Investigation for Spatial and Physical Factors of Open Areas in Residential Complex of Apadana Regarding the Relationship Improvement between Internal and External Residential Areas

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Abstract: *Residential open area provides light, internal spaces brightness and natural ventilation as well as is considered as an opportunity of more relation with nature and a place for social interactions. It's an opportunity to promote performance of internal space and relationship to external one regarding limitations of internal space of residential units. Therefore, revision and recognition of status quo of open area predisposes more conscious design for open areas and landscapes of residential areas. Since open areas in residential complexes (RCs) can respond crucial demands of users and play a major role creating desirable residential area. Therefore, we practiced here to evaluate spatial and Physical factors for open areas in ApadanaRCin order to improve life quality within RCs. The method for this paper is survey and is of explanatory- analysis kind. 325 resident household were randomly sampled. Results were analyzed using descriptive and perceptive statistics. SPSS 18.0 was applied to all analyses. Data analyses indicated that 50% of studied units evaluated the quality of open area as moderate, 48.8% desirable and 0.6% undesirable in Apadana RCs. Finally, certain suggestions have been offered in order to expand these areas qualitatively and quantitatively emphasizing spatial and Physical factors and relationship between internal and external areas.*
Keyword: *Residential Complex, Open Space, Physical and Spatial Factors, Apadana.*

I. Introduction

It's perhaps can't clearly be expressed that RC is a function emerged in 20th century within cities, but obviously this function has changed during that era such that resulted in creation of new and different concept within architectural functions field (Lai, 2011; Glaeser et al, 2006). Undoubtedly, life quality in bulky, overpopulated and monotonous complexesnot only accompanied sense of alienationfor Eastern people (who used to live in houses with a yard, vast balconies, and luminous area)but also for all residents of cities habituating for the first time in these complexes (Smith, 2014; Gkartzios& Scott, 2013).They are products of living in 20th century based cities. They basically have been unimaginable prior to fast overpopulation, industrial revolution, rural migrations to urban areas, increasing prices of lands and dwellings,mass production and prefabrication. They were inevitable to live inside after world war particularly during mid- decades of 20th century (renovations after World War II) (Hong et al, 2014). For this, what is considered as superiority criterion for complex design compared to others is nothing more than accomplishment rate of each design to decrease this sense of alienation and increase ownership feeling and restoration of individual characteristic of each residential unit.Since residential open areas are parts of artifact environment occupying the volume between constructed framework and can be composed of natural and artificial elements with beautiful, fascinating and desirable view (Anderson, 2013; Hennessy &Patterson, 2012). They make fixation drawing the attention of people and environment vivacity. Open areas of RCs are can meet users' demands and play a role creating a desirable residential area (Atkinson-Palombo, 2010). Thus, here we practice to evaluate open areas spatial and Physical factors within RCs (Mortensen et al, 2014).

II. Residential open area (ROA) and its Physical and Spatial elements

Residential open areas (ROAs) are referred to one or more organized, ordered and arrayed areas located among constructed residential surfaces and make a basis for human activities and behaviors. Open area designing is the art of combining open area to behavioral mass, human memorials, and citizens' impression out of their living environment (Cerón-Palma et al, 2013). ROA within urban elements hierarchal is a barrier between private (house) and public (urban open area) areas and form separation line between these two as a

transmission and middle area. It also allows for both physical and psychological movement through public and private areas (Chaskin et al, 2013).Spatial and Physical elements of these areas are including sidewalks, motor ways, landscape, playgrounds and etc. whose design and array should be performed observing stability principles and ecological planning in addition to general design of the area (Temelová & Slezáková, 2014; Mattingly, 2012).

III. Necessity and significance of within RCs

Dimensions of residential units internal areas in general and especially for certain classes of the society tends to incline. Most of current life needs aren't met within limited private space of residential units and naturally overflows out of this space (Ibem & Amole, 2013). Then the semiprivate, semipublic and public spaces become significant and seriously applied. Since activities are performed within open areas, diverse activities may be allowed to emerge creating desirable spaces resulting in residential areas vivacity (Sengupta, 2010). Certain advantages of application of residential open areas are:

1. Securing them via bodies by creating sanctum, hierarchal and climatic circumstances preservation
2. Increasing social interactions and recent constructions mixed to traditional identity and stable pattern
3. Enjoying reasonable level of leisure time facilities, traffic and other urban services fit to RC
4. Establishing Physical relationship through domiciles and their surrounding contexts and their direct effects on RCs view

Examples of applying patterns of internal and external areas combined to each other within RCs
1.   Karow residential complex in north eastern Berlin

Design for RC of North Karow by Charles Moor and his colleagues contain 500 residential units(Dutton,2000). Open areas of RCs created by building bodies are significant ones that are being included in a series of vacant and occupied spaces forming whole city. Open areas have been created with identity and correspond to its performance when combining closed and open areas. It's clear that private sanctum for residential units are being created through combination of building masses and open areas. Private pen areas and/ or public paths have been constructed using building bodies within this design (Fig. 1).

Figure 1. The pattern mix of open and closed spaces, a residential town of Karow in the northeast of Berlin
(Dutton, 2000)

2.   RCs onLos Angles, Playavistain of US

Moor and his colleagues have provided another plan related to Playavista of LA including 11750 residential units within which business, administrative, education and open areas are placed in residential context so that residents have access to them easily (Fig. 2). Designer had noticed hierarchy of open areas formed by building constructions from one hand, constructions visual highlight to signify open areas on the other hand(Ojeda,2004).

Figure 2. The pattern mix of open and closed spaces and residential complexes in the city of Los Angeles, Playavysta

3. RCs of Savigney Le Tempel in Senart of France

As a medium heighted and high density project, AlianSrafti has designed 88 residential units for low income classes on the corner of Pairsurban and suburb areas. The street has been changed to a public element that exhibits residents' diversity through highly diverse visual experiences (Fig. 3). It also provides an opportunity to show personal interests in public places leading to collective identity expansion (Goodman, 2003).

Figure 3. Residential of Savigney Le Tempel in Senart of France

IV. Case study

Apadana complex located at west of Tehran, region 5. The area is 304.407 m. It's bounded to Sheykh Fazllolah highway on the north, Ekbatan 3rd phase on the northwest, 1st Bime lane on the southwest, and from south to south west to barren lands of Fakoori and Apadana (belonging to ministry of defence). All buildings of the complex include 2901 residential unit having 2 or 3 bedrooms and divided to 6 phases (Table 1).

Table 1.The town units based on phase, block and entrance

Units	Entrance	Block	Phase
488	28	8	1
510	30	8	2
459	27	7	3
512	30	8	4
512	30	8	5
420	24	7	6
2901	169	46	Sum

Apadana complex is one of the wealthiest districts of Tehran regarding landscapes. An area approximately 8 m width along with concrete walls has been tree planted all around the complex. Inside the complex, the space between blocks and cement pavements is decorated with lawn, flowers, trees and shrubs. Therefore, the area can be as a big park for residents.

V. Research Method

This research is of explanatory- analysis survey kind. 328 households of Apadana complex were sampled based on Kukran formulation. Questionnaire and interviews containing closed items and checklist were applied to collect observations. Field and physical observations, taking photos and pictures of different areas includeother sections of data collection system. Data analysis was performed using explanatory and perceptive statistics. The relationship between certain demographic qualities and respondents scores was investigated applying X2 test. SPSS 18.0 software was applied to all statistical analysis. The relationship among ranked data was evaluated via Friedman and Wilcoxon test. Study samples were households whose habitation exceeds one year. Questionnaires consist of two sections: social- personal characteristics and evaluation of quality of open areas in Apadana RCs. Respondents answered the items using five point Likert scale with (5) "I completely agree"; (4) "I agree; (3) "I have no idea"; (2)"I disagree"; and (1); I completely disagree". The consistency of data collection instruments was obtained 0/86 using internal consistency method. A questionnaire wasfirst devised through library studies, reviewing sources related to research subject including book, performed papers and researches and then 12 experts and specialists investigated and valuated items.

VI. Results and Findings

The quality of open areas in Apadana RCs can be divided in to three categories:
1.   Undesirable (1-106 score)
2.   Moderate (107-213 score)
3.   Desirable (214-320 score)

The majority of respondents (50%) evaluated it as moderate while the minority (0.6%) as undesirable. Average and standard deviation of studied units here were 2.496 and 0.512, respectively. Findings related to research primary goal (quality of spatial and Physical organization of open areas in Apadana RCs) suggested that majority of respondents (56.1%) and minority (1.82%) of them have evaluatedresearched units as desirable and undesirable, respectively.The average score and standard deviation were respectively 2.54 and 0.53 forquality of spatial and Physical organization of open areas in Apadana RCs. Findings in case of second goal (the facilities and equipment quality of open areas in Apadana RCs) indicated that majority of participants(59.7%) have evaluated this quality as moderate while minority of them (8.5%) as undesirable.

Findings related to the third goal of the research (quality of traffic and access to open areas in RCs) showed that majority of respondents (65.3%) have rated this quality as moderate while minority of them (0.6%) rating as desirable. The average and standard deviation in this case were 2.65 and 0.476, respectively (Table 2). Friedman test was also used to study the difference of average scores of studied units regarding the quality of open areas in Apadana RCs which was significant based on this test ($P<0.05$) (Table 3). wilkokxon ranks test was used to paired comparison of average scores for studied units regarding special goals in case of the quality of open areas in Apadana RCs.According to Wilcoxon test results, paired comparisons of average scores for studied units to first &second; first & third; and finally second & third goals are significant (Table 4).

Table 2.Total and relative frequency distribution of studied united based on general and subsidiary goals

Total goal: general quality of open areas in Apadana RCs	Frequency Distribution	The relative frequency	First goal: quality of installations and equipment to openspaceandresidentialhousing complex	Frequency Distribution	The relative frequency
Inappropriate	2	0.6	Inappropriate	28	8.5
Goodhalf	164	50	Goodhalf	196	59.7
Favorable	160	48.8	favorable	102	31.1
Noreply	2	0.6	Noreply	2	0.6
Sum	328	100	Sum	328	100
Average	2.496		Average	2.2317	
SD	0.512		SD	0.5914	

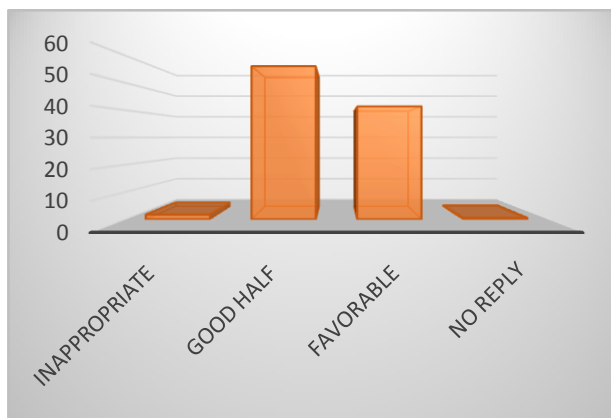| Second Goal: quality of Spatial organizationandresidential toopenspaceandresidentialhousing complex	Frequency Distribution	The relative frequency	Third Goal: quality of Trafficandaccess to openspaceandresidentialhousing complex	Frequency Distribution	The relative frequency
Inappropriate	-	-	Inappropriate	6	1.82
Goodhalf	65.3	214	Goodhalf	184	56.1
favorable	34.1	112	favorable	136	41.4
Noreply	0.6	2	Noreply	2	0.6
Sum	328	100	Sum	328	100
Average	2.65		Average	2.542	
SD	0.476		SD	0.5344	

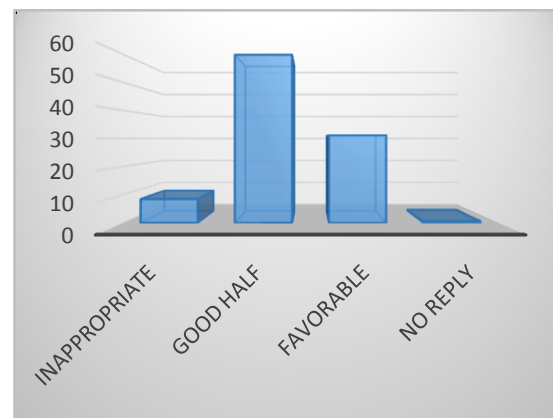Fig .2. general quality of open areas in Apadana RCs

Fig .3. quality of installations and equipment to open space and residential housing complex
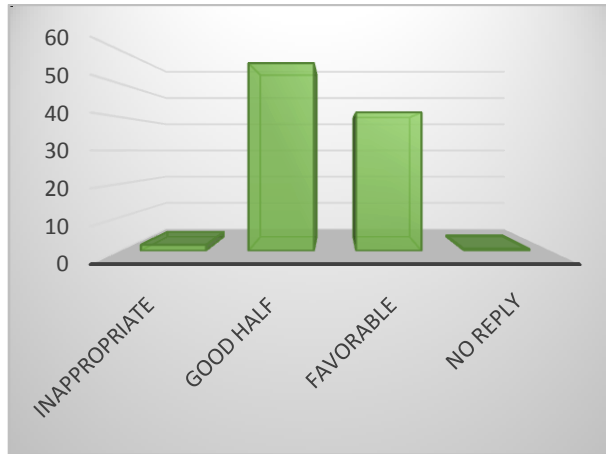
Fig .4. quality of Spatial organization and residential to open space and residential housing complex
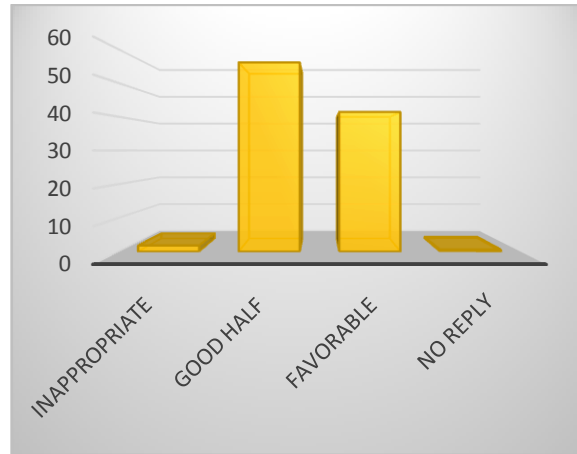

Fig .5. quality of Traffic and access to open space and residential housing complex

Table 3.A comparison of average scores for studied units regarding determination of general quality of open areas in Apadana RCs according to special goals

	Number	Average	Standard deviation	Min	Max	Chi-Square
installations and equipment to openspaceandresidentialhousing complex	2901	2.2270	0.59018	1.00	2.00	df= 6 Chi-Square= 293.757 sig= 0.000
Spatial organizationandresidential toopenspaceandresidentialhousing complex	2901	2.5399	0.53488	1.00	2.00	
Trafficandaccess to openspaceandresidentialhousing complex	2901	2.6503	0.47761	2.00	3.00	

Table 4.Pairwise comparisonof average scores for studied units regarding determination of special goals quality of open areas of according to the Wilcoxon test in Apadana RCs according to

Test	First and secondtest	First and Third test	secondand Third test
Z	-9.3889 (a)	-3.838 (b)	-11.106 (b)
P. Value	0.000	0.000	0.000

Certain demographic characteristics of habitants regarding the quality of open areas in Apadana RCs suggested that age groups of 15-25 (76%), 26-45 (52.4%), and +65 (84.4%) have considered this quality as desirable. Regarding gender, majority of males (52.5%) ad females (51.5%) have evaluated the quality of areas as moderate and desirable, respectively. Majority of singles (63.2%) and married ones (51.1%) have considered it as moderate and desirable, respectively. Most of households with 5-3 member (50.5%) have considered it as desirable. Majority of illiterate and low literate (85.5%) have evaluated the quality as moderate while 61.6% of literates put it as desirable. Regarding the profession, majority of unemployed ones (83.4), housewives (56.8%), and laborers (56.2%) have considered the quality as desirable while office clerks (52.2%) and freelancers (58.4%) put it as moderate. Test result of K2 suggested that there is a significant relationship between age, income, gender, marital status, household aspect, education, number of kids younger than 18 and profession variable and the quality of open areas in Apadana RCs (P<0.01).

VII.   Conclusion

This research attempted to investigate the quality of open areas in Apadana RCs located in Tehran region. This research is significant due to the fact that this complex attracts certain part of Tehran and surrounding districts population overflow. Therefore, expanding open and public areas within RCs and integrating internal and external areas of residential constructions may in turn be helpful to population attract and fixation as well as more attracted Apadana RCs. The analysis of results indicated 50% of samples

considered the quality of open areas as moderate; 48.8% desirable; and 0.6% as undesirablein Apadana RCs. Therefore, open areas should be expanded qualitatively and quantitatively corresponding to social groups in line with physical expansion of the city. Naturally, in addition to employment and production variables, noticing vivacity, eagerness and life and creating fresh areas can serve this objective.

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