Employing traditional heritage elements in shaping contemporary architecture

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Abstract

The architecture of Baghdad suffers from a lot of problems, ranging from the application of materials and form to the expression in contemporary buildings that not only change the traditional architectural identity but also the performance of the buildings that meet the needs of the local population. This unfortunately increases the damage related to cultural values and environmental sustainability regardless of adaptable solutions that can improve the energy efficiency of building performance. The traditional elements of architecture in the city of Baghdad represent a source of inspiration for contemporary architecture and are exploited to enhance its identity and spatial affiliation. The process of exploiting these elements takes place on several levels, including those that achieve environmental, symbolic, or formal aspects. Hence, the research problem crystallizes in the lack of clarity on the levels of benefiting from the elements of traditional local architecture in enhancing the identity of contemporary architecture and its spatial affiliation. The research aims to shed light on how to analyze the components of the performance and value of traditional architecture in the city of Baghdad, which is rich in cultural heritage and which can be translated into contemporary architecture that creates continuity in traditional cultural identity. The study uses the theoretical descriptive approach through which data is collected on the vocabulary of local traditional architecture of the city of Baghdad and its roles at the environmental, formal, and aesthetic levels to arrive at a main vocabulary for the theoretical framework, which is represented in four basic vocabulary represented in the aspects of form formation, dependence on the environment, and the interface. , aesthetic aspect, and cultural value. These vocabulary were applied to two recently elected projects in the city of Baghdad, through which the four indicators and the role of each of them in enhancing the identity of contemporary architecture and its spatial affiliation were analyzed.

Keywords: *urban fabric, traditional houses, cultural identity, thermal performance*

1. Introduction

The use of architecture to reflect cultural identity is a prominent theme worldwide, with many architects striving to connect modern designs to the historical essence of their locations. Often, this includes incorporating elements of architectural heritage, such as facades, openings, and materials, to overlay contemporary structures with a semblance of the past. These efforts represent attempts to comprehend and evolve traditional architectural elements in a way that satisfies contemporary needs while preserving historical authenticity [1]. Langhein (2005) notes that traditional housing was designed to fulfill social, environmental, and cultural requirements, creating sustainable spaces adapted to their environmental contexts [2]. In recent decades, Baghdad has experienced rapid development and a significant transformation in architectural and design philosophies that align with global trends. This research seeks to thoroughly understand traditional architecture on various levels:

- The traditional urban fabric.

- Characteristics of Baghdadi houses, including structure and building materials.
- Performance of architectural components.
- Cultural dimensions.

These aspects were realized through experimental harmony with the environment and efficient utilization of natural resources, acknowledging architecture's fundamental role in providing protection against natural and external environmental conditions. This approach is evident in Baghdadi traditional architecture and is integrated into contemporary designs at multiple levels. These include aspects related to form, performance, and construction, as well as those linked to humanistic and cultural dimensions. Moreover, these fundamental principles of traditional architecture are continuously applied in modern sustainable architecture to articulate the identity of the era.

2. Historical Background

The traditional House was developed according to the cultural, social, and climate requirements that Iraq is going through .

In general, The Arab city, with its traditional cohesive texture, is the best example of applying the sustainability concept to the city as a whole. City planning and pathway processors in terms of width, shape, height, orientation, and change of direction represent the basic stage of adaptation to the environment [1]. The fabric led to softens the effects of harsh climates and reduces their effects, especially high temperatures, solar radiation, and hot dusty winds, thus reducing the total thermal load on the facades of buildings, especially residential units, where housing units form the largest quantity in the overall construction in the Arab cities, which is considered a powerful influence in the environmental data [2].

Adaptation to the surrounding environment starts at the level of city planning and the degree of adaptation depends on the degree of privacy, location, and nature of the building and urban organizations, differences in area, size, and number of housing courts, are the one that formed outlines of space composition, which shape self-sustainable complexes [3]. As shown in Figure 1 .

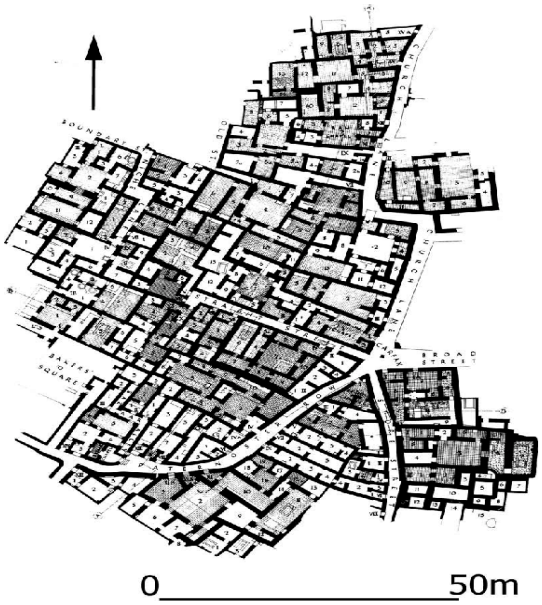

Fig 1. Traditional urban fabric [4].

2.1 Traditional house features

The traditional Baghdadi house represents a modest yet efficient approach to residential design, utilizing local materials and meeting fundamental human needs in a manner well-suited to the environment [5]. Its architecture reflects the adaptation to Iraq's warm, sub-continental climate and is indicative of the region's customary Eastern structures and societal organization.

Baghdadi houses are constructed either as single or multi-storied structures. Single-story houses typically feature an open courtyard, encircled by an iwan (a vaulted hall, walled on three sides, open on one) and several rooms. In two-story variants, the ground floor comprises corridors, a hot kitchen, and a storeroom, while the upper level hosts bedrooms interconnected through a corridor that allows external light and ventilation. Additionally, these houses often include a basement-level room known as 'Sardab', situated beneath the courtyard, and a semi-basement level called 'Neem Sardab.[٦] '

The entrance of an ideal Baghdadi house, marked by a decorative doorway, leads through a passage (mejaz) into the central

courtyard (hosh). Virtually every house features this central courtyard, which is flanked by living spaces, 'Tarma', and 'Talar' [7]. Courtyard configurations vary based on the shape and size of the land.

There are typically two staircases in these houses: one leading to the diwan khana (for external visitors) and the other to the harem (family area). The talar and the iwan are smaller porch-like spaces opening to the tarma, integral to everyday living activities [7].

The 'Ursi' is a domestic room uniquely positioned between the courtyard and the street, serving as a transitional space [8]. A distinctive feature of Baghdadi architecture is the 'Badgir', a ventilation structure. The Iraqi Badgir, with an opening facing north or northwest and elevated two meters above ground, can be equipped with adjustable clamps, water jugs, wet mats, or a coal pile for air conditioning purposes.

In terms of privacy, traditional Baghdadi houses are designed to be inward-facing, with windows on the outer walls positioned above pedestrian eye level in the alleys. Street-facing windows are set higher for privacy and often feature 'shanasheel' (ornate wooden windows) that allow for interaction with the street while maintaining privacy, reducing sunlight, and cooling the interior [9]. These 'shanasheel' also enable residents to comfortably observe street activities.

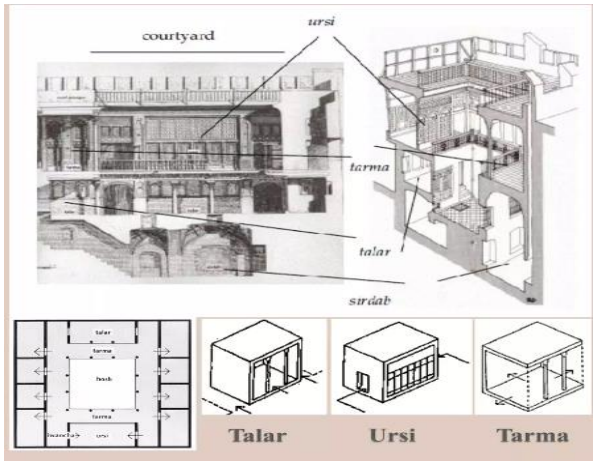

Fig 2. Component of traditional house [10].

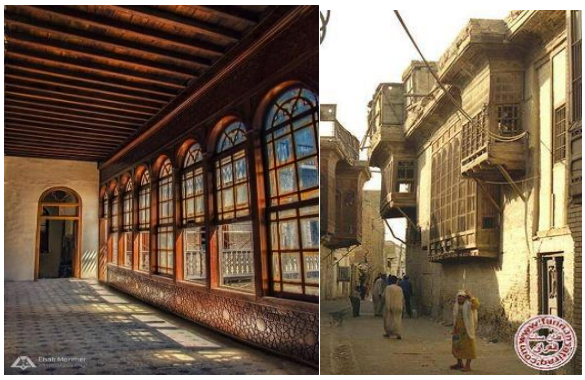

Fig 3. The shaded movement in alleys of Arabic Cities [3].

2.2 Building materials

The Building Envelope in traditional architecture represents the main barrier between the inside and the outside, it can be considered as the medium that reduces the impact and softens the harsh external environment to make interior spaces comfortable for the occupants. The building's cover consists of several construction materials, each with different physical and thermal characteristics.

The transfer of thermal energy from external surfaces to the interior depends on the thermal capacity of building materials and thickness, fit the capacity of the heat storage material and delay re-broadcast to the inside, which is called retardation time, is directly proportional to the thickness of the material, Therefore, we find that the thickness of the walls in traditional housing ranges between (0.36 - 0.75) cm. The traditional house uses brick as a basic local material for foundation and load-bearing walls. Mud with straws is used as a waterproof material for the roof. The timber is used largely as a fast-building material for the construction of columns and floors. The ground and first floor were paved with farshi (square brick) the same brick that was used for walls.

Clean-cut, engraved, and bricks were used to introduce decorative brickwork, geometric, and arabesque to windows, doorways, and facades .Sometimes, mosaic bricks were utilized in cornices, spandrels, and friezes on building surfaces to create complex shapes [11].

2.3 Traditional house performance

In traditional houses of Baghdad, thermal comfort is achieved through skillful space organization and material selection. Courtyards play a crucial role in providing sunlight and fresh air, and are spaces for daily activities like children's play [2]. In Baghdad's harsh climate, characterized by prolonged hot summers, fluctuating temperatures, and low humidity, these courtyards effectively modify the home's internal climate [12].

In such hot and arid conditions, the courtyard serves as a natural temperature regulator, helping to cool the interior spaces during summer. This effect is achieved through thermal processes like convection and radiation. The courtyard's ground and surrounding structures act as transitional elements between daytime and nighttime temperatures [13].

The residences are connected by shaded, narrow passageways bordered by partially solid walls, which, along with the courtyards, help to regulate the temperature of both individual homes and the broader urban area [1]. The outer walls of the main rooms on the first floor extend almost continuously to the exterior [1].

Residents can view the streets through 'Shanasheel' windows, and the roof terraces, projecting over the first floor's external walls, serve a similar purpose [2]. As a result, alleyways are spacious at the ground level, tapering as they ascend towards the roof terraces. This design promotes pedestrian movement and enhances cross-ventilation and natural lighting on the upper floors.

A slender gap at the roof's pinnacle allows sunlight to penetrate the alleyways. This gap is often so narrow that opposing houses nearly touch at the attic level. The structures maintain a uniform height [14]. Another feature, 'Tarma', blocks direct summer sun without obstructing the low-angle winter sunlight [14].

Three primary factors influencing the house's climate control are shading, material choice, and ventilation. The orientation of the house is crucial, as it generates different micro-climates within the house, accommodating seasonal shifts in living spaces. Families move to south-facing rooms with more sunlight and heat as winter approaches in September, and to north-facing rooms in April or May. In summer, the lower floors are used during the day, and the rooftop porch at night.

The roof thus becomes a bedroom during the warm summer nights. The houses, connected on three sides, provide additional insulation. The central courtyard's thermal performance, acting as a regulator, benefits from the significant temperature difference between day and night, and the varying pressure between shaded streets and the open courtyard.

The courtyard's thermal regulation operates in three distinct cycles. At dusk, the high-heat-capacity surfaces of the courtyard, including the ground and walls, release the heat accumulated during the day, cooling the area [15]. As indoor temperatures peak, cooler air from the courtyard is drawn into the rooms, with warmer indoor air exiting through upper vents [16], thereby reducing thermal discomfort.

At night, heat stored in the courtyard's ground is released as long-wave radiation due to its exposure to the sky [17]. The size of the courtyard, especially its width and height, influences this process. Narrower courtyards have limited sky exposure, resulting in less heat loss, while wider courtyards lose more heat [18].

The next phase begins in the early morning when the microclimate stabilizes, with courtyard and interior temperatures aligning. At this time, the solar elevation angle is low, minimizing solar radiation and keeping the courtyard shaded [16]. The cool building mass from the previous night means that convective air currents have a minimal role in temperature differences.

As the sun intensifies, the courtyard's external surfaces start to warm, absorbing more heat [19]. By midday, the courtyard's temperature significantly increases [20]. The thick walls slow external airflow, leading to temperature

and pressure differences between adjacent spaces [21]. As a result, the courtyard's function shifts, with hot air rising and cooler air descending [22].

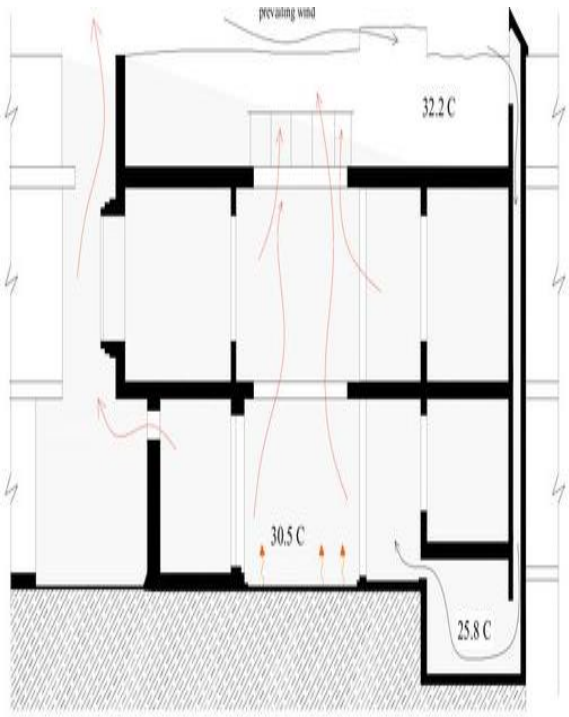

Fig 4. Shows the thermal performance of a Baghdadi traditional courtyard through midday (adapted from Al-zubaidi 2007) [23].

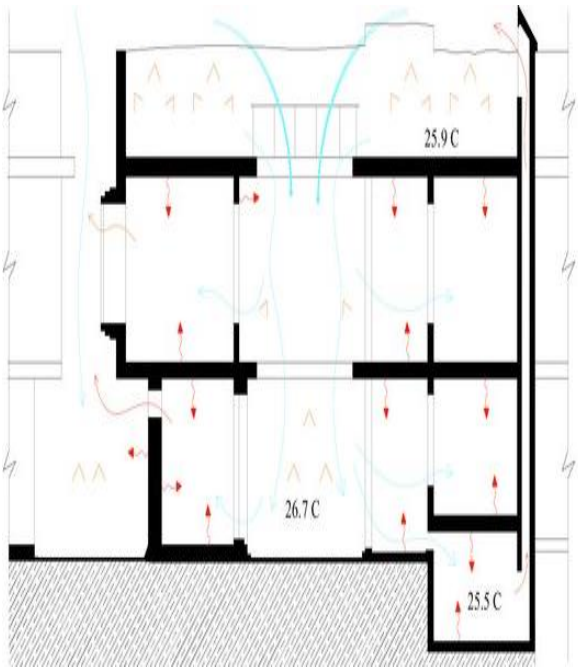

Fig 5. Shows the thermal performance of a Baghdadi traditional courtyard during night (adapted from Al-Zubaidi 2007) [23]

2.4. Cultural identity

In the classic architecture of Baghdad, homes were designed with seclusion in mind. The structures featured heavy, thick walls with minimal openings to ensure privacy for the residents and to block external noise.

The interior spaces, including rooms, were arranged around a private courtyard. This courtyard was essential for providing natural light, airflow, visual access, and a means of communication within the household [24]. A semi-private area, distinguished from the public domain (often in a cul-de-sac layout), acted as a transitional zone, overseen by the neighboring residents, thereby enhancing security and privacy [14].

Privacy considerations extended to the design of the entrance. Typically, entrances were concealed by doors or curtains, preventing direct visual access from the street and ensuring family activities remained private. The vestibule or entrance hallway was often designed with bends to further safeguard the privacy of the inner spaces [25].

'Shanasheel' windows were a notable feature for allowing daylight and fresh air into the rooms. These windows, with their three openings, could be fully closed when needed. They also facilitated face-to-face communication with neighbors across the street. Due to the challenges of opening windows onto external streets for adequate ventilation, lighting, and views, courtyards were often utilized as a solution.

The distribution of space within Baghdadi houses reflected the cultural norms of Islamic society. Distinct areas were designated for male and female inhabitants and guests. The 'Diwan-Khana' was the section reserved for male visitors [26], while the 'Haram' referred to the female space, accommodating women of the household, servants, and female guests.

In Islamic architecture, the design of both the residential unit and its surroundings were deeply influenced by Islamic cultural values. The Qur’an and Sunnah provided guidance on

Muslim living standards, including housing and residential arrangements [26].

Traditional courtyard houses were prevalent until the 20th century. However, their popularity waned due to new architectural influences and regional conflicts that impacted the overall architectural landscape of Iraq. Life in these houses centered on the courtyard, with surrounding rooms serving various functions. Ground-level rooms such as lavatories, kitchens, and storage areas were more utilitarian. The reception rooms, overlooking the courtyard, featured delicate railings and tall timber colonnades.

3. Theoretical framework indicators

The methodology is based on a qualitative analysis of the case study: from their selection to their analysis using four criteria: form composition aspects, adopt the environment, facade and aesthetic aspect, and reflect cultural value. Table 1.

Table 1. Analysis criteria.

criteria	Definition criteria
form composition aspects	Analysis of design composition and space distribution
adopt the environment	Response to local climate, Provide comfort environment, orientation
facade and aesthetic aspect	Local materials reflect the traditional form
cultural value	Hierarchy, privacy

3.1 Case Study:

3.1.1. House of Mr. Hassan Al-Saffar

Arsat Al-Hindiyya on the Tigris River / Baghdad / Iraq, Design by dr.saher al-qaissy. The formal, topographical and geographical nature of the site had an effective impact in forming the philosophical idea and in making design decisions.

Fig 6. House elevation. From dr.saher al-qaissy archive.

1. Form composition aspect: The shape of the strip plot of land is relatively narrow in relation to its length extending perpendicularly to the Tigris River from the back side, as opposite it on the other bank of the river is the Doura oil refinery and its flame tower, which is reflected on the river day and night, and which with its reflections in the Tigris River creates a picturesque, romantic image. The front side of the facade is bordered by the embankment on which the main street is located, which provides the project with a sloped entrance.

2. Adopt the environment: The house is an inward-looking plan, similar to traditional Iraqi architecture, and provides an internal environment by creating a courtyard (courtyard), a space for movement and sitting, and an entrance to the house, in addition to direct lighting.

3. Facade and aesthetic aspect: The designer employed elements of heritage architecture, such as shansheel, dealing with local bricks, and using a fountain, which achieves elements of surprise, excitement,

beauty, and a suitable climatic environment. The design also relied on the orientation and view towards the river by expanding the facade architecturally through the elements of mass penetration, emptying, and displacement, in addition to the use of Iraqi Islamic heritage elements.

4. Cultural value: The project enhanced the interaction between heritage and contemporary expression, giving the project a local identity. Through the plan, we notice the clarity of the idea of spatial gradation and the clear isolation between public and private spaces to achieve privacy for the residents

Fig 7. Elevation details. From dr.saher al-qaissy archive.

3.1.1. Federation of Industries (1966)

The Federation of Industries building was inspired by Baghdadi traditional houses, a model of Chadirji's style to form a sculpture

1. Form composition aspect: The complex composition was divided into three parts which were carried together by shanasheel act-like balconies in the center part of the building through the design process, the designer covered the building scale and functional spaces behind a 'flying wall'.

2. Adopt the environment: The curtain wall acted as a block to prevent direct sunlight and the interior spaces from overheating, particularly during summer and let the indirect sunlight into the building through the structure's sunken walls, which would bind the back of the wall from the reflective surface.

3. Facade and aesthetic aspect: An artistic formation from a rich collection of traditional architectural elements and forms.

4. Cultural value: modern planning limited the privacy and opening of private spaces to the outside, creating unlimited access to inside social contexts.

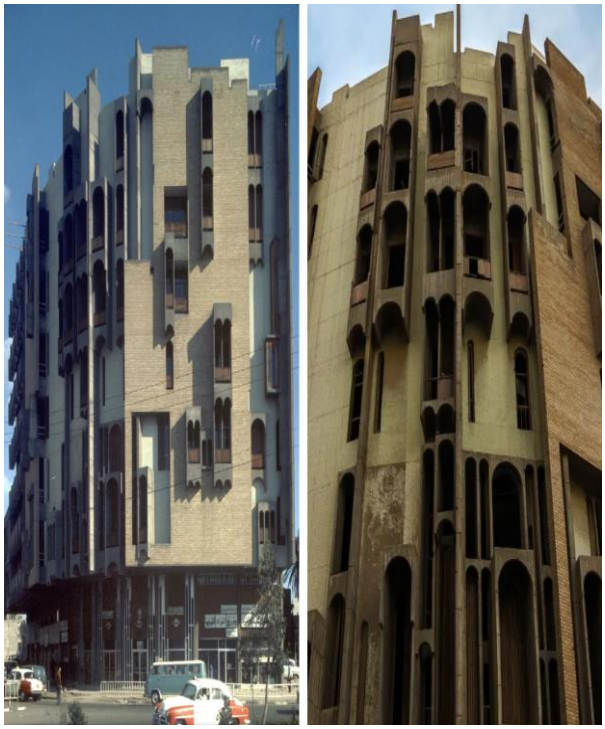

Fig 8. Federation of Industries designed by Rifat Al-Chadirji in 1970 [27].

4. Result and discussion

The final research phase consisted of a comprehensive analysis to employ the basic elements of traditional architecture.

And represent it in a modern and contemporary way. Depending on specific criteria: composition aspects, environmental adoption,

interface and aesthetic aspect, cultural value Table 1.

The selected projects differ in the way heritage is analyzed and the elements used. In the first project, we noticed the translation of heritage and its modification to suit the development of the city and meet its new needs Figure 6. We notice from the spatial distribution that the designer separates the private and public parts through a semi-public entrance to achieve spatial gradation. In traditional architecture. The designer transformed the court into a semi-public entrance through which private and public spaces open Figure 7. The designer used interior curtains of different sizes to achieve adaptation to the climatic environment by creating air currents that reduce heat load. We notice the use of traditional shapes in a modern way, such as the chinchilla. At the level of building materials, we note the use of bricks in the facade, in addition to the use of wood.

On the other hand, the second project adopts modern planning (a forward-looking plan) that limits privacy and openness to the outside, and this has led to cultural and historical separation and the loss of the identity and efficiency of their architecture. On the height scale, we see a modern style integrating the traditional through the use of form and materials. This combination acts like a mask that covers the chart without any connection between the outer shape and the inner chart Figure 8.

Heritage architecture has become merely an external façade that does not reflect the true use of heritage architecture.

This research aims to shed light on how to use heritage architecture to create an innovative structure that integrates and adapts to the surrounding environment. This issue is considered extremely important when building new architecture that reflects the heritage identity

5. Conclusion

1. Environmental, cultural, and social requirements formed the sustainable traditional house exploitation of natural energy sources such as the sun and wind.

2. After the emergence of modernity globally and in Baghdad specifically, we witnessed a huge shift in architectural style away from its original identity, which caused a negative effect on the city.

3. The idea of traditional architecture was to reflect site identity to protect the residents and provide requirements in a flexible manner that fit several purposes.

4. Natural ventilation is the most important strategy in traditional houses to reduce heat load and eliminate heat stored in the building's crust to provide a comfortable environment for the occupants. Traditional architecture has developed innovative methods for natural ventilation.

5. The middle courtyard is considered the lung and the main ventilator of the house, which acts as a heat regulator benefiting from oscillation between the degrees of temperature and between night and day.

6. The air drawn down through the ‘Badgir’ was warmer and dryer than the air in the basement, this condition helped to alleviate the basement humidity

7. The nature of the traditional house movement starts from public to semi-public and semi-private spaces, ending with private spaces, which reflect the cultural and Islamic spirit of Baghdadi residents.

8. In order To achieve Baghdadi traditional architecture in a contemporary style to suit the residents, we need to use traditional style by simulating and improving with contemporary needs instead of dealing with tradition as a mask.

9. Adapt the environmental condition through space formation to create adequate ventilation and provide natural lighting, achieve social aspect by providing a central space for the family to gather and bond strengthen between them

10. Contemporary architecture should take into account the family privacy and

provide them a space to prevent stranger eyesight employ traditional elements facades and use low-energy materials and provide open spaces represented in a modern style, to provide an aesthetic aspect for contemporary architecture.

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