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Designing a Residential Complex through the Sustainable Architecture Approach (Green Architecture)

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Abstract: Now a days as the population and immigration from villages to urban areas have grown for various reasons, life space has decreased from houses villas to apartments. Aside from the house crisis, there are more serious crisis like water and energy crisis. The limitations of energy sources have turned into fundamental crises throughout the world and buildings make up a vast part if energy consumption. By being aware if this fact, along with the issues of environment protection and reduction of air pollution of cities, the need of using sources and supplies in a better way are further brought up. In order to deal with these problems, a universal thought called 'sustainable development' has made since the last forty years and international communities have provided many strategies including changing approaches in lifestyle to complete it. Now with the ruling condition in the world and the country, it is appropriate to use nonrenewable resources in certain places and to think of providing energy through sustainable methods and also to attempt to prevent energy from being wasted. Therefore, Iran's traditional architecture which possesses exclusive features meets the climatic need of every region in addition to paying attention to the environment protection and aesthetic issues.

Key words: Designing a residential complex, sustainable architecture approach, green architecture, population, protection

INTRODUCTION

The applications of the concepts of 'sustainable and the purposes of sustainable development to reduce energy waste and environmental pollution in architecture has made a subject named "sustainable architecture". In this kind of architecture, the building not only adapts itself to the climatic condition of the region but also makes mutual connections with it. According to Richard Roger's words, buildings are like birds that cover their feathers in the winter and adapt them to the new condition of the environment according to which they adjust their metabolism.

Now a days, over the half of the population of seven billion live in cities. On one hand, the rapid growth of the world's population and on the other hand, the vast trend of city-dwelling cause increasing consumption of sources and supplies of the nature, destruction of the environment capabilities and the unsustainability of development.

The faces of cities, each if which had a different world in it, seek to vanish what it gave an independent identification to and produced this monotonous production for pre modern humans which resulted from climatic and structure limits on one hand and people's mass beliefs on the other hand. What made up the artificial space was the production of being in harmony with the features of the region. This connection made the production of an architect's thought be able to get going in the scale of characteristics and necessities which the local materials and the environmental conditions. On the other hand because of metaphysical beliefs in nature and its phenomena and the needs of keeping it as a bonus, the wasted was managed in a way that the life circle wouldn't be spoiled. Needless to say, the change speed was so suitable that the chance of experimenting and determining errors and then correcting them to keep the life structures as much as possible was possible. But the limits of the metaphysical beliefs were broken and man found one thing to be important, human brain and got witnessing in thinking and in an extreme way in doubt and believed in himself and freed himself, so much that he thought all he did to be right. It is interesting to know that the speed of these changes destroyed the possibility of measuring the feedbacks. With the help of using technology to make up the weaknesses and to consider it the best document to meet the needs, man made it legal to recourse to the nature as a source of providing needs extremely. This decreased the impressibility of architecture from the local and environmental features as some claimed all the

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architecture problems would be solved through the international architecture plan and Athens charter but nature and cities were being destroyed. The war between Arabs and Israel and the prevention of exporting oil to the West were the first sound of alarm. In fact what is called 'sustainable development' these days is the reform revision to modernism and tradition in order to get a middle way. Sustainable development is a development which meets the current necessities in a way that it won't reduce the capabilities of next generation in supplying the requirements. Based on all these suggested points, we try to explain the concept of 'sustainable design and development' and to make this belief to be proven by mentioning the strategies. It is evident that life, job, fun, rest and etc are all activities that are done in spaces designed by architects and since the power and weak points of a building will have direct influences on the world's ecosystem, architects have a very sensitive and important roles about it (Krygiel and Nies, 2014).

Thesis statement: Now a days, city resident's deal with many problems including air pollution of cities, loss of green space per capita provokes it. Inattention to urban policy towards the energy issue made energy waste spread from residential space to the levels of cities and since our urban energy consumption depends on fossil fuels, this phenomena has destructive effects on the environment (Masnavi, 2014).

Sustainable architecture or green architecture is a term which states sustainable architecture method or techniques for designs in architecture which are parallel with environmental approaches and have been made by the idea of respect for nature. As conservation of energy sources and prevention of environmental pollution and also the reduction of fossil fuel consumption and the use of clean energy as much as possible have turned into one of the most important plans in architecture and urbanization to the extent there are principles and rules imposed to it and architects and planners are made to obey them (Pei and Nahid, 2011).

In the sustainable development and so sustainable architecture subject, raising the issue that every building needs to interact with the surroundings is an evident thing but how to interact and the type of considered plans are discussable in this regard, the previous architect's correct use of clean energy like sun and wind in this territory with the exemplary skills in warm and dry climates did it and these days it is forgotten and destroyed by carelessness (Mehdi, 2013). Therefore, it is attempted to determine and update the forgotten strategies in designing the sustainable environment and to use them in designing a sustainable residential complex through the available technologies.

The international green architecture movement was introduced in 1990 amid the generation of the American architects institution, environment committee and the introduction of American Green Building Institution (Mehdi and Ehsan, 2012).

The guidance reference for the Standards of Green Buildings (USGB) exists and the parameters of green building in the US and several other countries have been recognized. Its main ideas are the use of materials consisting of a natural circle and also the use of effective sources and renews designs of some products and valuing natural systems to protect the quality of human life as much as possible, the appropriate use of lands are very important elements in green architecture (Baribeau, 2013). Buildings with different floors need sources for creativity and action, especially material, energy, water and land which are very necessary and valuable resources and the suitable use of them is a very important consideration in developing the advanced execution of building. Therefore, according to the global warming, the depletion of the ozone layer because of the use of different kinds of pollutants, the increase of the environmental pollution and the extinction of biological species make it more necessary to pay attention to environmental issues. Development as one of the biggest factors of changing the environment and construction as a big industry which spends 50% of fuel reserves on the basis of statistics, triggered the destruction of agricultural lands, soil erosion, the environmental pollution and jeopardizing people's health and hygiene and provoke the energy crisis. The increase of the environmental pollution crisis in middle of 1970's helped creating pro-environment groups and a vast concept under the title of "sustainability" was mentioned. The term "sustainable" was first introduced in 1986 by the world committee of environment spreading under the title of "countering the needs of the current era without jeopardizing the resources of next generations in order to deal with their needs". The green and sustainable trend in architecture has an ancient history and the examples are cavemen's understanding of directions and sides of the caves by the environment temperature or analyzing the principles of "useful, aesthetic, firm architecture" by Vitruviu's views, an architect of centuries BC which is still considered the general indexes of the sustainable or green architecture. The general main of the green or sustainable architecture is to reduce the damages of the environment and energy sources and the nature that is a building has the least incompatibility with its surrounding environment or in a vast scale with the region and the world. So, the sustainable architecture consists of a multi-value combination: aesthetics, environment, social, policy and designs and construction in harmony with the

environment. A good architect should consider several factors: resistance, sustainability, the structure lifespan and suitable materials. The concept of all principles if the green or sustainable architecture incarnates in a full trend which leads to the creation of a healthy environment.

In fact, the green architecture seeks to find a way to minimize the negative effects of the building on the environment. In this regard, the green architecture tries to use the energies from nature in buildings. stead of standing to it. Achieving such a goal is possible by obeying the simple principles and rules such as:

- Energy conservation
- Coordination with climate
- Reducing the use of new sources
- Meeting the needs of residents
- Coordination with the site
- Holism (www.phce.org)

MATERIALS AND METHODS

This study takes a close look at the dimensions and the subjects related to the discussion in a descriptive case method (residential project of Kosar in Iran and the office building of Council house 2 in Sydney, Australia) and seeks to look at the green or sustainable architecture from different aspects. The statistical society used in this study is residential complexes (tall buildings) in Tehran. In this study, two types of methods have been used in data collection, library and field method. In library method, books, essays, related architecture magazines have been used and in field method, data has been got by observing sites and visiting similar samples. In this study, inductive reasoning has been used to analyze and reach a conclusion. In this regard, first by observing and field study and analyzing domestic and foreign samples, we present models and methods to design and considered foundation in a residential complex through the green architecture approach and therefore, primary hypotheses have been proposed to choose a designing system and consumer materials and at the end we reach the final theory (proposed plan) through the primary hypotheses.

Data analysis

Building placement: According to the climatic situation and mentioned subjects in section two, the best placement of buildings is in Wester_Eastern extension and according to the disturbing wind in the western north to Eastern South extension, circulating for several degrees in vertical extension to the wind is the best placement for buildings in this residential complex.

Sunlight: The proper use of sunlight and division of internal spaces considered in the plan has put the lightning of the main spaces in the southern and northern directions and made the least use of the west and east light to provide light and internal spaces. Therefore, popping in the west and east directions is not forecast.

Designing the area: In order to supply the needed green space per capita, various plant covering should be considered. It is better to use conifers and vast_leaf trees in the edges to provide shadow and green coverings in all seasons. By the way using water and its flows in the project leads to making moisture and joy for residents and mass spaces in different points of the site.

Using sewage: In order to save and supply water needed for watering areas, water supply systems for cooling network ,water needed for flush tank, firefighting system and (non-drinking water) and also since the urban sewer pipe passes near the project use a refinery.

Making a parasol: In order to make a shadow, a parasol should be made for the windows looking to the sun and in order to reduce the effects of the sun in tge summer, a proper form proportional to the plan should be attached.

Photovoltaic system and solar water heater: In order to supply parts of domestic water heater and to provide the lightning if areas use photovoltaic system and solar water heater on the roof.

RESULTS AND DISCUSSION

Summing and providing strategies

General strategies: Selecting correct locations for buildings based on all provided cases and issues, through linear plans and making the ultimate use of light from the North and the South and not utilizing the light from the East and the West in the main and secondary spaces. Selection internal spaces properly by keeping public and private privacy. Making good interactions between the internal space and the nature such as: thoughtful guidance of light in daytime, good perspective, considering a yard and a balcony to have a direct presence in nature and the presence of plants in the space if possible, proper ventilation and. Using vernacular elements and familiar elements to make a sense of attachment in the space.

Designing public spaces to make interaction among families in the premises. Paying attention to the appropriate location selection of private spaces over

noisy places to suggest sense of comfort. Appropriate location selection of houses near the workplace or at least synthesizing these two in a distinct combination.

Suggested strategies for designing tiny spaces

Rooms: The functional features of rooms in designing houses should be paid more and formal attention to by gaining enough knowledge and precise evaluation of demands.

None of the features like area or the number of rooms can fulfill expectations and prepare proper situations for various residents. But the interaction of these features should be considered in the approach ruling on decisions and combination of the whole spaces of houses. The main objective of this approach is making a balance between the main indexes of selection and designing rooms and other house spaces in proportion to the resident's expectations and limit to the area left for the settler unit.

Preparing enough number of spatial chances in the house plan whcih should have the ability of making separate private privacy in separate time or at the same time, without leading to the reduction of the functions of spaces and mass or public domains.

Flexible and changeable designs of rooms by paying attention to type's facilities and furniture exploitable in common ways of the resident's lives. Avoiding clutter and similarity of rooms and the use of different types of rooms in plans of settler units in proportion to the situation and prescribed physical program.

Predicting necessary abilities in the form, size and way of placement and other features of stable and main elements of the rooms of the settler unit like door, window and closets on the basis of better understanding of different expectations of the goal segments and by considering the possibility of mobility in 5th functions of multi-purpose spaces.

The design of the complex is trying to use the potential natural energies to reduce consumption of fossil energy and mechanical load of machines. The best way to achieve to this goal is designing in harmony with the climate. The following features are also anticipated in the collection.

Central wastewater treatment plant in the South West part of complex for wastewater treatment of complex and producing water needed for irrigation of fountain and green space area. Gray waters including water used in sinks and rainwater will be collected in separate pipes and after recycling and purification will apply for irrigation of green space for washing area and flush tanks. Supplying by solar energy and solar panels on the roof:

- The use of solar lights in the area for lighting
- Applying geothermal energy
- Recycling
- Applying BMS smart system

Building management: Design green terraces for each dwelling unit as well as the designing green spaces in central terraces between units.

Designing the kitchen: Strengthening the role of a kitchen in spatial organization of houses through spatial combination of the kitchen with spaces like family room, dining room, living room and in order to maximize the ability of possessing the kitchen for actions like sitting, gathering, studying, talking, eating.

Aisles: Avoiding making narrow and tiring aisles in floors; the aisles which only play motion roles and have no openings in their paths and make people pass them quickly and reach the house. The routes of the main movements in a residential complex need to be short by considering the point that how many times the distances between the main spaces of the building should be passed, the necessity of shortening these distances will be clear. Therefore, the access distances should be short as much as possible.

Open space: Making an open and green space in height in every floor or among several floors in a common way, through this strategy the resident's access to open and green spaces is facilitated. Selecting a height proper to the bodies in spaces like yard, backyard, roof, balcony, light and patio as a pause and view space.

Increasing the quality levels of open spaces by planting trees and making green spaces and considering ranges appropriate for static social activities (sitting, gathering by the residents).

Rehearing the roof space to increase spatial expansion, view and lightning. Reducing undependable spaces like the spaces from the area that are roofed and make the supervision by the families in their residence floor on their children difficult.

Separating the different performances of open spaces for example considering some parts for children play, some for exercise and running and some for sitting and talking by the residents.

Social spaces: These spaces play fundamental roles in maximizing the familiarity and interaction between the residents. Now that living in apartments make distances between humans and nature, making open and green spaces with architecture abd pretty landscaping is very useful in providing situations for interactions. Also by making public spaces at the heart of the building and creating a part for gathering in evenings could promote interactions and relations between people.

Table 1: Results of parking forecast

Variables	Values
Name of the space	Arena/number
Resident's parking	320 numbers
Guest's parking	100 numbers
Space for children play and green space and emergency access route	10000 m^2
Main entrance	200 m^2
Conference hall and entrance lobby of each block	500 m^2
Powerhouse(mechanical room)	2400 m^2
warehouse for the number residential units(the least area of each warehouse unit)	4 m^2
Two-bedroom housing units	80-100 m^2
Three-bedroom housing units	120-160 m^2
Four-bedroom housing units	180-200 m^2
Four or five penthouses	450-500 m^2

According to the previous studies, it is necessary to consider the effective factors in designing so that three main scales will be determinable in classifications of effective human-environmental factors in physical designs of complexes.

First: The scale of external links of residential complexes with the surrounding environment; in this scale, the most important issues are making continuity and social physical connection of complexes with the surrounding environment and making identification and local ID.

Second: The scale of internal connection complexes and contacts beyond residential complexes in this scale, relations and proportion of internal spaces of the house and coordinating them with the culture and resident traditions of the residents are of much importance in designs. Aside from that, climate and saving energy in all this scale, the placements of buildings and designing areas of complexes, the scale in the vicinity of settler units are all important factors (Coates, 2011).

Physical program: According to the new detailed plan in Tehran, this estate is located at R122 arena and based on the land area (15000 m^2), the legal occupancy level for this land is 30% in this regard, the legal residential occupancy level in each floor should be considered 4500 m^2. Now, the devices that should be considered for designing are as follows.

Designing at lwast 5 building blicks with the height of 9 residential floors or 4 blicks with the height of 12 residential floors. Designing a parking on the basis of building national requirement criteria (for residential units under 150 m^2, a parking and for residential units above 150 m^2 two parking's) and no parked car in the area and guest parking forecast in a part of the area Table 1. Therefore, the complex possesses 4 residential towers consisting of the ground floor+12 residential floors as follows. The ground floor consists of; entrance lobby, conference hall, mechanical room of the complex, room of the building's manager, vertical contacts (staircase and elevator).

Residential floors consist of residential units and vertical contacts (staircase and elevator). A common basement between two towers, an independent entrance for parking, warehouse and powerhouse and sport space The space of refinery of the sewage in the South of the site in order to provide non-drinking water (watering trees and green spaces, the water needed for firefighting and the flush tank of WC and...).

CONCLUSION

The techniques used in this architecture consist of many modern concepts in sustainable architecture. Therefore, it has been attempted to study the effective causes and reasons of designing a residential complex through sustainable architecture approach (Green Architecture) and to provide strategies for using available sources and building a correct culture in the field if management of energy consumption. In this study, the data collection method is based on field and library data and the use of essays and theses related to the subjects.

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