

Research Article

Designing a 100-unit Residential Complex with Public and Mental Health Approach

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Abstract: The present study first discusses different climate conditions in Iran and traditional methods of architecture in these places as well as importance of identification and evaluation of these methods. Then, designing methods of residential complexes on the basis of components and conditions of the favorite climate will be closely taken into consideration. Finally, the impact of different methods and techniques of designing on society's mental and public health will be examined. Accordingly, designing a 100-unit residential complex with open and local green spaces, dense neighborhoods with mixed land uses, physical and visual access to the nature, creation of cultural-social-business and entertainment opportunities adjacent to the residential complex, reducing car dependency in combination with walking, strategies of improving public health in designing residential complexes and architecture in Yazd city are used. Consequently, a few strategies are provided for enhancement of citizens' health and development of this type of architecture.

Keywords: Citizens, climate conditions, designing residential complexes, mental health, public health

INTRODUCTION

Due to its very diverse limited conditions in different seasons, in Iran, classical architecture has invented reasonable solutions and methods for providing a peaceful life for man. The Iranian classical architects through benefiting from their experience and conditions they were in have strived to approximate the environmental characteristics of buildings as much close as they could. Today's, using modern technologies have added to methods of designing buildings in a way that life without these technologies is hard to ignore. Reusing past methods is pretty impossible and the past lifestyle would be unable to support today's life. However, investigating in this regard seems necessary. It should be mentioned that benefiting from traditional architecture never means a duplication of the past but the logic behind traditional forms must be learned and used (Farifteh, 1987).

In most areas in the world there are regions that identical climate exists, though in spite of similarity some specific local conditions make many big differences, which are critical in architecture and an architect needs to consider them. Therefore, for designing in any region such points must be explored and the designing plan should be prepared that will be in accordance with the local climate. Considering these conditions, specific climate factors like temperature, relative humidity, intensity and rate of annual rainfall, intensity and angle of the sun, are among the most

significant factors (Olgyay, 1981). Wind speed and temperature in thermal exchange through transfer depends on each other. Continuous flow of air into indoors in contact with human's body causes evaporation of sweat and creates a sensible coolness on the skin surface (Olgyay, 1981).

Lack of air flow in the environment, increases temperature and humidity and brings a stifling environment for the residents and temperature and humidity inside the building maximizes compared to outdoor. Therefore, direction and way the building is founded play a critical role (Moshiri, 1986).

The used materials in side walls possess a considerable high thermal capacity and good thermal exchange. The other building elements matters in traditional typology is wind towers that wind contacts them in four directions and direct it into the building. As a result, the warm air is lighter than the outside air and the cold air goes downward and enters the room. Because of repetition of this process, a desired air stream flows that creates a relative comfort zone (Negro and Stafferi, 1984).

About ceilings, roof should be Flat and available and it is intended that the slope is so steep that at time of irregular rains, the water is drained quickly. Ceilings should come out of the side walls to the size of the junction of walls and ceilings are not exposed to the rain and wind. Openings shall be designed to allow maximum air flow and wind can be used to touch directly with the residents. It is better to build a shelter

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above the windows that prevent from direct light entering into the residential areas.

One of important points are green spaces that are regarded as a part of façade and retaining visibility of the ground floor and as the ivy climbs walls and greatly contribute to natural ventilation of the environment and beside tree and waterfront create a pleasant spaces for the residents. This issue not only communicated with form and size but also with local materials as well. Using the central courtyard is the focal point of organizing space that generally has a rectangular and regular structure.

In designing buildings, use of different colors highly affect the public and mental health. For instance, using color white for a special element impose the spirit of freedom and liberty, though color gray individually stimulates fatigue, depression, coldness, despair and hopelessness. The glass surface of openings should be minimizes as much as possible and in staining windows frame, dark color have to used in order to absorb radiation emitted by the surface and only light enters inside areas. Materials should be selected from wood of trees grow in warm and moist areas or dark aluminum do not decay due to high humidity (Negro and Stafferi, 1984; Di Giacomo, 1979).

Increasing urban expansions and transportation vehicles as well as deterioration of the environment leave detrimental impact on environmental-physical structure of the city and finally on citizens' physical and mental health. Lack of security in urban and residential places, social collision in urban locals besides extreme dependency on cars and less mobility in different social classes is among urban environmental chronic diseases. Therefore, identification of unfavorable effects of urban and housing development on the public health and improvement of healthy urban life sounds crucial (Badland and Schofield, 2005).

WHO also reports improvement of residential place in addition to immunization of individuals against diseases as a definite factor for providing man's health. According to WHO, besides variables of age, sex and inheritance, factors like lifestyle, local-social structure, work and living place, general socio-economic and cultural conditions and the environment are effectual on the individual's health. Low quality of urban environment, air pollution, mismanagement of municipal waste, noise pollution, as well as harmful impact of toxic chemicals and heavy metals such as lead and mercury can be threat for metropolitans' citizens. Moreover, the effect of designing and visual quality of the urban environment on people's behavior and mental health have been affirmed in studies of environmental planners such as William Whyte, Opliard, Kevin Lynch and Alexander. High quality urban spaces, is a ground for social interaction and appearance of personal skills and abilities and attract

people, professions and even wild life and birds in macro and micro scales of urban spaces (PPHTSG, 2005).

Ceragioli-Nuccia Gorgio is one of 19th century architects that introduced the idea of presence in the nature and landscapes considerably decrease citizens' mental and life stress. He, in designing the central park of New York designed independent paths for slow and fast on foot and ride and through merging the park in the metropolitan, left the unspoiled natural view and order for maintaining its paradox with the city. Furthermore, noise pollution raised from cars in urban spaces causes a decrease in efficiency in near spaces and chronic headaches. Some investigations proved that children who are exposed to noise pollutions (especially residents of buildings close to highways) are faced with mental development and mental unhealthiness.

As it can be seen, it is mandatory for through use of a country natural resources and balanced distribution among the population center, preparation of residential complexes plans happens in form of the land comprehensive plan. In other words, specification of borders of different population centers such as small, medium and large centers should be in form of a comprehensive plan and in relation to each other (Ceragioli and Comoglio, 1985).

Indeed, the urban spaces and social situations are intersecting points of formation of social capital. Queen observed that when configuration of local maximizes non-verbal communications by residents, rate of crime decreases. Children are under better surveillance and people show more inclination and satisfaction in interaction with their surrounding public environment (Queen, 1992). Also, Sullivan *et al.* (2004) indicated that presence of green spaces is one of approaches for increase of unofficial communications and social happiness in the locals. Moreover, points like architectural designing of landscapes, renovation and improving existing buildings around urban spaces and different urban planning and function, in addition to prevention and decrease of crime will be critical in increase of security of urban spaces. Therefore, environmental designing play an important role in providing safety and public health.

Various studies in field of type and form of the building, considers several subjects like quantitative and qualitative dimensions, social aspect of building, different forms of plan, evaluation of different forms of plan, qualitative values, the home entrance, dining room, kitchen etc, the problem of children and adolescents, necessity of people interference in managing the town, spatial territory, urban centers, pavements and supportive activities. Pictures that is created in the observer's mind, in fact is an outcome of a mutual relationship between landscape and its environment. The environment manifests itself through its unique landscapes and a relationship forms between



Fig. 1: The beautiful appearance of a city



Fig. 2: Building and classical architecture in old city part, Yazd

him and his previous experiences. The observer chooses some visual factors of the environment, mentally organizes them, assign them special meaning. This mental image m then, intensifies the observing factors and put some limitation on them.

It is accepted that any urban place with mysterious features of twisted streets, with very distinctive visual elements is worth to be seen. In fact, the Fig. 1 of a city is no necessarily a fixed, precise, simple and organized set of characteristics, however sometimes it may be, we do not mean that an urban appearance should be pretty visible, plain and too simple to be colorless and a rapid view is enough to be understood.

Evaluation of characteristics of any urban environment in a way that it is counted as exclusive example sounds hard. City with no colored appearance will be so tedious since only few natural examples are the same. Though, full chaos without any sign to be inferred is never pleasant. One of the most salient factors in formation of a new project is the landscape and neighborhood conditions for creation of live spaces. How inner spaces communicate with outer landscapes will add to quality of life or spatial function.

A new residential complex cannot be only a place for living, eating and sleeping such as a dormitory. Rather, a residential complex is obliged to afford its residents all required urban services in smaller size and through providing facilities guarantees an ideal and relaxing life for residents. This wellbeing and facilities in much extent depend on residents' access to professional, educational, health, mass communication, transportation, markets, stores, parks, green spaces and finally industry facilities.

Structure of architecture in Yazd province at least displays two features, one continuous development in accordance with all urban elements and spaces in the old city and two hasty and irregular developments in the new city. The continuous formation of the old city took place within a long period and based on thousands

of year experiences., however, the new city is the product of growth in recent two decades. Both parts, though posses different values and textures. The old city is integrated and regular, but the new city is integrated and scattered. In the old city some specific elements stand as the city identity, however in the new city such elements are absent. In spite of severe deterioration in the old city some parts have maintained their visual values yet, but considering living and transportation, this part is suffering various problems.

Pass ways are narrow and hard to access and there are no appropriate urban facilities and constructions. While, the new city has lots of wide streets and urban facilities and constructions, they bear lack of visual value. Due to geographical location of city Yazd, there is a very dry and arid climate. Little precipitation with very high evaporation, humidity is low temperatures is high and extreme temperature fluctuations have caused a situation that the summers are very hot and winters are cold (Fig. 2) (Typology of Housing and Rural in Yazd, 1988).

In order to identify the natural environment ecologically, first the inanimate elements of the ecosystem in the region must be recognized, then the live creatures should be identified. Finally, the ecological analysis of the region will manifest how either live or inanimate elements act and react in form of the local ecosystem.

Since the major climate factors affect comfort include:

- Radiation
- Temperature
- Humidity
- Air current

And the chief purposes in climate design in Yazd city according to the analyses are:

- Decrease of the effective solar thermal energy on the building in warm days and using from solar energy in cold conditions
- Reducing building heat exchange with the outside environment and benefitting from daily temperature fluctuations
- Increase of humidity and use of evaporative cooling
- Reducing the effect of wind on the building

It is evident that reaching the above goals will be possible with different methods. After considering the key aspects the best approaches for the favorite plan must be chosen. In following, a few approaches as "architecture decisions consistent with the Yazd climate" will be provided to achieve each of the major purposes.

The effect of solar radiation on the temperature inside a building depends on the used materials in

Table 1: The rate of annual fall in synoptic station of Yazd during period 1963-2002 in term of millimeter, Source: weather almanac

Index	January	February	March	April	May	June	July
Rainfall	11.9	8.7	13.6	8.0	4.3	0.3	0.3
Index	August	September	October	November	December	Annual	
Rainfall	0.1	0.1	1.4	4.5	8.9	62.1	

Table 2: Rate of temperature in synoptic station of Yazd during period 1963-2002 in term of centigrade, Source: weather almanac

Index		January	February	March	April	May	June	July
Temperature	Average	5.8	8.5	13.3	19.3	24.7	29.9	31.7
	Minimum average	0.6	1.7	6.5	12.2	17.3	22.1	24.1
	Maximum average	12.2	15.4	20.5	26.3	32	37.6	39.3
	Absolute minimum	-14	-10	-7	0	2	11	16
	Absolute maximum	27.0	28	32	38.0	41	44	45.4
	Arid temperature	5.4	8.4	13.3	19.6	25.2	30.7	32.4
Index		August	September	October	November	December	Annual	
Temperature	Average	29.8	25.7	19.2	12.3	7.3	19	
	Minimum average	21.7	17.2	11.3	4.7	0.4	11.5	
	Maximum average	37.9	34.2	27.4	19.9	14.3	26.4	
	Absolute minimum	12	2	-3	-10	-16	-16	
	Absolute maximum	45.6	42	36	30	27.4	45.6	
	Arid temperature	30.5	26.3	19.4	21.1	6.9	19.2	

Table 3: Rate of radiation and sunny hours in synoptic station of Yazd during period 1963-2002 in term of millimeter, Source: weather almanac

Index		January	February	March	April	May	June	July
Radiation	Sunny hours	185	205	211	240	296	341	345
	Rate of radiation	3.29	3.34	3.96	5.06	5.62	5.71	6.07
Index		August	September	October	November	December	Annual	
Radiation	Sunny hours	343	314	283	221	198	3188	
	Rate of radiation	5.49	4.56	4.22	3.76	3.34	4.53	

exterior walls and type of used materials also greatly affects the residents' comfort zone. Increase of the outside temperature is the reason for warming the outer surface of the exterior walls. This effect is the same around direction of walls has no effect on the amount of heat received in this case. Temperature fluctuations of outer surface to inner surface are a variable of thermal resistance and capacity of the wall materials. As capacity and thermal resistance of a wall intensify, fluctuation in inner surface temperature decreases and time to reach the maximum and minimum internal surface temperature will be delayed compared to outer air (Olgyay, 1981). Decrease of temperatures fluctuation of inner surfaces of a building in comparison to outer surfaces correlates with thermal resistance of materials is used in the walls. But, any delay in making maximum and minimum temperature of inner surfaces compared to time of outer spaces is highly dependent to thermal resistance and used materials in the walls (Moshiri, 1986).

Overall, the ideal inner condition of physical comfort is created in the building that materials are used in living rooms, a place for daily interactions, are made of heavy materials and walls in bedrooms and other parts of the house are a place for night usage, should be made of light materials. The thermal resistance of a wall consists of the amount of resistance that wall show against thermal exchange from one side to its other side. Therefore, fluctuation of temperature of inner surfaces of a building depends on thermal resistance of materials in those walls. Less thermal conductivity coefficient in materials causes higher

thermal resistance in materials and consequently lower heat is conducted from that wall. Still air is the best thermal insulation and generally, light building materials having pores and thin air layers possess huge amount of thermal resistance (Table 1 and 2) (Negro and Stafferi, 1984).

Since city Yazd is located in latitude 5/31° north, it is in the area of large and very large radiation. Radiation level in the area is to extent that even in the coldest times of year, direct solar radiation is intolerable. This, therefore, provides a good potential for exploiting solar energy either actively or inactively (Table 3).

Planning method: The current research was conducted in Yazd province, city Yazd and in a local had a arming and gardening application. This local consists of 100 residential units. The plan area was designed with total area 11575 m² with 100 residential units for the middle class of the society. In this plan, the purpose was through respecting Yazd's culture, traditions and rituals plan a complex that coexists with Yazd architecture and its harsh climate.

The study sight is placed in Yazd province, city Yazd in north-south (to west) path of Mohamad Reza Paknejad boulevard. Due to low traffic and car speed, the car entrance of the site was determined in Street 14 from northwest direction. The entrance for pedestrians was from east Blv. The reason to so doing is presence of bus station, easy access to public transportation and shopping centers. However, a second entrance was determined for emergency operations, ambulance and

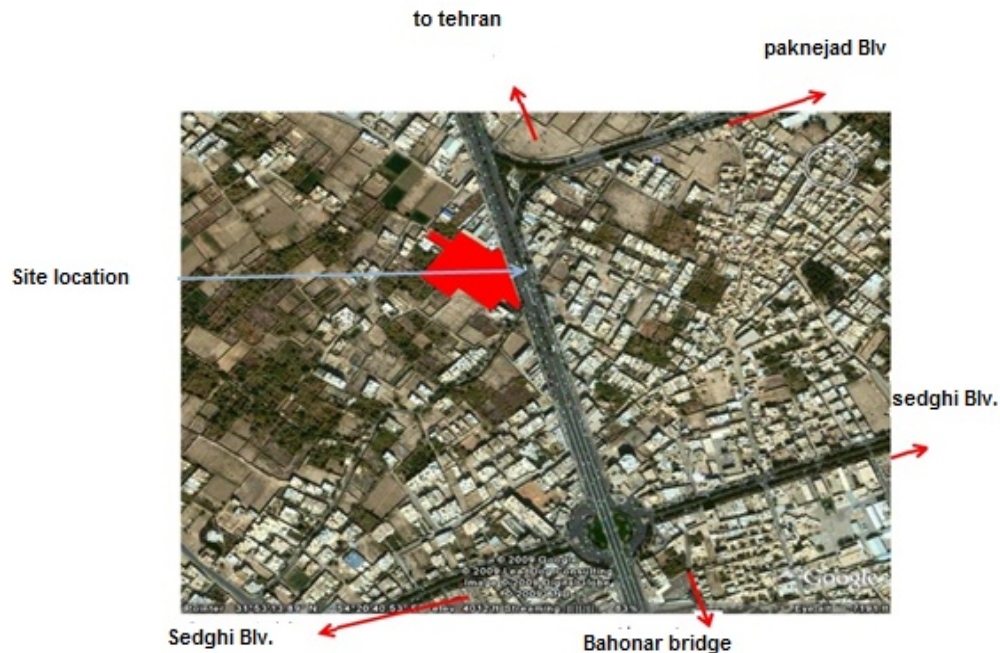


Fig. 3: Map of the site location in Yazd

fire and other services. The study sight ends to Street 14 from northwest with 12 m wide, from east to 45 m Blv. and from south to neighborhood buildings.

The site is a rich site in having a view from inside to outside (Fig. 3). Presence of gardens and farm land in the north and northwest and south and southwest as well as streets and Bahonar Bridge that are important urban elements confirm this quality. Indeed, it is a strong point for a desert city that could greatly add a visual depth to eastern open space of the buildings and causes an integrated environment with outside. This privilege in warm seasons through creation of micro-climate in gardens and farms brings a cool environment, therefore, with inspiring the Yazd allies and the Yazd architecture logic in addition to applying classic architecture and understanding climate conditions, an integrated texture could be achieved to properly fit into Yazd urban texture (Urban Discussions and Methods, 1980).

The residential units in this plan were 1, 2 and 3 bedrooms. Three units were 3 bedrooms, two units in the ground floor and one in the first floor. Two bedroom units were 69 ones, which 23 units were in the ground floor, 23 units in the first floor, 15 units in the second floor and 6 units in the third floor. Also, two units were duplex. The three bedroom units were 18 that 2 units were in the ground floor, 5 units in the first floor, 4 units in the second floor, 3 units in the third floor and 2 units in the fourth floor. Totally, 90 units were designed. area of the ground floor, first floor, second floor, third floor and fourth floor were 3500, 3700, 2500, 1000 and 250 m², respectively. The total

area of whole building was 10950 m². In this complex, some commercial and recreation spaces were individual as follows:

- Multipurpose stores
- Green spaces for children playing
- Coffee houses
- The child whereabouts

Also, in this plan it was aimed to reach the following general purposes:

- Respect to Yazd architecture and urban texture
- Respect to Yazdi peoples' traditions and culture
- Respect to the nature and Yazd climate
- Establishment of residential spaces for the middle class
- Geometric design

The issue of movement was another problem must be considered in the plan. This was appropriately satisfied through passing allies with diverse designs, moving beside water spaces, creation of green spaces in path of central courtyards and connection of all allies and paths together, which incline each individual to move through these tracks. Hearing the water sound which is one of significant Yazdi architecture is founded via various waterfront and use of cement and bricks as foundation materials in facades besides designing spaces full of peace at heart of the city were some other advantages of this complex.

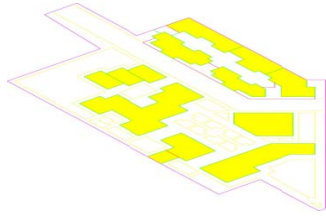


Fig. 4: Map of the first etude for combination of volume in the plan

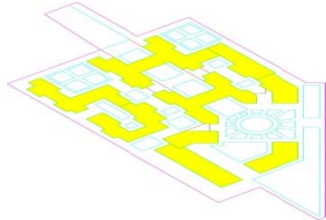


Fig. 5: Reviewing the first etude for combination of volume in the plan

As it can be seen in Fig. 4, during the designing process, first an etude was prepared for the combining volume in the plan, then according to the existing facilities and conditions this etude was corrected. Figure 5 and 6 are presented here.

The next important point is the place of the building. In this complex, all lines are connected together in a way that the principles of continuation lines of designing are used, but the place of tower the angle volume is approximately broken up to 130° is broken. However, due to long sides of this break the circular tower is used as the joint and cause of turning in this place. Because of long sides of the horizontal angles, they are shown elevated, which could be regarded as a good urban symbol for this complex and strengthen the connection of this break. If the hypothetical line is drawn from center of tower to center of square, it will exactly locate in front of the Qibla. The designed models for the complex are represented in Fig. 7.

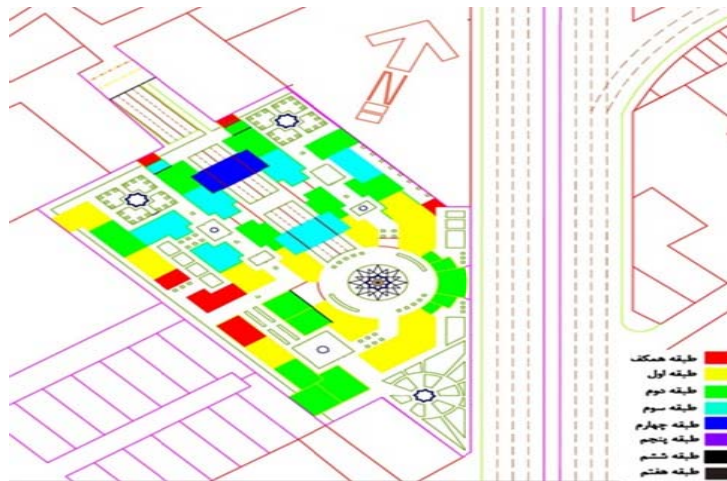


Fig. 6: Final composition of volume in the plan





Fig. 7: The designed models for 100 unit complex plan

CONCLUSION

Urban and building planning can be a cause of physical and mental health when they precede on the basis of combinatory and holistic appearance besides an amalgamation of environmental health experts in one hand and urban planners on the other hand. Urban planners and designers are required to hold joint workshops with general health experts and transportation professionals in the process of making decision about urban environments designs in order to the created urban spaces contribute to enhancement of mental and physical health of citizens.

Therefore, the following results are obtained in the present research:

Respect to Yazd architecture and urban texture: In the historical texture of city Yazd the spirit of times could be felt in a way that through passing old allies and watching high mud and brick walls remind the observer the ancient time has been compromised with Yazd city as a whole and historical, cultural climate context as well as people lifestyles. The historical texture of Yazd is one of connected architectures, which combine all architecture elements and residential units (Yazdi houses). This has created consequently; an integrated texture has been maintained so far.

Respect to traditions and culture of citizens: From thousands years ago up to now, Yazd has introduced great athletes, politicians and religious scholars. House of worship (Dar-al Ebadeh) is one of many designations Yazd has been named with and leaves a direct impact on their private life and keeps the privacy in full support.

Respect to the nature and climate: As it was mentioned earlier, the problem of arid climate in Yazd has never been separate from architecture issues and civil lives. Using climate approaches in architecture designers, creation of a corridor for favorable winds and directing them into the spaces, using materials with high thermal resistance and low thermal exchange coefficient, making a humidity by use of waterfronts and shadows without any change in size and façade, creation of micro-climate and a comfort zone in the complex via trees and green spaces for resistance against this climate were included in the present project.

Building a residential space for middle class: The residential units in this project were appropriate for the middle class and average income employees. It has been stroked that the complex stands as a good

representative of dwellers either from size and combination of plans or facades and compositions.

Geometric composition: The geometrical composition of this complex is pretty evident in complete application of lines of the walls which are clear in the projects and use of square as an urban element for pedestrians in the complex not as a space for cars, using central courtyards as symbols of Yazdi houses and classical architecture all are aligned with each other that this creates some nodes for connection between elements of volume. Another interesting point in this complex is the small garden puddle located in the north and different service, sports and recreation spaces are organized. Putting all of these elements together a classical view of Yazdi houses comes to mind that is built in a larger scale.

RECOMMENDATIONS

Of solutions for enhancement of physical and mental health through planning and designing, the points below are noteworthy:

- Physical activities and walking are health patterns of urban life that designing pavements, on foot shopping centers and malls as well as bike routes reinforce them.
- The new patterns of urbanism and designing residential locals like modern, modern-traditionalism, naturalism, design based on public transportation network and designing walk-based neighborhoods are among the considerable approaches in increase of public health, which can be taken into serious consideration.
- Complex and compact patterns of land uses lead to variety of activities and population density in urban spaces and activist.
- Attention to issues of security in urban spaces through street lighting and planning of life continuation in open spaces at quite hours like midnight hours can guarantee presence of citizens in these spaces.
- Increase of social interactions and communication with neighbors through proper designing strategies such as planting, landscape architecture in the neighborhoods are effective on social ties.
- Designing of civil and public spaces that display social and civil communication and through attracting public participation in addition to contribution to managing the society, will assist social happiness and commotion.
- Designing appropriate aesthetical spaces and street landscapes encourage citizens to attend these spaces regularly.
- Designing residential complexes in relation to natural landscapes and renewable energies which with sufficient diversity and flexibility welcome presence and activity of different groups of residents and provide them with different areas of activity.

REFERENCES

- Badland, H. and G. Schofield, 2005. Transport, urban design and physical activity: An evidence-based update. *Transport. Res. D Tr. E.*, 10(3): 177-196.
- Ceragioli, G. and N.M. Comoglio, 1985. Note introduttive alla tecnologia dell'architettura. CLUT, Torino.
- Di Giacomo, D., 1979. *Tecnica Dell, Architettura Tipologia Strutturale*. Politecnico di Torino, Ed. Gollardica-Pisa.
- Farifteh, J., 1987. Desert, climate classification systems. *Center of Desert Researches, University of Tehran, Iran*, 20: 112.
- Moshiri, S., 1986. Politecnico Di Torino Facolta. Di Architettura Cattedra Di Tecnologia, Elementi Costruttivi in Ambiente Caldo-Umido Bandar Abbas.
- Negro, A. and L. Stafferi, 1984. *Tecnologia Dei, Materiali, Da Costruzione*. Eezionni Liberia Cortina, Torino.
- Olgay, V., 1981. *Progettare Conil Clima, un approccio bioclimatico al regionalismo architettonico*. Padova franco muzzio editione.
- PPHTSG (Promoting Public Health through Smart Growth), 2005. Retrieved from: [www.smartgrowth.bc.ca/downloads/SGBC_Health % 20 Report % 20Final.pdf](http://www.smartgrowth.bc.ca/downloads/SGBC_Health%20Report%20Final.pdf).
- Queen, L., 1992. *The Theory of Good Shape of a City*. Translated by Hessuen Bahreini, University of Tehran.
- Sullivan, W.C., F.E. Kuo and S.F. Depooter, 2004. The fruit of urban nature, vital neighborhood spaces. *Environ. Behav.*, 36(5): 678-700.
- Typology of Housing and Rural in Yazd, 1988. 4th Edn., Ministry of Housing and Urban Planning, No. 98.
- Urban discussions and methods, 1980. *Geography*, Ministry of Housing and Urban Planning. Center for Urban Planning Studies and Researches.