

Courtyard housing: Environmental Approach in Architectural Education

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Abstract

This paper demonstrates, through discussions on sustainability and regional identity, and through a series of case studies developed into the teaching programs within the school, that the courtyard housing archetype acts as a vital center of the house and as a climate regulator.

Climate has given shape to a particular type of courtyard housing in different cultures. In many regions of the world, the courtyard has been reinterpreted as one of the oldest forms of domestic development spanning at least 2000 years. The courtyard housing reinterpretation represents an outstanding example and source of inspiration, in terms of integrating local and universal architectural traditions with contemporary understanding and techniques, to create humane, sustainable and site-specific architecture.

The challenging part of designing a courtyard house is to find and maintain the delicate balance between architectural quality and sustainability. In the learning process, we often examine the Master architects who have drawn their courtyard houses in which this ideal has been achieved. The course examines the design of courtyard archetypes presenting individual analysis of each one seeing, nature, culture, and the built environment as integrally connected. We are committed to sustainability as situated, culturally embedded, and historically derived practices.

In recent years, the Barcelona School of Architecture has built up a considerable expertise in Sustainable Development, rethinking the way the built environment can be analyzed and transformed.



1 The courtyard house

The courtyard could be defined as a room without a roof, which is the core of the house. From the standpoint of the weather, the patio is an outdoor space, but from the topological point of view is clearly a interior space bounded and protected, a concave space. A house developed around a courtyard that gives its main area of use, lighting and circulation is the more ancient type of the history of mankind, forming a variable archetype, which was built the ancient civilizations and has survived through interesting examples of modern masters.

But this courtyard archetype has been changed and news types may be developed from the modern architect's courtyard experiences and vernacular tradition. Courtyard house it is also a climatic device: in summer the courtyard becomes a second living room and facilitates outdoor activities, in winter the house it looks inward onto the private courtyard which is an enclosed room. It is an open room sheltered from the wind and protected from the neighbors.

The patio house was developed to achieve privacy in the outdoor space and good orientation of the rooms. Privacy is the key quality of the courtyard house. The courtyard is the centre of the dwelling and facilitates outdoor activities. The courtyard looks inward into the space it surrounds.

1.1 The courtyard house as a temperature regulator

The courtyard plan works quite differently in hot and cold climates. Courtyard house type is naturally well suited to the hot climate. In hot areas exposure to the sun is to be avoided. Courtyards are kept small and overshadow by high walls, wide eaves and foliage. By sharing the external walls with the neighboring houses, exposure of vertical surfaces to the sun is minimized. The thick walls and small windows keep the interiors cool, the courtyard layout allows cross ventilation and shady verandas and patios facilitate outdoors living. In the courtyard plants and fountains are used to cool the air through evaporations. In hot humid regions courtyard plans are good for encouraging through ventilation.

In northern climates the courtyard archetype is used to allow sunlight to penetrate into the house. Therefore, rooms can be given large windows without any loss of privacy. To admit the northern sun, the courtyard needs to be wide and open. In addition, the patio house is an open room sheltered from the cold wind.

2 Courtyard precedents. Architecture by subtraction

Modern courtyard house have been derived from earlier examples, especially



Greek and Roman atrium houses, and Muslim and Spanish patio houses. One of the most radical solutions is the underground Chinese towns and villages built in Honnan. The dwelling is entirely underground and developed around a courtyard. The town structures of Marrakesh based on its quadrangular houses is also organized around interior courtyards. In the Nordic countries the intense longing of the south, the Mediterranean world, provides the appearance of the patio. That yearning for the Mediterranean civilization determines the Nordic courtyard characterized by the gradual opening to the landscape.



Figure 1: Underground towns and villages in the Chinese loess belt at Tungkwan, Honnan, from Bernard Rudofsky: *Architecture without Architects*.

This paper is concerned only with modern courtyard houses. The courtyard house is quite different from the ancient vernacular version. Modern architects used the courtyard form in an original and modern way.

3 Courtyard archetypes

The experience of the courtyard as introverted scene of everyday life is a characteristic feature of the architecture that appears again and again in different cultures and under different interpretations. Modern architecture is close to the concept of courtyard through a series of operations that always contain a transgressive component over the archetype of the traditional courtyard house. In the traditional archetype courtyard house, the patio is always at the center,



forming the vital core of the house. However, this paper explores a number of operations around the concept of courtyard house which can also extend the essence of the patio.



Figure 2: Courtyards archetypes and operations: Forecourts, patios, patios as a transitional element, binuclear principle, patios as a prism of light and courtyard system.

These operations seek to exploit the essence of the courtyard house condensed in this series of courtyards and relationships that are proposed:

3.1 The forecourt

In primitive dwellings is not unusual to find a forecourt in front of the entrance, whose floor has been leveled to provide a space suitable for everyday household activities. The forecourt is a protected area that provides access to the house and articulates the relation with the private domain of the house. This space provides a transitional area with the access road to the house. The forecourt is to be used as an outdoor entrance lobby. Jørn Utzon owns house in Hellebaek built in 1952 is a pavilion with walls extending outwards into the open landscape. The area between the two blocks, the car area and the house, is a partially covered entry area and therefore a forecourt.

3.2 Patio

The second theme includes explorations around the central courtyard as the core of the house and the wealth of meanings acquired: continuity, transparency... The courtyard house type was an L-shape plan, with sleeping and living rooms grouped in the two wings around a private courtyard was developed by Hannes Meyer and Ludwig Hilberseimer at the Bauhaus in 1931.

Alison and Peter Smithson's house of the future for the 1956 Ideal Home exhibition was a completely introverted dwelling characterized by a central courtyard to be used as separate living room in the open air.

Josep Lluís Sert own house built in Cambridge (Massachusetts) in 1958, is a house with three courtyards. Only in Sert House, while two of them have been in contact with the enclosure wall, the third recovers the central position of the archetype and is fully encompassed by the various units. However, the central courtyard is a place of distribution, as often occurs in traditional architecture,

but rather an enrichment of the home space that allows certain parts of two open sides, creating a system of greater complexity and rich visual relationships between the different areas.



Figure 3: Josep Lluís Sert own house, Cambridge, Massachusetts, 1958.

3.3 Courtyard as a transitional element

The third section examines the courtyard as part of mediation with the surrounding nature. The courtyard becomes a completely defined and introverted, and admits a moderate opening to the landscape. The patio is decentralized with respect to the house and splits the wall enclosure. The patio becomes an introverted place but opens laterally resulting in a hybrid situation between the patio and terrace. One of the finest examples of this hybrid interpretation of the courtyard archetype is Alvar Aalto's house in Muuratsalo that he built for himself in 1953.

Opening the building's inner spatiality towards the landscape through a defined courtyard space as a spatial transitional figure, is a theme which Aalto will develop in his Experimental House built in Muuratsalo. The house was on the forested shores of Lake Päijänne, and despite this, Aalto conceived an L-shaped embracing a square courtyard, paved, bounded by its four sides, and presided at the center for a place to fire.

The plan is an L-shaped plan one wing with living spaces and a loft space at one end, the other with bedrooms which produced a square-shaped interior courtyard room surrounded by free-standing high walls. The kitchen, the entrance



and the fireplace are at the intersection. A geometric analysis reveals that the plan can be divided into nine square modules, four for the courtyard and five to the house. The inner courtyard room and the house constitute the two inner squares of the plane figure, placed on the same diagonal axis which measured 20 meters. The house is organized around a courtyard that creates a space that mediates between the house and nature; at its centre is a square fireplace. The exterior walls of the courtyard, whitewashed bricks on the outside and internal red bricks, are developed as mosaic like experimental walls, divided into fifty areas in which different types and sizes of bricks and ceramic tile are used.



Figure 4: Alvar Aalto, Experimental house in Muurtasalo, 1953.

The use of the partially enclosed courtyard defines the spatial balance of the courtyard space mediating between open and closed form. The courtyard space, which is the “interior landscape” of the house, has a changeable character respectively as an interior and an exterior and becomes the articulation of the interior spatiality with nature. Therefore the courtyard becomes an outdoor room and a piece of captured nature.

Aalto can not be insensitive to the landscape surrounding the house and break the enclosure of the courtyard to embrace distant views in a huge picture window recreating romantic scenery. The courtyard also manages to capture the landscape.

The courtyard house as an archetype from ancient building cultures was developed simultaneously by Aalto and Utzon. Utzon's competition for low-cost housing in Skåne (1953) entitled "Private Life" which was awarded First Prize conceived the residential unit on the model of the courtyard house developed on a 20 x 20 metre square. The dwelling is set up on a 4.5 metre bay around a central patio and unfolds according to family needs, without spoiling the totality of the project. All the courtyards follow the same basic rules –the same ranges of sizes, for the interior, the same range of thicknesses or depths for the buildings.

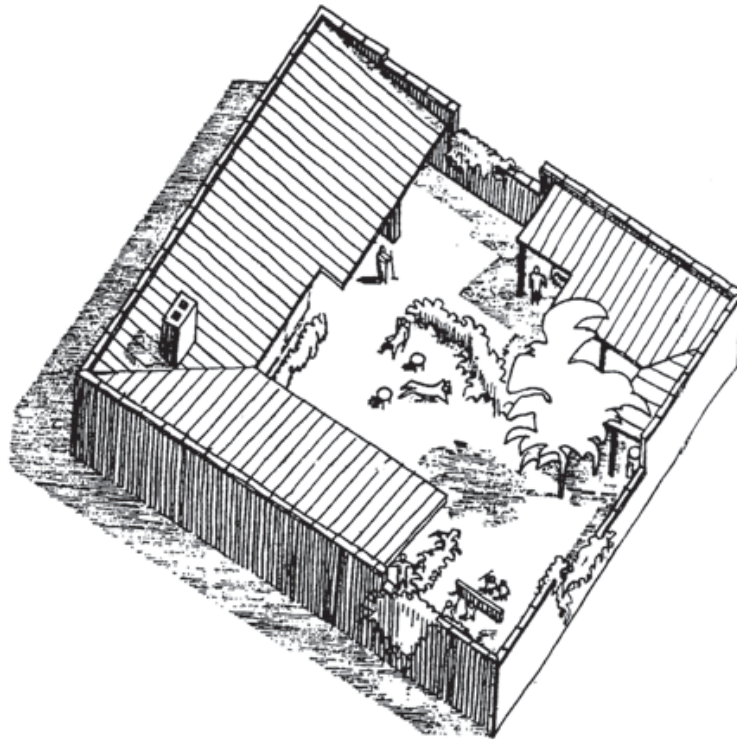


Figure 5: Jørn Utzon, Competition for low-cost housing in Skåne, 1953.

Each family has a private domain surrounded by a sheltering wall, while the glass facades towards the patio extend the family life in close contact with nature. Inside circulation space leading to the bedrooms was developed in two ways: along the enclosure wall or along a common space facing the courtyard, which would, needed windows in the perimeter wall. "The courtyard is the centre of family life" asserts Utzon.

But the courtyard also enhances the transition between the building and the landscape as a way of grounding the building in the place. Utzon's proposal was further developed over the years: at Helsingør the vernacular topography of the Kingo houses (1956), with the landscaping intelligence of their courtyards arranged in sequences and the tactile sensibility of their brick masonry, was extended soon after at Bjuv (1956) and Lund (1957) both in Sweden, and another model of residential development, the Fredensborg complex (1959-65).



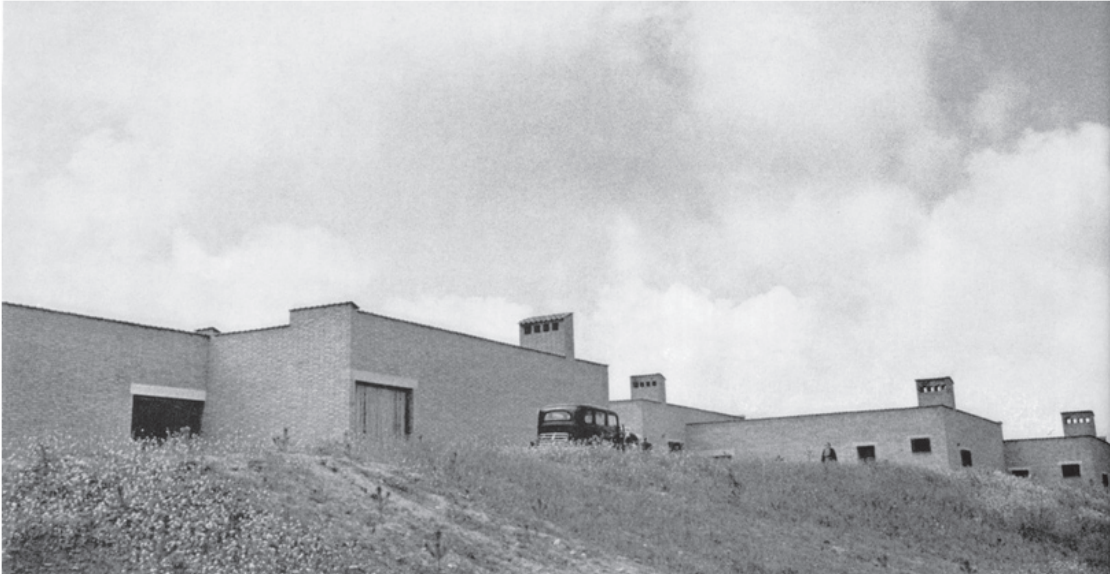


Figure 6: Jørn Utzon, Kingo houses, Helsingør, Denmark, 1956.

3.4 Binuclear principle

This section examines the binuclear principle. The binuclear courtyard house came about by dividing the house into two parts, to enclose a patio between them. Marcel Breuer used the binuclear house with living and sleeping separated into two blocks, with the entrance the connecting link between the two blocks.

Robinson House, 1946, is one of the earliest and most complete applications of the binuclear principle. The two blocks are different in shape and size. One rectangle containing bedrooms and garage, while a square includes the living room, the dining room and kitchen with its annexes. The H-shaped plan is connected by an entrance hall that acts as a bridge. Thus, between the two blocks creates an intermediate space partially enclosed by the house that acquires the status of a semipatio.

Three years later Marcel Breuer designed the Clark House, 1949 and developed further the binuclear principle. Between the two blocks is defined a courtyard that characterizes the entrance hall. The courtyard is bounded by three sides, while the fourth side is open to the landscape, and clearly defined by the edge of the pergola and a masonry wall that divided the slope of the terrain.

During the fifties, Breuer developed a series of variations on this theme, exploring the binuclear principle. Hooper House, 1959, is conclusive point of this reflection. The two blocks become more homogeneous and reconstruct the appearance of a unit volume. Hooper House is a paradigm of condensation and formal abstraction. The house is perceived as a broken masonry wall at its center by a large open door to nature. Behind the enclosure wall the presence of an attractive garden is suggested.



Figure 7: Marcel Breuer, Hooper House, 1959.

3.5 Multipatio system

The binuclear patio was developed into a multipatio patio house in the late fifties. The house became a strip of alternating plans and patios. The house is conceived as a linear multipatio house with extended circulation through connecting passages along the patios. The house is characterized by long views through the house and a varied daylight effects.



Serge Chermayeff y estudiantes de Harvard. Planta núm. 5, 1957.
Robert Gordon y Serge Chermayeff. Casa patio para un cluster.
Casa patio, Harvard.

Figure 8: This long, narrow house with several patios is the patio house developed by Serge Chermayeff and his Harvard students.

Serge Chermayeff developed the idea of the linear patio house and developed



it. He increases the privacy within the house where each patio relates to a particular part of the dwelling. Separating the different parts of the house, noise could not pass from one patio to the next. Chermayeff published jointly with Alexander the book *Community and privacy* where they developed the privacy of the house and the principle of separating functions and insulating lobbies separating each room with its private outdoor space. Thus, each patio related specifically to one indoor function.

3.6 Prism of light

Patio lighting as a ventilation of the house does not depend on the presence of essential patio. Here, the patio becomes a prism of light used to characterize the interior space. Wyzata Davis House built by Philip Johnson in 1954 (Minnesota), developed this idea. The main volume of the house, from the standpoint of its ventilation and with the relation to the environment do not requires the courtyard. But the house would be another, radically different. The courtyard, measuring 6 x 7 m, is an area subtracted from the main volume. It is a prism of light embedded in the house, a kind of transparent illuminated furniture, organizing and linking the various parts of the house.



Figure 9: Josep Maria Sostres, Moratíel House, Barcelona, 1957.

Moratiel house built in Barcelona in 1957 by Josep Maria Sostres developed further this idea. In this case, the prism of light is embedded in the volume of the house. Moreover, the patio, with minimum dimensions (3 x 4 m) and two faces opaque and two transparent, contributes to the organization of the house and produce perceptual aspects: transparency, luminance uniformity, effects of shadows that defined with certain elements of spatial subdivision.

3.7 Courtyard system

This final section examines the patio as a system in the works of Mies van der Rohe. The paradigm as a patio enclosure is the project of Mies van der Rohe for a house with three courtyards, 1934, which is the canonical form in which results of research on the Mies courtyard house that began at the Pavilion Barcelona.

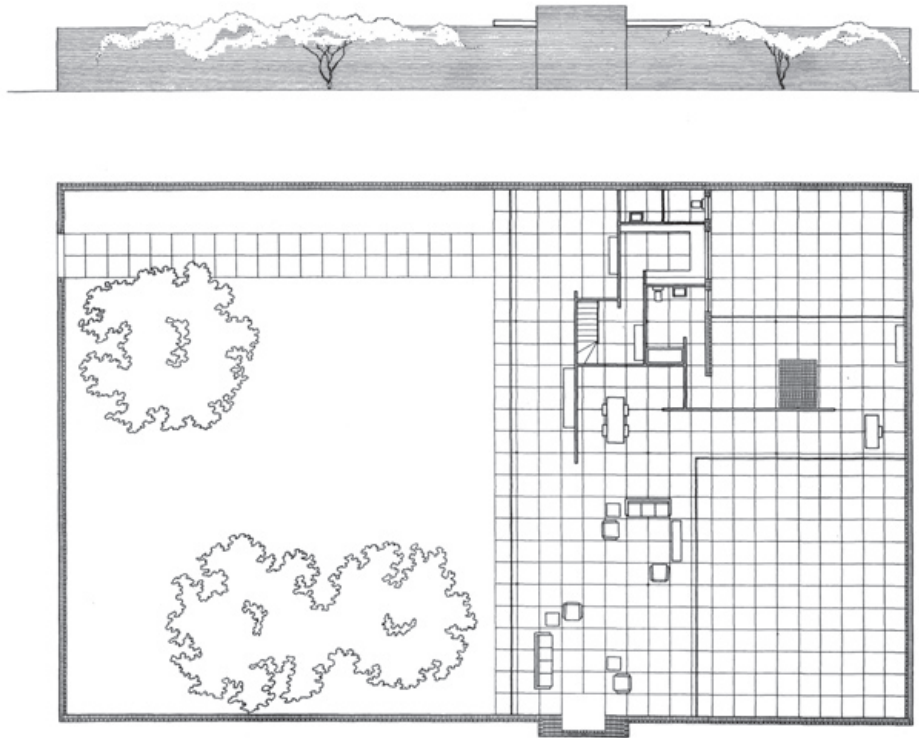


Figure 10: Mies van der Rohe, House with three courtyards, 1931.

Mies developed a topological transformation with respect to the courtyard of the traditional house. It is no longer the house around the courtyard, but in a way, is the courtyard or patios that surround the house: open up the courtyard house and make indoor and outdoor spaces flow. Mies gave the courtyard more enclosure and connected the house and the courtyard as a unit. Only one glass membrane separates the inside from the outside.



The house is seen as a unitary whole perimeter defined by an enclosure partially covered by a roof. The wall enclosure allows courtyard housing complex with one other by either side. The facades on the street are long walls characterized by the doors of access, as in the old city's Greco-Roman world.

This series of operations that always contain a transgressive component over the archetype of the traditional courtyard house are being developed in the courses at the Barcelona School of Architecture. The research explores the potential of courtyards for passive climate control in domestic buildings. In the courses, these operations seek to exploit the essence of the courtyard house and expand significantly the concept of a patio. This is the strategy in relation to the archetypes of the past. This mode of operation is inseparable from the abstract thought. By abstraction is possible to develop further the permanent and universal notion of the patio by exploiting the archetype's potential.

4. Pattern of courtyards

Grouped together, courtyard houses generate a dense urban fabric with a clear separation of public and private open spaces. This urban complexes formed by the addition of units are characterized by an articulated system of access roads, paths and public open spaces. In Europe, mass courtyard housing was created in order to provide a functional house, low-rise housing form for the urban working class.

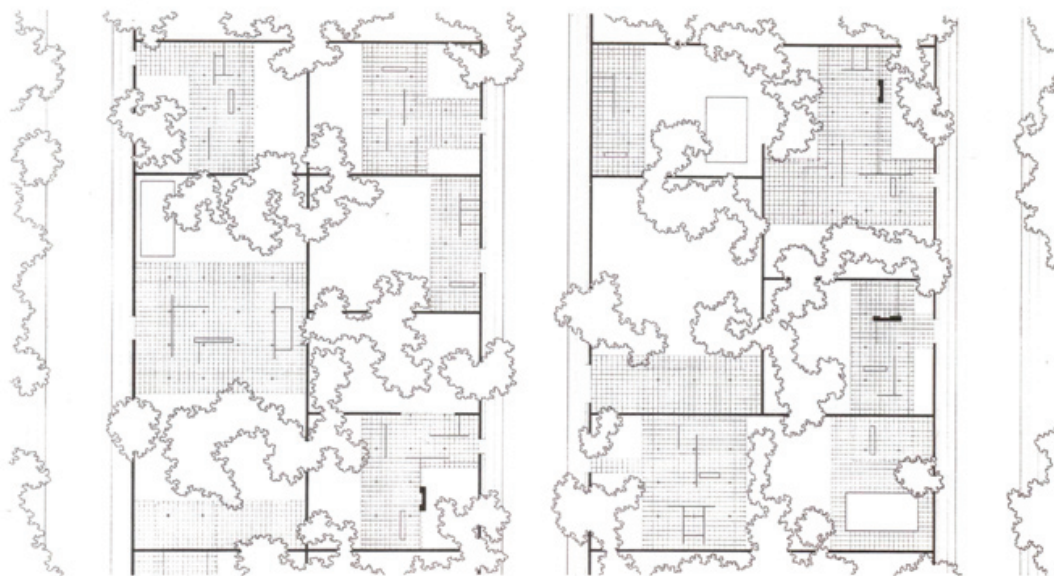


Figure 11: Mies van der Rohe, Pattern of courtyards houses, 1931.

Jørn Utzon's residential communities built in Denmark in 1959 were based on an atrium typology comprising an L-shaped dwelling in plan, set within

a square court and enclosed on all sides by brick walls. Featuring mono-pitched roofs draining into the private courtyards, these standard dwellings were assembled into continuous formations where evocation of romantic ruins blends with allusions to rural architecture. As a result each courtyard is unique, because it sits in a slightly different relation to its neighbors, it plays a different role in the whole, and this shapes it and makes it unique.

5. Courtyards: Environmentally Sustainable design

Environmentally sustainable design integrates supply factor and demand factor efficiencies through low energy technologies and passive design strategies in building. The use of passive design strategies aims to minimize energy demand in buildings and the rational use of energy. Passive systems are essential and the use of passive climate control can reduce energy use in building. The natural energy sources such as passive solar, ventilation and daylight are considered essentially energy sources. Buildings make use of natural energy in the environment and its free running capability to control indoor climates of buildings for climatic comfort.

Such strategies should be integrated within the building form and materials. Passive strategies as airflow, thermal mass and passive solar can regulate ventilation and heat transfer between the external building microclimate and building interior and therefore obtain climatic comfort.

Design variables of building design as the orientation, enclosure and geometry of the building form and thermal properties of the fabric should be considered intensively to obtain a site-specific architecture and a climate responsive building.

The case studies designed are located in Barcelona, at latitude N 41° 23 where the outside average temperature in winter is of 10°C and the inner of 18°C, whereas in summer it is of about 31°C in the outside with a 68% of relative humidity (RH) and an inner temperature of about 24°C +/- 1°C and a 55% of RH +/- 5%.

Design should promote comfort ventilation and prevents indoor heat gain and removes or transfers indoor heat into natural heat sinks during summer and accepts solar gain during winter. In this climatic area the temperature and humidity standard of the Mediterranean climate is moderated by the marine influence and are characterized by soft temperatures in winter and hot summers, with a stable running rate of breezes. The wind blows from inland to the sea during the day and the night sea breezes blow from the sea to inland, thus facilitating to refresh the interior ambience in buildings. The enclosure and geometry of the building form can control wind forced pressure fields around a



building and therefore indoor airflow behavior. In warm climates good shading can reduce the radiant heat and temperature of incoming airflow. Under these conditions, ventilation can enhance comfort and space cooling.

5.1 Courtyards and passive strategies

The courtyard house acts as a temperature regulator and as an open space within a building, a courtyard is a recurrent design element in most of the vernacular buildings originally used in the Mediterranean, Middle Eastern and Tropical regions. The archetype of the courtyard house have been considered to offer a substantial potential for utilizing passive strategies for indoor thermal comfort and has been adapted in subtle regional variations to the climate variations. Building geometry, enclosure, orientation, density of the building context and access to wind flow can produce considerable architectural implications in modifying the microclimate of the courtyards. The courtyard offers a specific microclimate area between the outdoor and indoor environments of the building. From the climate design viewpoint, the courtyard layout allows larger areas of internal passive zones, which can benefit from natural ventilation and daylight. In addition, the patio sheltered from the wind also facilitates outdoors living.

5.2 Airflow effect and heat transfer in the courtyards

In warm areas the courtyard can overheat and transmit solar heat to adjacent rooms, creating overheating. The avoidance of this overheating can be promoted and thus exposure to the sun is to be avoided and courtyards are reduced in size and are overshadowed by high walls and pergolas reducing radiant heat at the microclimatic level.

The avoidance of this overheating can be promoted by the airflow effect. Airflow is a primary effect that characterizes the thermal environment inside the courtyard. In warm humid regions courtyard layouts are good for encouraging through ventilation. The effects of airflow promote comfort cooling of occupants, controlling of overheating and removal of solar heat out of building interior. Airflow is generated to move through buildings by either wind pressure effect or stack effect, which can be regulated through wind permeability of the geometry or the building enclosure. The enclosed courtyard promotes cross ventilation through the courtyard and adjacent room spaces.

The regulations of ventilation cycles through the courtyard gives optimizes in the summer feeling of freshness latent inside the house and eliminate pockets of heat that could be generated. The many possibilities for cross-ventilation,



redesigned for the winds and optimized by mild passive cooler air in contact with the surface vegetation, enable optimal comfort inside the courtyard house.

6. Conclusion remarks: Environmental Approach in Architectural Education

The environmental approach is an innovative approach to building issues, including the project brief, design, and construction and building management. All parties have a common aim, that of environmental protection. The reinterpretation of the courtyard archetype as an environmental element contributed to achieve this environmental protection. The courtyard, also as vital center of the house, acts as climate regulator.

Study of modern precedents should be integrated into our method of design and teaching consciously. The course also explores ways to re-imagine the futures of cities and urban environments through new understandings of their present and their past. The course emphasizes connections between theories, societies, urban knowledge, and landscapes. Particularly studios and research seminars will often act as the site for innovation and action on the built environment. The environmental approach in architectural education becomes a subject to innovate and forge networks globally with a view to enhancing urban futures while remaining sensitive to their pasts and responsive to the needs of the present.

We have gained the understanding that the energies that society uses to achieve its welfare is not always unlimited resources, making it look back supported by a technical architecture and systems to better exploit the energy that nature gives us an unrestricted (sun, air, vegetation), which promotes a harmonious and respectful environment. Because, without doubt, observation and investigation of the operation of the exemplary nature of their bodies and systems, we can learn from their masterful efforts to minimize and avoid anachronisms and waste. Architecture and its construction should always respond to human needs following these guidelines.

6.1 Awareness of site

We encourage the site-specific discourses on modernity and built environments. Furthermore, we embrace the complexity of architecture and urbanism by emphasizing the study of the great master's architects expressing a multiplicity of voices and a plurality of perspectives.

The specific local situation, existing buildings and vegetation, climatic



and topographic characteristics of the site, the environmental energy supply, according to the duration and intensity and acting as local constraints, should be key factors for planning and analysis and rated in each particular case. The use of passive design strategies aims to minimize energy demand in buildings and the rational use of energy. Students analyze available natural resources in place, especially solar, wind and geothermal heat, must be activated and used in the development and reflected the shape of the buildings.

Depending on the location, shape and material it contains, and the type of use that house, models of buildings existing and future relationships with various local issues such as the:

Energy management: Climate data (position of the sun, the distribution of sunlight, air temperature, direction, strength and duration of periods of wind, amount of rainfall, etc.).

Limiting environmental impact: The sun and orientation of the exterior spaces and surfaces of the terrain (slope, shape, topography, proportion and measure...) The position, geometry, dimensions and mass of adjacent buildings, topographical formations, vegetation and hydrological factors (variation in the shadows thrown, reflexes, size, emissions...)

Social dimension: Environmental approach has a social dimension. Projects may use local materials and techniques that facilitate the sense of ownership of the space by its inhabitants. The project context and place must attend to the existing tradition of constructive and architectural heritage.

A global, interdisciplinary approach allows a rationalization of all aspects of the Project through a combination of traditional and innovative methods. User comfort, energy management and environmental approach are all taken into account from the early stage of the project.

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References

AA. VV. (1999) A Green Vitruvius. Principles and Practice of Sustainable Architectural Design. London: James&James, University College Dublin, Architect's Council of Europe.

Jodidio, P. (ed.) (2000) Green Architecture. Cologne, New York: Taschen.

Kemp, D. D. (1998) The environment dictionary, London, New York: Routledge

Gauzin-Müller, D. (2002) Sustainable architecture and urbanism, (pp. 92-105). Basel: Birkhäuser.

Langston, C. (2001) Sustainable Practices in the Built Environment. Oxford: Architectural Press.

Rogers, R. (1997) Cities for a small Planet. London: Faber and Faber.

Ruano, M. (2002) Ecourbanism. Sustainable human settlements: 60 case studies. Barcelona: Gustavo Gili.

Thomas, R. (1999) Environmental design. An introduction for architects and engineers. London: E & FN Spon.

Vale, B. and Vale, R. (2000) The New Autonomous House. London, Thames and Hudson.



باحة السكن : نهج البيئة المعمارية في التعليم

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الملخص :

هذا يدل على ورقة ، من خلال المناقشات المتعلقة بالاستدامة والهوية الإقليمية ، ومن خلال سلسلة من دراسات الحالات التي وضعت في البرامج التعليمية داخل المدرسة ، أن باحة السكن أصلية بمثابة مركز اساسي للمنزل ومناخ منظم. المناخ نظرا لتشكيل لنوع معين من باحة السكن في مختلف الثقافات. في مناطق كثيرة من العالم ، وفناء وقد يعاد تفسيرها بوصفها واحدة من أقدم أشكال التنمية المحلية تشمل ما لا يقل عن ٢٠٠٠ سنة. باحة السكن إعادة تفسير يمثل مثالا بارزا ومصدرا للإلهام ، من حيث تحقيق التكامل على الصعيدين المحلي والعالمي على التقاليد المعمارية المعاصرة ، مع الفهم والتقنيات ، لخلق إنساني ، ومستدام ، والهندسة المعمارية في مواقع محددة. جزء من التحدي وتصميم فناء المنزل هو إيجاد والحفاظ على التوازن الدقيق بين الجودة المعمارية والاستدامة. في عملية التعلم ، فإننا كثيرا ما يدرس الماجستير والمهندسين المعماريين الذين الانتباه على منزل في هذا المثل الأعلى الذي تم إنجازه. ويبحث خلال تصميم فناء الأمثلة الفردية تقديم تحليل لرؤية كل واحد والطبيعة والثقافة ، والبيئة المبنية على الحوار تباطا. ونحن ملتزمون كما تقع الاستدامة ، وجزء لا يتجزأ من الثقافة ، والممارسات المستمدة تاريخيا. في السنوات الأخيرة ، وكلية الهندسة المعمارية في برشلونة كونت خبرة كبيرة في التنمية المستدامة ، وإعادة التفكير في الطريقة التي يمكن أن تكون البيئة المبنية تحليلها وتحويلها.

