



COURTYARD: IT'S EVOLUTION & FUNCTION

(An Important architectural element)

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ABSTRACT

The courtyard is an internal space and one of the classic architectural elements that contributed to the climatic condition, physical and psychological, in the courtyard house. This paper focuses on the history of the courtyard and its privacy measure throughout civilizations. Variant courtyards were researched; besides the courtyard history, evolution, form, and elements record their physical features and benefits. The conclusion demonstrated that the courtyard everywhere has a similar form, but the qualities differ based on the region's environmental characteristics. The research finishes with an outline to maximize a courtyard microclimate performance.

INTRODUCTION

A courtyard is a style of structure that has existed since humans started to build their houses. Courtyards are enclosed indoor spaces but often open or covered at their top. The alternative definition of the courtyard is "An unroofed area that does totally or partially enclosed by walls or structures.

Although usually, the courtyard was covered and activities that had taken place outdoors began to occur indoors. Thus, once the outside public side does obscure, the inside rooms become private. However, some religions are still expected to remain in constrained locations in the house and are not allowed to penetrate men's domain. In such a circumstance, the courtyards supplied people with a private open space for various activities and divided the private living quarters from the public portions of a house; A courtyard is a frequent design feature employed for thousands of years in many regions of the world, notably in dwellings. Courtyards employed primarily as a gathering place for house users' as we have seen, are multifunctional spaces bringing an outdoor environment inside a house. They have been effectively included in dwellings of

different Indian cultures as a symbol and identity of their traditions, representing their beliefs and lives.

As we have seen, its origin served as a private open place bringing light and air into the dark chambers. Gradually qualities were given to the courtyard, which contains thresholds where does ceremonies conducted. The courtyards do not belong to one certain time of history; it seems that they had always been around. The idea of courtyards as a plan layout extends back thousands of years to Neolithic communities. To understand court in all guises, it is helpful to introduce the fundamental topological difference between a courtyard house (inside) and a terraced house (outside) (exterior). The courtyard house is an indication of urban pattern through time, especially in the hot region of the Middle East and North Africa, which offer an exclusive private function of the household. On the other hand, a terraced or (row) house always lies on road facing and is directly accessible outside. Guy Pether bridge offers a comprehensive explanation for the dispersal of the courtyard house types by distinguishing two varieties: "The interior courtyard house, where the house encloses a courtyard characteristic of urban areas, and the exterior courtyard house where the courtyard borders the house providing protected area, contiguous with the dwelling

units but not enclosed by them". Andre Bazzani asserts the distinct variations of the economic status by each type of the interior court used by the sedentary farmer and the second type external utilized by Sami-Normand. There is a need for more investigation on the courtyard microclimate performance, such as passive strategies for maintaining thermal comfort and energy efficiency in the building, and consider at the preliminary design stage or at the building refurbished stage as a low-cost element that enhances the significant impact of a courtyard in buildings.

HISTORY EVALUATION OF COURTYARD FORM

Introduction of the History of Courtyard House

Courtyard housing is known as the oldest form of living. The historical evolution of the courtyard forms a cross the world seen in ancient civilization from unearthed at Kahuna in Egypt, which dates back to 5000 years old to the Chaldean City of Ur about 2000 B.C. The characteristics of courtyard housing depend on the environment and culture of a group of the specific region; for example, courtyards may be utilized as an inside garden, or there may function as the main point in the house. Through thousands of years of diverse courtyard dwellings and designs exhibited, Sumer and Pharaonic Egypt are recorded as the earliest culture of the Middle East, which possess the oldest example of the courtyard. Later, this structure was seen in western cultures such as Greek and Rome.

In Italy in 700 B.C, a new courtyard design referred to as the atrium home, created from the old forum, the objective of this kind is to provide a private outdoor area, the atrium house met up with the Greek pre-style which has a different design, the design displayed small courtyard encircled by columns. In the Middle East courtyard homes are as arcan hitectural tool, the hat is prevalent in hot and dry climatic and endures in many old towns and aims to provide a private area for introversion.

Ancient Civilizations

A troglodyte village in Matamatas of Southern Tunisia is the most primal and homogeneous community to create courtyard houses, according to Schoenauer and Seeman "Each dwelling-unit is built around a carter open to the sky with sloping wall and level bottom". Douars in North Africa, an encampment of nomadic tribes in West Africa, the Kraals of Bechuanaland in South Africa, and the first rectangular houses in Morocco presented the prototype of a courtyard. Figure 1 depicts many types of courtyards plans throughout Africa.

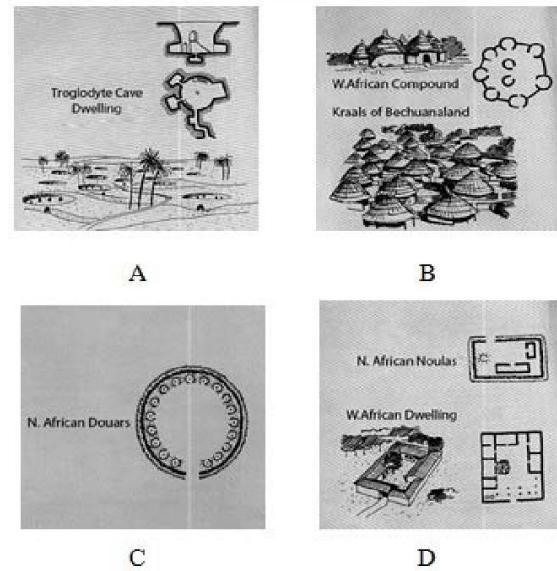


Figure-1. (A-D) Different types of courtyards form in Africa (Schoenauer, 1962)

Another example that indicates in the archaeological survey located at Ur on the Euphrates River in Mesopotamia about 2000 B.C Figure-2. The plan displayed a square courtyard that was encircled by rooms on the Ground level, and the second floor of the house was open to the courtyard, the building material in that era was predominantly fired brick. In China, primary houses have been strongly impacted by religion and the philosophy of Yin and Yan (Schoenauer & Seeman, 1962), the goal was distinct from the courtyard used for privacy and meditation. Even the form has additional property from the first example at Ur. Instead of being encircled by rooms, the Chinese courtyard is surrounded by individual dwellings, which belong to different people. Garden and water features were two markers for the courtyard; consequently, it was employed as a cooling technique in warm temperature in the Southern area Figure 3 displays the traditional arrangement of Chinese residences and courtyard houses. While Figure 4 depicts the usual layout of a Japanese traditional house.

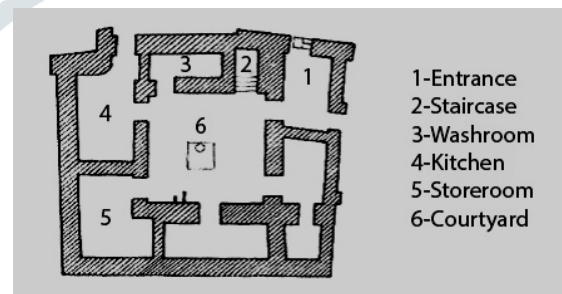


Figure-2. Plan of House at Ur, Mesopotamia (Al-Dawoud, 2006).

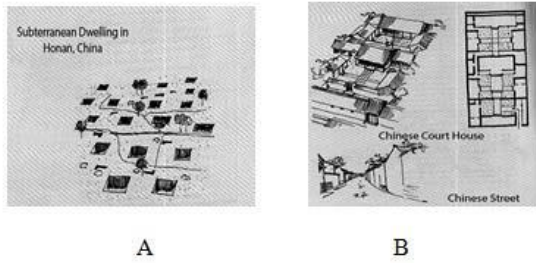


Figure-3. (A-B) Typical layout of Chinese dwelling and courtyard houses (Schoenauer, 1962).

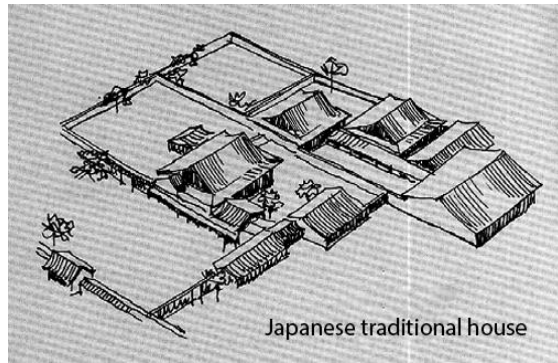


Figure-4. Typical layout of Japanese traditional house (Schoenauer, 1962).

Classical Civilizations

The creator of the courtyard borrows another form of design from 700 B.C; in Italy. The atrium house design features a tiny courtyard surrounded by rooms, with a container in the center of the courtyard to capture the rainwater to drink. The major objective of this design, which is open to the sky is to give a private outdoor place. Around 275 B.C., Roman architecture became a blend of traits inherited from the Etruscans and the Greeks, after being occupied by Southern Italy Romans.

The atrium house met up with Greek pre-style (court enclosed to columns) when people started to create a big house having two styles (atrium pre-style), either one of these styles has got their location in design, atrium next to street and pre-style in the back of the house. Figure 5 displays both the classical era of the courtyard and atrium.

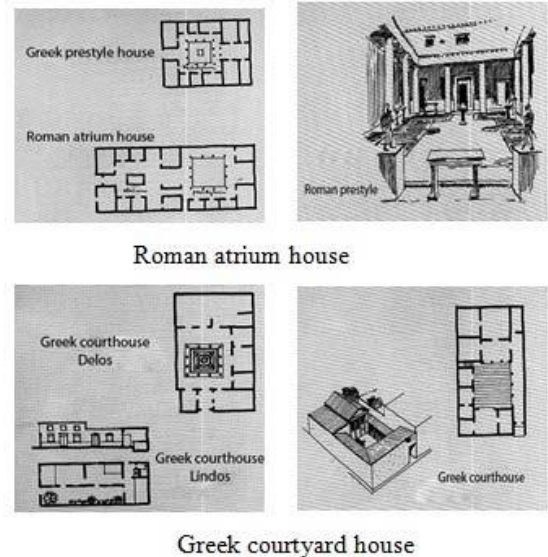


Figure-5. Typical courtyard dwellings are prevalent during Classical Civilization.

Middle Ages and Renaissance Civilization

After the fall of the Roman Empire by A.D. 476, courtyard-type houses suffered relapses, found in Italian Cortile and monastic cloisters. During the Christian architecture era, the atrium became prevalent in early Christian churches as the main entrance; it was utilized as a meeting area in the center of the colonnaded open court there was a fountain or well used by worshipers to wash their hands before entering the church.

In several Islamic countries in North Africa and the Middle East, the courtyard in the Dar follows the notion of “privacy and isolation with a limited show of the occupant’s socioeconomic standing to the outside world”. The private courtyard gives a separate place for women to rest with protected courtyard trees, a pool, and outdoor furniture. Another element in the design of the courtyard (serdab) developed in the Mesopotamian region, this chamber was utilized as a refuge in cool air in the house.

Mean While Courtyards in India

1. Indus valley civilization

Climatic influences on the spatial organization are visible in the centuries from 2000 B.C. during which the basic principles of the central court with chambers all around it have continued in the Indian sub-continent. The geographical and climatic circumstances have arisen as indigenous architecture is ideal for the best condition.

If we search for the origins of the courtyard, then it leads to dwellings of Indus valley culture. Excavation and investigations demonstrate that constructed forms in ancient times had core open-to-sky zones. They had no windows facing the street but instead focused on the courtyard. Considering the region’s climate, these integrated homes would have depended on the courtyard for light and ventilation. It also gives an area for open living within the house which controls the harshness of the

tropical sun. In later years the construction of the town took place and the cluster courtyard transformed and took shape inside in the form of a private courtyard. The next key cultural development that emerged was Buddhist culture, the idea of the courtyard was carried further in the Buddhist Viharas. These were built as a collection of individual cells or dorms exposed to sky court. Figure 6 displays a vast courtyard complex of Indus valley.

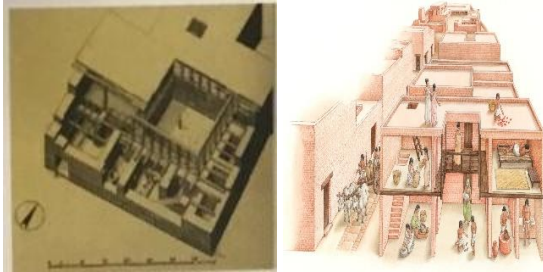


Figure 6. A large courtyard complex of Indus valley.

2. Courtyard in Fourteenth Century

The advent of Islamic powers into northern India caused political and cultural changes. The geographical conditions, climatic adaptability, and accessible resources had a key impact in the development and continuance of Islamic architecture. The purpose fused with royal expression was a vital component taken into consideration for developing any edifice.

Most buildings public to private have a sequence of introverted courtyards performing climatically well. The central courtyard has a vast dimension and several minor adjacent courtyards connected through tunnels, gates, and colonnades. Figure 7 (A) illustrates a mosque plan with two internal courtyards.

According to Abha cock “the kings and nobility were learned architects who established a resource of knowledge for today’s generation.” The royal court of Mughal Red Fort connects which succession of landscaped gardens that look like an intrinsic component of the design. The scale and proportion, the quality of surfacing, views, and operationally well-organized courtyards show a more sensible designer approach of this age. Figure 7 (B) illustrates the Plan of a Mughal Court.

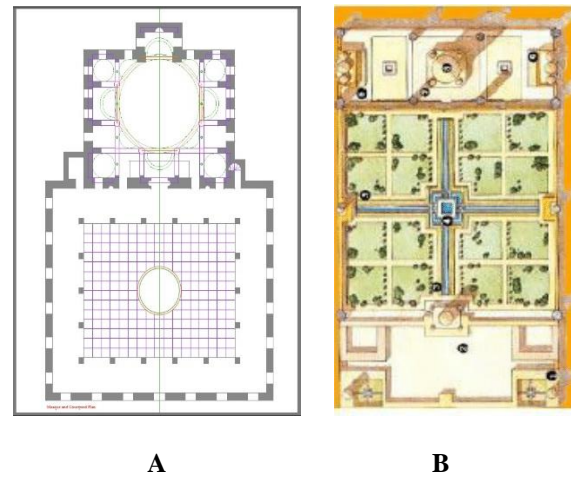


Figure 7 (A) shows a mosque plan with two internal courtyards and (B) shows the Plan of a Mughal Court.

Modern Civilization

In the contemporary age, the courtyard first penetrated the West Coast of North America and was unveiled in Southern California due to the influence of Spanish colonialism. Observing the increase of tourists settling down in California between 1880 and 1930 caused a requirement for high accommodation that, transformed the style of courtyard houses in that region.

Lately, the courtyard type travelled across the United State to the East Coast when the idea of employing a courtyard to separate the sleeping space from the living area was spread. the binuclear patio has been converted to a long, narrow terrace house in the country.

In Europe, single-story courtyard buildings became prevalent, that sort of courtyard is demanded by the low-income class. In addition, the first courtyard was built in the South by Hugo Haring in 1928, his design modification later into the L shape plan, which became popular in England and Germany during the 1960s.



Figure 8. Terrace house – Los Angeles 1956 (Carolina, 2008)

Courtyard Form and Elements

The courtyard does not have a definite plan, the first design of courtyard home is usually rectangle, square, or round. These shapes have been altered to accomplish ecological elements such as site limitation, topography, building orientation, and function to develop new forms [U shape, L shape, T shape, V shape, H form, or Y shape] Figure - 9 shows multiple possible forms for a single-family courtyard of one or two stories. The scale and size of the

courtyard can be modified from extremely close to expansive the area. it may be that the courtyard design can be entirely or semi-enclosed or relinquished by simply two walls

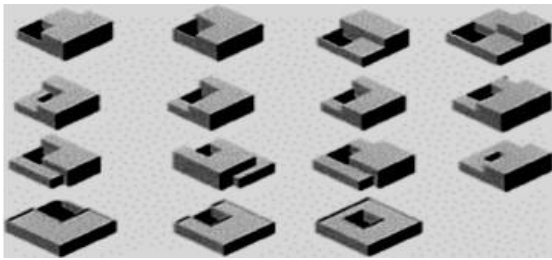


Figure 9. Different possible forms for a single-family courtyard of one or two stories.

Different studies are carried out to investigate critically the performance of courtyard shapes and elements at both urban and architectural levels. This study serves to define the weakness, obstacles, and the possibility for future design development. The rectangular arrangement of the courtyard was analysed by research advised this form to protect the structure from sun radiation and dusty wind. Three side courtyards produced ideal temperature conditions, especially when orientation and ventilation were required during the design phase. studied rectangle shape proposition to gain the extreme effect in summer and winter in four regions, while creating ecological conditions through natural ventilation in high-rise residential buildings by a used interior courtyard.

Orientation, wall enclosure, and natural components of the courtyard were examined as essential architectural elements, within each housing unit. The substantial role-play by these aspects proven their efficiency in the climatic and social aspect that distinguishes the building environment.

Orientation

Building plan plays an essential influence in the orientation of the courtyard, hence the sun location, shading performance, solar gain, and wind direction. All of these can alter the microclimate situation. The correct orientation of the courtyard helps to generate thermal comfort, nevertheless, sun angle and wind direction may induce thermal discomfort if the orientation is not suitable.

Wall Enclosure

The design of a courtyard among areas has diverse forms, it depends on the features of the surrounding wall size and shape. Moreover, the diverse impact of culture, economic, social, and environmental factors, but in many cases, the design of the courtyard appears the same. The phrase wall enclosure refers to features, which have relevance in microclimate conditions such as walls, windows, and doors various components define the form of a courtyard within the building. Furthermore, designers

throughout the design stage might adjust these aspects to produce a favourable impression on the courtyard.

The diverse roles of wall enclosure functions such as the impact of internal courtyard ventilation on the thermal performance, the thermal performance, and the efficacy of the courtyard building during variant design situations such as glazing type and window-to-wall ratio. Finally, colour, materials, shading devices, and wall enclosure materials were explored as options option to construct the environment condition.

Courtyard Natural elements

The natural features within the courtyard identified that promote thermal comfort, and have the ability to recreate environmental benefits, such as example shrubs, trees, and flower plants in shaded regions, which sit up by. Thus, employing a water body, water spray, and tent was found that the internal courtyard and surrounding area to be cooler, especially during the sunny hours.

The significant effects of courtyard elements change the surrounding environment by limiting solar radiation, lowering the air temperature through landscape shading, and other functions, which will provide thermal comfort for users.

Courtyard Benefits

The courtyard plays a vital part in defining the climatic environment, and physical and psychological in the courtyard house, over time, various profits of the courtyard stated by researchers to define courtyard social and ecological purposes. These benefits are psycho-social benefits, cultural benefits, religious benefits, economic benefits, climatic benefits, and architectural benefits.

Psycho-Social Benefit

The base of the profits of the courtyard is a finding of it is inner form, which creates a sense of confidentiality and enclosure to the form and tenants of the house. However, numerous theories' set the court acts as:

Courtyard functions as an extension of the kitchen during the morning and as a living area during the evening to amuse the guests.

1. A area for interaction for all family members, and urge the family to function as a group.
2. Visual solitude, when the court is visibly separated, by screening or walled entrances.
3. Sleeping location throughout the night when the climate is favourable to outdoor exercise.
4. Acoustical privacy and enclosure features function as a noise barrier between the courthouse and the outside region.
5. The courtyard can play a role in healing procedures, the architect could add courtyard features such as a stamp of building design, Shade,

water, trees, and flowers examples of these features, also wind tower, pavement, and colours could provide positive effects towards the five senses of the human body.

A study at the Hong Kong university campus by (Lau & Yang, 2009), to produce a healing impact on the university campus showed that the garden within a courtyard that is located normally at the entrance and the meditation garden found near the campus library, has specific purposes and should have a different pattern and landscape design. The meditation garden is excellent for the study setting, while the garden within the courtyard fosters public social contact. the influence of healing gardens to reduce stress at children's medical centres in Austin, the finding revealed that the stress level is lower when patients sit in healing gardens than in the indoor environment.

Cultural Benefit

Use of more than one courtyard is documented in various circumstances. This is usually to partition the public and private spaces within the house. The public is meant for guests and is often used by males (particularly in Islamic nations) (especially in Islamic countries). The inner court is more restricted to the family and used as an outdoor location for recreation and used by a female.

Religious Benefit

The courtyard is both symbolically and religiously significant. This open-to-sky yet enclosed space within the surrounding walls of a house has been deemed the principal point of interest in the house. The courtyard may indicate several things: the focal point of interest in the house; a concentration of light, wind, sand, and water; a private, safe, and life-sustaining haven.

Climatic Benefit

Courtyards have been commonly referred to as microclimate alterations, due to their ability to alleviate high temperatures, channel breezes, and adjust the degree of humidity. Courtyards also were operating as a source of airflow thermal comfort to the dwelling. With the right position to the house and suitable material, it may also help to limit the heat gain and this will operate efficiently with the qualities of self-shading and thermal lag. Finally, the courtyard works like a cold air reservoir, especially in hot-arid climates.

Architecture Benefit

Courtyards often operate as a hub in buildings and dwellings, connecting the numerous regions and purposes. The significance of the courtyard by it is the centre position encompassed by diverse landscape and tree components, which play a key part in our social and professional lives. Moreover, it fulfils visual and acoustic protection to the building as well as climatic, for this reason, the geometry of the courtyard and the qualities of finishing materials should take priority during the design of the stage to give a high level of thermal comfort.

Conclusion

This report describes a research endeavour that contributes towards empathetic the history of the courtyard in diverse cultures. In addition, it displays the element and form of courtyards to comprehend the impact of the courtyard on building design.

The data demonstrated that the courtyards around the world have similar forms and elements, only the attributes are modified from one place to other due to the climatic characteristic of different regions.

The research has provided a basis to assist additional research and analysis on the historical evolution of courtyards, and the impact of courtyard features on their performance. Also, this study offers an awareness of the impact of the courtyard on the building surroundings as a climatic moderator and passive ways that aid.

REFERENCES

1. Fatma Abass, Lokman Hakim Ismail, & Mohmed Solla. (n.d.). A REVIEW OF COURTYARD HOUSE: HISTORY EVOLUTION FORMS, AND FUNCTIONS. ARPN Journal of Engineering and Applied Sciences. Retrieved August 14, 2022, from http://www.arpnjournals.org/jeas/research_papers/rp_2016/jeas_0216_3683.pdf
2. Anjali Patel, INDUS VALLEY CIVILIZATION (unpublished), Retrieved August 14, 2022, 2008 Batch, Institute of Architecture, Patan.
3. COLUMNS function. (n.d.). COLUMNS Function; support.microsoft.com. Retrieved August 14, 2022, from <https://support.microsoft.com/en-us/office/columns-function-4e8e7b4e-e603-43e8-b177-956088fa48ca>
4. Courtyard - definition of courtyard by The Free Dictionary. (n.d.). TheFreeDictionary.Com; www.thefreedictionary.com. Retrieved August 14, 2022, from <https://www.thefreedictionary.com/courtyard>
5. Wiktionary. (n.d.). 1 - Wiktionary; en.wiktionary.org. Retrieved August 14, 2022, from <https://en.wiktionary.org/wiki/1>
6. Lag - definition of lag by The Free Dictionary. (n.d.). TheFreeDictionary.Com; www.thefreedictionary.com. Retrieved August 14, 2022, from <https://www.thefreedictionary.com/lag>

7. Abdulac, S. (1982). Traditional housing design in the Arab countries. Paper presented at the urban housing. Proceedings of the second seminar... Harvard, august 17-21, 1981.
8. Ahmadi, A. R. a. (2004). Tamadun rumpun budaya Melayu: Kementerian Kebudayaan, Kesenian dan Warisan Malaysia.
9. Al-Azzawi, S. (1994). Indigenous courtyard houses: A comprehensive checklist for identifying, analysing and appraising their passive solar design characteristics Regions of the hot-dry climates. *Renewable energy*, 5(5), 1099-1123.
10. Al-Dawoud, A. (2006). *Comprative Analysis of Energy Performance between Courtyard and Atriumin Building*. (PH.D), Illinois Institute of Technology.
11. Aldawoud, A. (2008). Thermal performance of courtyard buildings. *Energy and Buildings*, 40(5), 906-910.
12. Almhafdy, A., Ibrahim, N., Ahmad, S. S., & Yahya, J. (2013). Analysis of the Courtyard Functions and its Design Variants in the Malaysian Hospitals. *Procedia - Social and Behavioral Sciences*, 105, 171-182. doi: 10.1016/j.sbspro.2013.11.018
13. Almhafdy, A., Ibrahim, N., Ahmad, S. S., & Yahya, J. (2013). Courtyard Design Variants and Microclimate Performance. *Procedia-Social and Behavioral Sciences*, 101, 170-180.
14. Ayhan, B., & Neslihan, D. (2011). The influence of climate and privacy on indigenous courtyard houses in Diyarbakır, Turkey. *Scientific Research and Essays*, 6(4), 908-922.
15. Bagneid, A. (2006). The creation of a courtyard microclimate thermal model for the analysis of courtyard houses. Texas A&M University.
16. Blaser, W. (1985). *Atrium: Five Thousand Years of Open Courtyards*. New York: Wepf and Co. AG, Basel.
17. Bridson, D. (2012). *Courtyard Housing Study-Djingis Khan and The Kingo Houses*. Sustainable Urban Design.
18. Carolina, N. (2008). Los Angles terrace house. Retrieved 13 March, 2015, from www.ncmodernist.org VOL. 11, NO. 4, FEBRUARY 2016 ISSN 1819-6608 ARPN Journal of Engineering and Applied Sciences ©2006-2016 Asian Research Publishing Network (ARPN). All rights reserved. www.arpnjournals.com 2563
19. Das, N. (2006). *Courtyards houses of Kolkata: Bioclimatic, typological and socio-cultural study*. Kansas State University.
20. Duncan, M. (1973). *The Modren Courtyard House*. London: Architectural Association.
21. Edwards, B. (2006). *Courtyard housing: past, present and future*: Taylor & Francis.
22. Hussain, N. H. M., & Byrd, H. (2012). Towards a compatible landscape in Malaysia: An idea, challenge and imperatives. *Procedia-Social and Behavioral Sciences*, 35, 275-283.
23. Lau, S. S., & Yang, F. (2009). Introducing healing gardens into a compact university campus: design natural space to create healthy and sustainable campuses. *Landscape Research*, 34(1), 55-81.
24. Lea, D., & Runcie, M. (Eds.). (2002) New York: Oxford UP, USA.
25. Meir. (2000). Courtyard microclimate: A hot arid region case study. Paper presented at the Architecture City Environment, Proceedings of the 17th PLEA International Conference, Cambridge, James & James, London, pp218–223.
26. Meir, Pearlmutter, & Etzion. (1995). On the microclimatic behavior of two semi-enclosed attached courtyards in a hot dry region. *Building and Environment*, 30(4), 563-572.
27. Muhaisen, A. S. (2006). Shading simulation of the courtyard form in different climatic regions. *Building and Environment*, 41(12), 1731-1741. doi: 10.1016/j.buildenv.2005.07.016
28. Oliver, P. (2003). *Dwelling: The House across the world*. Oxford: Phaidon Press Ltd.

29. Petherbridge, G. (1978). *The house and society. The Architecture of the Islamic World, Thames and Hudson, New York, 193-208.*
30. Petruccioli, A. (2006). *The courtyard house: typological variations over space and time. Courtyard Housing: Past, Present and Future, 3-20.*
31. Rajapaksha, I., Nagai, H., & Okumiya, M. (2003). *A ventilated courtyard as a passive cooling strategy in the warm humid tropics. Renewable energy, 28(11), 1755-1778.*
32. Rust, C. (2010). *Design for Healthcare. The United States of America. Renee Wilmeth.*
33. Saxon, R. (1986). *Atrium buildings—design and development: London: Longmans.*
34. Schoenauer, N., & Seeman, S. (1962). *The courtyard house: McGill University Press Montreal.*
35. Stefanos, P., Roger, S., & James, T. (1996). *Courtyard Housing in Los Angeles: A Typological Analysis: Princeton Architecture Press.*
36. Sthapak, S., & Bandyopadhyay, A. (2014). *Courtyard houses: An overview. Recent Research in Science and Technology, 6(1).*
37. Tablada, A., Blocken, B., Carmeliet, J., De Troyer, F., & Verschure, H. (2005). *Geometry of building's courtyard to favour natural ventilation comparison between wind tunnel experiment and numerical simulation.*
38. Toone, T. L. (2008). *Effect of healing garden use on stress experienced by parents of patients in a pediatric hospital. Texas A&M University.*
39. Zakaria, A. Z., Salleh, I. H., & Rashid, M. S. A. (2014). *Identity of Malay Garden Design to be promoted as the Cultural Tourism Product in Malaysia. Procedia-Social and Behavioral Sciences, 153, 298-307.*

