety of Iraqi buildings that were established to attend the bricks and made it a global building material.

In spite of the fact that brick showed high structural, environmental and aesthetic potentialities, which proved their success through various experiments in Iraq , no adequate studies are carried on to explore this. The objective of this paper is to highlight the potentiality of brick as the dominant building material in Iraq for ages. A sample of modern and contemporary architectural works are selected to assess the Iraqi brick work aesthetic, environmental and structural aspects as an identity features . Keywords: Brick, Brick work , Iraqi Architecture, Local Architecture, Architectural Identity

1. Introduction

This paper deals with an important topic at this era in particular as it is essential in Iraqi architecture and the scope to inspire it through the material as a contemporary and renewable thought. Raw materials are characterized by special morphological attributes and the appearance of any work depends largely on the material used to create it. Understanding the nature of the material and what inherent in it , including innovative and renewable aspects, generated compositions which had a great impact in achieving the identity of architecture, in other words, it was an approach to achieve identity is by choosing an appropriate material. Research has hypothesized that there is relationship between the the brick as main construction material in Iraqi architecture and identify the features of Iraqi architecture. research goals were identified such as:-

1. The nature and the ability of the bricks to identify the features of Iraqi architecture.
2. The continuity of using brick as main local material played a main role to uniqueness the Iraqi architecture

To achieve these goals; adopted Analytical approach Within two axes: -

1. 1stTheoretical axis: The construction of the theoretical framework by analysing the characteristics of bricks in Mesopotamian architecture.



2. 2nd The practical axis:- Extract the most important vocabulary and purposes that characterized the use of bricks in those eras and apply these vocabulary to models of contemporary Iraqi architecture built with brick material, in order to verify the hypothesis of research into the ability of brick material to identify the features of Iraqi architecture.

3. findings, conclusions: Examine research hypotheses and draw out the Results, Conclusions. It was found that there are correlations between the brick and determining the feature and identity of Iraqi architecture. The most influential indicators of using brick is that there are three purposes were gave the Iraqi architecture its uniqueness: Structural , ornamental , combine purposes. Form is an aspect of the energy created by material which the architects show through their belonging to the environment to which they relate.

2. Architectural Features and its relation to Identity:

The set of visual attributes which expresses the building is constituting a total architectural identity that gives it a distinctive feature, it can be explored through several approaches including: structural system, building materials, architectural elements, function and aesthetics, as well as the molding and ornament elements utilized (4). Architectural identity is the expressive character of features that reflects the intrinsic truth for architectural production. The architectural identity has three properties:

- 1- Original for its association with the place.
2. Familiar with its association with prevailing traditions.
- 3- Identical architecture in its characteristics and distinct from others (9).

While Charles Jencks was define the architectural identity as through physical entities connected with time and place, and has emphasized the sense of place as unique and distinct characteristic as an expression of identity (7). Able has cited several trends in architectural practice for expressing identity, One is to adopt local forms and materials in a relatively simplified manner (6). The properties of the material act as catalysts in the design act and as an essential element in showing the identity of the place. , it remain latent waiting for the active man who comes out, which interacts with them and helps them to take certain patterns and ideas by using various methods in interaction with the material.

3. The Environment and the Construction Materials :

The Natural environment factors played a significant role in determining the type of materials used in construction. Geological configuration provides building materials of rocks and mud. In addition to its role in stimulating human to develop types of housing suited to the need to protect it from changeable climate. Badawy confirmed that it did not show any architectural style influenced by the natural environment as Mesopotamia architecture, the role of the natural environment in shaping this architecture cannot be denied. The land of Mesopotamia has fundamental basis of civilization, the existence of Tigris and Euphrates rivers as the most important elements of settling and prosperity as well as the different Mesopotamia topography between the coastal areas in the center and the south and the mountainous areas in the northern regions, which led to a dramatic diversity in architectural treatments between the north and south, and also influenced the pattern of town planning (3). The development of architectural achievements in ancient Iraq was characterized by a complete interaction between the raw material and the environment and climate. It seems that the first use of clay appeared in the first stages of civilization in Iraq, specifically in Tel Hassouna, as Its was used in irregular form blocks mixed with the remains of wheat husks and stalks plant. The mud brick production has emerged as an advanced stage where the clay was placed in regular molds dried under the sun, It is believed that the use of mud brick is back to the Halaf and some return to the al-'Ubaid periods (11). Because the mud bricks were a little water resistant, the builders turned to the pride of mud block and conversion it into a brick. It is worth mentioning that the bricks did not replace the mud blocks in construction, but continued to be used together, because of the mud blocks has many properties like It is less costly and easier to form, it can be produced in the construction site as well as the thermal insulation characteristic that distinguishes it, the brick was used in the foundations and the mud block in the walls after coating with fermented clay. The brick industry flourished and reached its peak in the era of Babylonian king Nebuchadnezzar until it became of fixed size with regular edges, as well as the appearance of glazed and colored bricks, which stands out in decorating the palaces of Babylon and its

temples. Which during the Islamic era, it had been used to decorate the walls of mosques and shrines, now known as the Karbala's bricks (2).

3.1 Properties of Brick in Mesopotamian Architecture:

A clear image of the forms of the brick throughout the succeeded periods is not easy to be presented, because it did not take one form or fixed standard dimensions, whether through the stages of civilizational development or during a single civilized age in different cities, sometimes there is dissimilarity in one city. But despite of this contrast, similar forms prevailed in some stages and locations. The shape of the rectangular prism - with its varying dimensions - is the dominant form. In the Ubaid era, regular shapes appeared, with a rectangular base twice its width (8x22x44 cm). Later, In the Warka era (the city of Aridu) the bricks appeared with dimension of (8x11x22 cm). But the form of rectangular prism did not continue in construction when the square-base shape was appeared instead, Which prevailed in the Akkadian era and continued to be used for nearly 4000 years, until the end of the Ottoman era. British forces have introduced the rectangular prism again and this form returned for use in Iraq with a dimensions (8x11x5x24) cm (5). The use of mud brick continued as raw material in early dynastic, with alteration in the style of construction. Here, it must be pointed out that the old Iraq knew other forms of bricks that are strange in their shape, which named of Plano Convex, that one side convex and the other plane as in Figure (1) (8).

Figure 1.
Plano Convex bricks
Wright,G.R.H,616

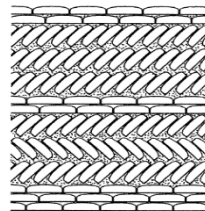


Figure 2. Typical Plano convex brick masonry-
Herring bone bond

So, the main types of bricks which were used in Mesopotamia architecture are within the following types:

- 1- Flat square bricks
- 2- Long, narrow brick of square cross- sections (Riemchen)
- 3- Plano – convex bricks
- 4- Flat rectangular bricks (10)

Accordingly , the dimensions and shapes of the most important types of bricks used in Mesopotamia architecture can be listed in the following table(1), (1):

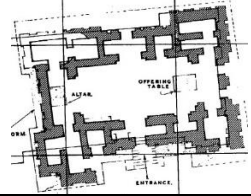


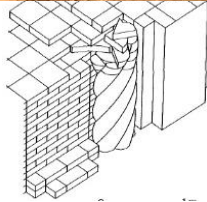
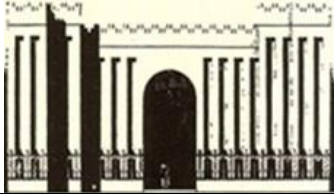







Table 1. Measurement of brick and plano convex used in Mesopotamia architecture

Dimensions of Plano convex bricks				Dimensions of bricks used in the walls				
Region	L.	W.	Th.	Region	L.	W.	Th.	
Khafajje	18	12	25-55	early dynastic	36	26	6	
Telloh	20	12	50	Akkadian	38	38	7	
A-Ubaid: burnt brick wall	203	152	40	Ancient Babylon	35	35	9	
kish	Semicircular buttress	20	13	30-65	The Kishi era	32	32	10
	Baked brick pavement	20	135	30-60	Modern Babylon	27	27	10
	Stairway and wall	205	13	35-50	Islamic	36	36	9
	blocking of the fosse	205	13	35-60	Recent dimension	24	11.5	7
	Later facing of the outer wall	205	13	35-60	`Dimensions of bricks used in the foundations (City of Aredo)			
	Wall of chamber	205	135	40-65	Th.	W.	L.	
	Outside butters east of stairway	205	135	35-50	7	19	43	
				6	18	42		
				6	21	25		

4. The Development of Using Brick in Mesopotamian Architecture

The brick was the basic material in Mesopotamian architecture throughout the ages. First, it appeared in the Warka era in the buildings of the ancient city of Ardu in south-western Iraq and then spread to other cities of Iraq. The ancient Iraqis have mastered the process of production and quality control through the interest in the process of fermentation and kneading of clay, and in the process of burning to produce homogeneous bricks (10). The development of the use of bricks in the Mesopotamian architecture can be summarized as in table (2):

Table 2. The Development of Using Brick in Mesopotamian Architecture

Era	Technical Treatment	Examples	
Sumerian	<ul style="list-style-type: none"> Thick brick walls with a system of buttresses and recesses (white temple) Use colored clay cones to reinforce and decorate the walls (Warka temple) 		
Early Babylonian	<ul style="list-style-type: none"> Using molded mud brick to create columns embedded in the facade, Its surfaces are sculpted in shapes that reflect palm trunks or spiral form (Tell Alremah temple) 		
Keshi era	<p>Formations and prominent forms with brick, which were grouped together and the whole picture emerged with a height of 2m to 3m (ena temple)</p> <ul style="list-style-type: none"> system of Buttresses and Recesses Corner towers and pillars 		
Modern Babylonian	<ul style="list-style-type: none"> The system of Buttresses and recesses, built with brick material System of pilaster with Frequent rhythm Crenelated machicolation Use of fire-burnt bricks, One-sided enamel coating for gates and walls packing (Ishtar gate) 		
Abbasid	<ul style="list-style-type: none"> The role of bricks in determining mass formation as in almalwia minaret Al-Muqarnas as a decorative and structural means (Abbasi palace) Using brick in writing, engineering ,and plant ornamentation 		
Seljuk	<ul style="list-style-type: none"> The conical Muqarnas domes, in which brick was used as a basic structural material in structural and decorative textures from inside and outside 		

Ottomans	<ul style="list-style-type: none"> ▪ The use of bricks as a basic material both on the structural and decorative level 		
-----------------	---	--	---









Thus, the research concludes that the identity of Mesopotamian architecture has been achieved through the features produced by the brick material, and it was through three levels:


- 1 - Structural level: The use of bricks within the structural system of the building only.
- 2 - Decorative level: Use the bricks within the molding and ornamentation side only.
- 3 - Combined level: in which the use of the brick within the two (construction and decorative) for the same building. Accordingly, these three levels will be applied to examples of contemporary Iraqi architecture in order to verify the hypothesis of research which states “The brick material has a significant role in achieving the features of contemporary Iraqi architecture”.

5. The Brick in Contemporary Iraqi Architecture

The three levels of utilizing brick will be apply to selected samples from contemporary Iraqi architecture through a descriptive analytical approach on seven different samples for Iraqi and foreign designers, the basis for the selection these samples because of the distinction of the employment of bricks. The use of bricks in contemporary Iraqi architecture can be summarized as in table (3):

Table 3. Using the Brick in Contemporary Iraqi Architecture

Sample Description	Processing method		Photos of selected samples		
- Mustansiriya university - location: Baghdad - Year of construction: 1963 Designer: Kahtan Awni	Structural	✓	<ul style="list-style-type: none"> ▪ Quoting the buttresses and recesses system for decorative purposes only ▪ Innovative curtain walls, covering the external facade with configurations and details borrowed from handmade rugs 		
	decorative				
	Combine				
- House in Baghdad - loc.: Al Mansour Year: 1972 Designer: Rifaat Al chadarchi	Structural	✓	<ul style="list-style-type: none"> ▪ The use of the bricks to produce the shape of the half-circular vault Inspired by the cane houses in the south. 		
	Ornamental				
	Combine				
-Faculty of Education, - Baghdad 1964 Designer: Mohammed Makkiya	Structural	✓	<ul style="list-style-type: none"> ▪ Decorative configuration of the soffit arch within brick wall ▪ Double brick pillars bearing a bridge of concrete 		
	Ornamental				
	Combine				
-House of residence - Baghdad - Year: 1935 - Designer: craftsman	Structural	✓	<ul style="list-style-type: none"> ▪ The use of bricks according to the historical pattern - the solid system with arches ▪ The use of Greek order made by brick ▪ Innovation decorative, quoting from foreign styles 		
	Ornamental				
	Combine				

-Taxation building - Baghdad , 1979 -Architect: Mehdi Al-Hassani	Structural		<ul style="list-style-type: none"> ▪ The buttresses and recesses system for decorative purposes only ▪ Vertical pillars for new functions (V. movement) 	
	Ornamental	✓		
	Combine			

6. Conclusions

1- Brick is played a significant role in defining the features and attributes of Mesopotamian architecture throughout the ages. This was within three levels: the structural, decorative, and the combine level.

2- The brick material has shown great potential on three levels and in different ages through its human scale making it fit the dimensions of the human hand, as well as the regular dimensions that distinguish its units, So that it can come out with various formations depending on the bricks only.

3- It is essential for architects to understand the nature of the material and its determinations before using it to create a building and space, the architectural truth confirms that certain materials have been firmly repressed to their place or origin, the use of materials associated with a specific place gives the design strength and uniqueness distinguish it if non local material is used for a specific environment or place.

5- The Iraqi environment is one of the most important factors that stimulated the architects to create an architecture that harmonizes with them through the bricks characterized by this environment, which had a great impact and the main role in determining its features.

6- The forces inherent in the building material could be expressed in a building form as a relation within some limits. Form is an aspect of the energy created by material which the architects show through their belonging to the environment to which they relate.

References

- [1] Fouad S, Eridu E 1949 *Sumer Journal* **Vol. 5**, C2, p. 163
- [2] Syton L 1955 *Building in Brick and stone in a history of technology*, Oxford, Charendon press, second ed. **Vol. 1**, p.460
- [3] Badawy A 1966 *Architecture in Ancient Egypt and the near east*, The MIT press, Camb, p.116.
- [4] Ee K J 1983 *An Approach to the Search for Identity*, Aga Khan Award for Architecture, www , ArchNet .org.
- [5] Al-Tamimi A A 1985 *The Brick - Its Industry and Measurements in Ancient Iraq*, College of Education / University of Mosul pp. 278-279
- [6] Abel C 1997 *Architecture and Identity: Towards a Global Eco-Culture* Architectural press, London p.132
- [7] Jencks C 1997 *Theories and manifestos of Contemporary Architecture* Academy Edition, Great Britain p.150.
- [8] Wright G R H *Ancient Building Technology* **Vol. 3** construction, 2 vols., Brill, 2009, p. 616)
- [9] Al-Dewachi et al., 2010 *Place Identity of Residential Environment in Iraqi Contemporary Architectural Trends and its Impact on Academic Architectural Product* *The Iraqi Journal of Architecture* **Vol. 6**.
- [10] Erarslan A 2018 *Plano convex in ancient Mesopotamia architecture* Kerpic'18-Back to Eathen Architecture: Industrialized, Injected, Rammed, Stabilized 6th International Conference, Turkey p.114.
- [11] Henri F 2015 *The Art and Architecture of the Ancient Orient*, Penguin Books 2nd ed. P.2.