



An Analysis on Formal Typology of Metropolitan Contemporary Housing of Tokyo (by Emphasis on 50 Residential Houses in the City of Tokyo)

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ABSTRACT: Tokyo Metropolis, with some exclusive features such as the experience of land readjustment, high level of technology, great economical centralization, and high density of information, presents a type of complicated, crowded, and instable architecture and city planning. Such a status is a problem for determining the architectural typology and makes it practically hard for introducing the contemporary architecture and the viewpoints concerning it. Understanding the formal types in architecture, makes it possible to gain theoretical and practical ideas and plans for city growth and promotion. The hypothesis of this article declares that among the space and visual instability and the wide variety of architectural forms, there is a special tendency in residential architectural forms in Tokyo that could be studied. To prove the hypothesis, the article's research methodology starts with determining and understanding the uniqueness of Tokyo and influential factors in the city's formal state. Then, 50 samples of urban single-unit residential houses are chosen by random selection from the "archdaily" website. Statistical analysis expresses the specific tendencies in formal types of the samples, as the hypothesis states. Results declare the tendencies as: narrow and elongated forms, introverted with surrounded and internal yards and balconies, some facades without decoration and mostly white or grey with low area of glass, white internal space. Understanding formal typologies and tendencies in Tokyo's contemporary architecture as a developed city has useful trainings for developing cities and countries like Iran to have better decisions in architectural and urban design in the future.

Keywords: Typology, Metropolitan Housing, Form, Formal Statistical Analysis, Tokyo.

INTRODUCTION

Tokyo, the greatest global economic center, offers a view of complicated, disordered, center-less and instable city whose current state is caused, directly or indirectly, by various factors. These factors include: very high crowd density, advanced technology, high level of information exchange exorbitant price of land, land readjustment, continuous destruction and renovation, effects of Japanese powerful traditions, effects of modernism and outstanding architectures of the 20th century. A collection of these facts, along with the current historical, has caused such instable and variable status, close to disarray

and disorganization in city architecture and city planning. In such a various and complicated status, obvious and outstanding types of architecture may not be found or they would not be distinguishable. Lack of such knowledge about formal typologies of contemporary architecture in a city, prevents further theoretical and practical studies of the case.

The hypothesis states that in spite of the complicated, crowded, disorganized and instable status of Tokyo's contemporary architecture, some special tendencies could be found in today's urban residential designs.

In the first section of the article, Japanese historical architecture and traditions are studied. Then contemporary architecture of Tokyo and effective factors in its formation would be drawn upon to gain a modern viewpoint. In the second section, the results of statistical

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analysis of 50 samples of Tokyo's contemporary housing are analyzed. Afterwards, some indices and public tendencies in architectural form are presented. In the last section, formal typologies of the cases are identified and the hypothesis would be confirmed by some specific tendencies in form.

Traditional Architecture of Japan

Japan Islands with moderate climate have a nature with dense forests and their traditional architecture use wood as the main construction material and has designed the sloped roofs for intense raining (Zarei, 2004). The close relationship between indoor and outdoor activities and harmony with nature, are some of the important elements effecting Japanese traditional architecture (Tada, 2005). Therefore, a Japanese house has been designed in a close

relation with the surroundings, in a garden bordered by bamboo fences (Gardner, 1986). Porch or balcony has an important role as a mediator space between the interior and the exterior (Georgian, 2010). Also Modules such as Tatami and Ken are basis in forming the Japanese Constructions (Georgian, 2010), Japanese residential architecture, is a house for human sprite. The focus on Japanese design is not on surface, but on the quality of the resulting space. (Tada, 2005) In such architecture space is treated as a continuous entity, but dividable into harmonious details (Gardner, 1986). Japanese traditional architecture has some spatial concepts such as "Oku" meaning a flat obstruction and covering for providing an obscure space, "Ma", similar to an experimental location and "Miegakure", meaning providing an obscure and mysterious view (Khanlari, 2010). Figure 1 is a sample of spatial concepts for "Oku" and "Miegakure".



Fig. 1. Sample of "Oku" and "Miegakure" by a kind of Transparent Cover (Tada, 2005, p. 8)



Contemporary Tokyo

Tokyo, with the official designation of Metropolis, is the capital of Japan. Tokyo has gained the greatest global industrial metropolis after New York and London. Tokyo urban region, consisting of Tokyo and its adjacent provinces, with the population of 36,669,000 people is the most populous urban region in the world and has world's greatest urban economy (fa.wikipedia.ir). In this section, Tokyo's modern or recent visual status in architecture and city planning is studied and the relevant influential facts are briefly stated, so as to shed more light on the current state of the city.

Visual Status of Architecture and City Planning in Modern Tokyo

The current visual status of Tokyo is close to the definition of Botond Bognar: "Messy conditions, crowd, fundamental inconsistency, variety and plenitude of signs, along with lack of a sensible center or restrainer discipline, are familiar faces of variable and instable Japanese City Planning" (Joudet and et al., 1996, p. 158). The overall Architecture of the city can be characterized as introverted and defensive against the urban environment, or indifferent encounter with turning back of buildings facades to the city (Kanlari, 2010). Such a view of the city is a result of special and unique facts of Japan and Japanese city that will be studied hereafter (Fig. 2)



Fig. 2. Disorder, Crowd and Variety in Urban Aspect, Tokyo (google street view)

Effective Facts in Tokyo's Architecture and City Planning

The drawn picture for present Tokyo architecture and city planning may be known as direct or indirect effects that have been classified in Figure 3, on the basis of the most important facts providing them. In the following sections, each one of them will be briefly studied.

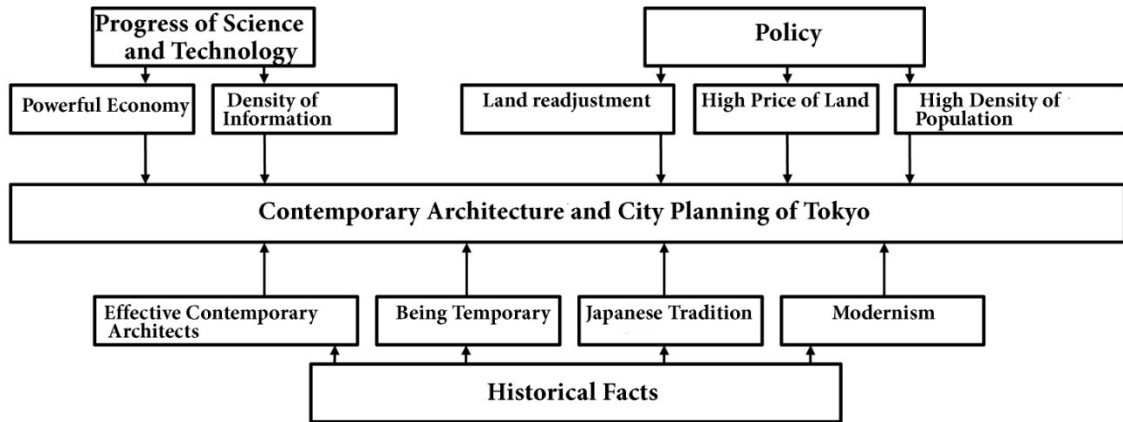


Fig. 3. Effective Facts on Current Status of Architecture and City Planning of Tokyo.

- High Density

Urban region of Tokyo Metropolis, with a population of more than 30 million people, is the most populous region of the world (Statistics Bureau, 2012, fa.wikipedia.org) and all houses exceed the standard population. The public transportation is the most busy, crowded transportation of the world. This physical density in business environment, local associations, groups and families, has various effects on the citizens, such as a strong sense of belonging to society (Joudet and et al., 1996) (Fig. 2).

- High Price of Land

Land price in Japanese cities is in such a way so high that for construction of a building in any plot of

land, almost 90% of the related budget is consumed for ownership of land and 10% of the budget is consumed for construction expenses (Joudet and et al., 1996). In the urban region of Tokyo, price of each square meter of land is equal to 700,000.—Japan Yen (equal to 7,090.—US Dollars) (Tsutsumi, 2011).

- Land readjustment

Amendments to the plots of land and readjustment law in Japan have caused the density to soar (Habibi, 2009). Also in some cases have disordered dispersions in regional scale and, there is not force to prohibit this disorder in local scale (Sorensen, 2000) (Fig. 4).

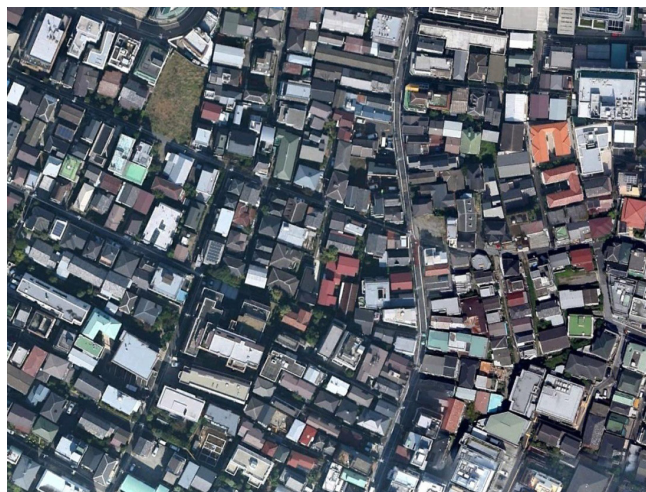


Fig. 4. High Density, Lack of Green Space, Irregularity and Disorder in a Residential Region, Tokyo. (maps.google.com)



- **Powerful Economy and Density of Information**

Urban region of Tokyo is the best region in the world economically speaking (Florida, 2009). Another characteristic of Japan is density of information. Wonderful development and easy access of most people to the most modern media and technology, has changed Japan to a country with the highest information concentration in the world. Powerful economy, high level of technology, globalizing fad and increasing density of growing information have caused such a strong competition among the Japanese architects that the smallest difference is seriously considered and the architects are encouraged to aspire for perfection and making their work different from others. (Judet & et al., 1996).

- **Being Temporary**

In the course of time, Japanese cities have been risky due to natural disasters such as flood, earthquake, storm and others. Tokyo has been destroyed many times in history because of different wars such as the Second World War and many earthquakes in 1703, 1855 and 1923 and has been renewed again (Stein, 2006). This continuous and repeated destruction of buildings and cities has caused a kind of lack of certainty about existence, a type of disbelief on visibilities and everlasting and eternal umbrage. Also differences of four seasons of nature and harmony with them are important parts of Japanese culture. Buildings and cities must naturally be designed and amended in coordination with nature. The tradition of making cities and buildings with temporary structures has originated from this heritage (Judet & et al., 1996).

- **Japanese Tradition**

Kisho Kurokawa (1996) believes that Japanese traditions tend to be invisible in comparison with western traditions. Therefore, we can call the Japanese aesthetic as “Spiritual”. Such a tradition, free of materiality, is transferred from one generation to another and is reflected in architecture and city planning of each period. Foreign visitors find Tokyo an International City such as Los Angeles, at the first glance. But foreign residents who have lived in Japan for a long time, know Tokyo as a perfect representative of a typical Japanese City (Judet & et al., 1996). Tokyo has been constructed with modern materials and technology but its lookout is an heir to Japanese tradition. While the Japanese are confident that they are able to preserve their invisible tradition, they are so eager to accept the elements of a new culture, modern technology, new frames and foreign cultural symbols (Judet & et al., 1996).

- **Modernism**

Ever since the second half of the 18th century, Japan has accepted the western modernization and began to

import the western technology and engineering sciences. Architecture of this period is a clear and formulaic imitation of western experience. As of early 20th century, following the feeling threatened by excess in westernization and modernization, the first traditionalist movements have commenced with the governmental support in the field of architecture (Khanlari, 2010). After the Second World War, Japan achieved a unique identity in international field and attracted the western consideration to a different kind of modern architecture with Japanese identity.

- **Contemporary Effective Architects**

Some of the contemporary architects of Japan have had important effects on Japanese architecture and other countries. Kurokawa is one of the first architects after the Second World War, who established the Metabolism School which defines city as a large-scale mass, flexible and developable phenomena with possibility of organic growth. Also, Kenzo Tange paid attention to aesthetics of Japanese traditions in his plans, in addition to considering modernism and attracted the architectural societies’ notice in this aspect. Tadao Ando is a minimalist architect who tries to simplify the form and provide the net space. Toyo Ito with the “light” concept in architecture and Isozaki with post-modern and exaggerated works along with some architectures, are the most effective architectures in Japan and also in international domain (Khanlari, 2010)

STATISTICAL ANALYSIS AND FORMAL TYPOLOGY

Effective facts which are explained in pervious section may lead to varied, complicated and instable status of architectural forms in residential buildings as it is in the city’s current view. But the Hypothesis states the opposite opinion which declares there are special tendencies in architectural forms. In order to gain the general tendencies of architecture in the field of urban housing and finding its obvious indices, formal typology of urban contemporary housing of Tokyo would be studied through a collection of samples and its statistical analysis.

Sampling Method

Some methods were considered to undertake the samples. One was random selection of some buildings around Tokyo, which has two problems: lack of access to project’s documents like floor plans, and chance of selecting worthless buildings which have no architectural design. Second method was selecting some architects or groups, but analyzing their designs would lead to limited and special tendencies of them. The better method of all in



this research was to choose the “archdaily” website as the cluster for some reasons: first, its users are architects who present their designs to receive opinions and critics from architectural society worldwide. So projects on website have architectural worth at least in their designers believe. Second, website has a great popularity all around the world for architects, as great designers like Steven Holl have admired the website’s features, presentation method and globalization. Third was its archive with complete presentation for every project with many images, plans, sections and other documents (www.archdaily.com/about). As mentioned, “archdaily” website were chosen as the main source. The archive of the site is chosen as a cluster of architectural projects, which their designers are interested in “archdaily” community. Among 70 contemporary urban single-unit houses presented on the website, 50 samples were chosen randomly. All cases are contemporary urban single-unit residential houses, built in 2006 to 2012, scattered around the Tokyo.

Formal typology needs physical analysis and study on the gained statistical results. In order to gain the objective, two domains of “external form” and “internal space” have been considered and some specifications and assessment variances were defined for each of one. In the section related to external form, structure of some variables such as dimensions and proportions, numbers of floors, width of the building, color of Facade, glass areas in Facade and semi-open or semi-surrounded spaces such as yard or balcony were studied. Some variables such as color of internal surfaces, amount of porosity in walls and use of

semi-storey or void were considered in physical analysis of internal space. It should be considered that in many cases identification of the used construction materials in the internal space or Facade from the pictures was difficult or sometimes impossible. Consequently, types of the construction materials has not been considered in this study as a variable but color which has visual and mental effect on internal space and also the Facade of building has been considered as variables.

Statistical Results

- Volume Proportions: average width of building’s Facade is 5.45m and 4 to 5m width has the most frequency. Also the buildings with more than 8m width are few. On the other hand, the numbers of floors of the samples is 2 to 5 units with the average of 2.96 floors. Table 1 states that as the width of the building increases, rate of length to wide will decrease and also the numbers of floors will decrease. Pearson Correlation Coefficient -0.403 indicates the inverse relationship of buildings’ Facade width with numbers of floors (Table 2). Also Pearson Correlation Coefficient -0.692 shows inverse correlation between proportion and width of samples (Table 3). Consequently, noticeable number of buildings with extended cubic rectangle forms with wide about 4m and length 10m and having 3 floors, is a typical urban buildings form.

Table 1. Statistical Dimensions and Proportions of Buildings

Average in floors	Rate of length to wide	Length of buildings (m)	Width of buildings (m)	Average of dimensions and proportions
				Types of Houses
96/2	98/1	90/9	45/5	All buildings
21/3	40/2	65/9	22/4	building with width less than 5m (28 samples)
64/2	46/1	23/10	02/7	building with width more than 5m (22 samples)



Table 2. Correlation Coefficient of Width and Number of Floors

		Width	floors
Width	Pearson Correlation	1	-.403**
	Sig. (2-tailed)		.004
	N	50	50
floors	Pearson Correlation	-.403**	1
	Sig. (2-tailed)	.004	
	N	50	50

**** Correlation is significant at the 0.01 level (2-tailed).**

Table 3. Correlation Coefficient of Proportion and Width

		Proportion	Width
Proportion	Pearson Correlation	1	-.692**
	Sig. (2-tailed)		.000
	N	50	50
Width	Pearson Correlation	-.692**	1
	Sig. (2-tailed)	.000	
	N	50	50

**** Correlation is significant at the 0.01 level (2-tailed).**

- Form of the Roof: Tokyo has moderate and humid climate with high rain fall. Previously, sloped roof was considered the main type of roof covering in this city. In the present study, three types of roof, sloped, flat and combined (a part, slope and a part, flat) are seen in the buildings. Frequency of sloped roof is 38%, flat roof is 44% and combined roof is 18%. This result indicates the tendency to use both roof types among the architects. But through considering the history of the subject, tendency of modern generation to use flat roof and modern technologies are visible.
- Semi-open or Semi-surrounded Space: in this study, the yards have been divided into two classes: “surrounded” and “open”. Open yards do not have specific usage and are only a separator between the building and public pedestrian crossing and sometimes green spaces are seen therein. But surrounded yards are used because of providing a private space and usually are in the shape of a central yard. From this viewpoint,

they have affected the form of buildings. Central yard is not so favorable because of keeping the air humidity in fixed its space in such a climate, but considerable use of it and also closed balconies, low amount of glass area in Facade, that will be stated in the next section, indicate a type of tendency to introversion and establishment of a boundary for urban and public environment.

Figure 5 state that 28% of buildings have the capacity of using the roof as a yard or balcony. Also, 68% has balcony that 48% are in the external type (balcony to an out and open environment) and 28% are internal and closed balconies. 14% of the samples do not have any type of balcony, yard or roof with operation ability at all and average width of these buildings is 4.4m that may states significant relationship between low width of land and lack of balcony or yard. In Table 4, it is shown that as the width of building increases, closed and surrounded yards have more frequency. It has also important effect on architectural form (Central Yard).

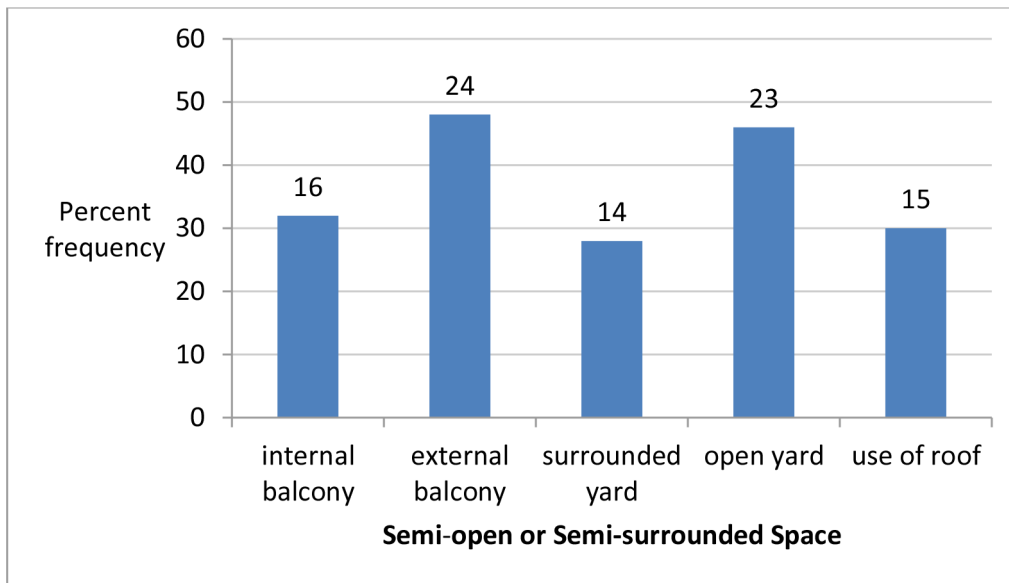


Fig. 5. Amount of Having External or Internal Balcony, Surrounded or Open Yard and Use of Roof

Table 4. Numbers of Houses with Surrounded Yard in Different Width

	Surrounded yard		amounts
	yes	no	
2.00	0	1	1
3.00	0	2	2
3.50	0	1	1
3.60	0	1	1
3.80	0	1	1
4.00	1	7	8
4.50	1	1	2
4.70	0	1	1
5.00	2	7	9
6.00	1	8	9
7.00	2	4	6
7.50	0	1	1
8.00	2	1	3
9.00	3	0	3
12.00	2	0	2
Whole amount	14	36	50



- Glass Area in Façade: in Figure 6 that indicates the amount of glass area in Façade, group 0-20 (percent of glass area in comparison to total Façade is 0 to 20), has the most frequency and indicates the tendency to lack relationship with

urban environment from indoors. On the other hand, 10% of the samples have had transparent and glass Façade and this indicates that there is minor tendency to exaggerated extroversion in urban environment.

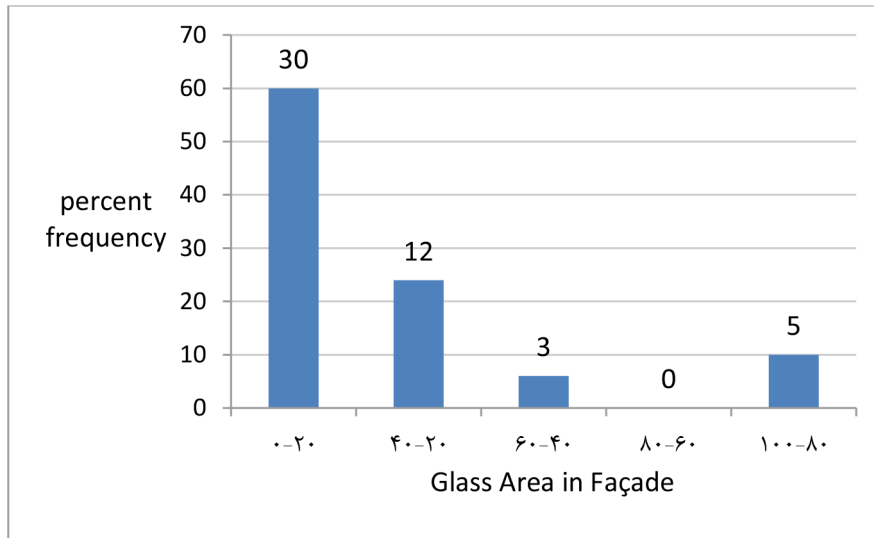


Fig. 6. Amount of Glass Working Area to Total Area of Façade on the Basis of Percentage

- Color and Decoration in Façade: Figure 7 indicates the amount of tendency to use bright colors, especially white and grey (color of cement or raw concrete) (Fig. 8). (In this section, because the Façade of one of buildings was not apparent, 49 samples have been studied). Also only in 5 cases (10%) of buildings, decoration may be seen in Façade and major part of samples have simple Façade and far from any type of decoration. It is noticeable that the buildings with Façade decorations have open yard and color of Façade of 5 houses are: cream, white, brown, black and grey. This matter indicates that in addition to main tendency to a type of minimalism in form, there are minority tendencies based on application of decoration and various colors in Façade.

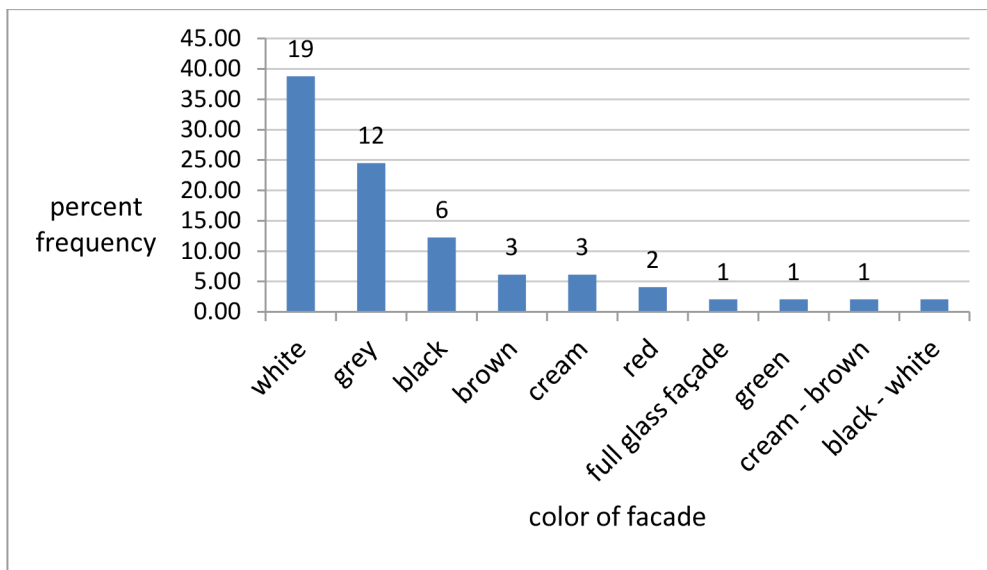


Fig. 7. Amount of Houses on the Basis of Colour of the Buildings Facade



Fig. 8. Case with white Facade and no Decoration
(www.archdaily.com)

- Color of Indoor Space: Figure 9 indicates the main color in indoor space on the basis of division of the main consisting surfaces: floor surface, wall and ceiling. Results show high tendency to use white color in walls, ceiling and also tendency

to use wood design for floor surface as parquet, wood and other products (Fig. 10).

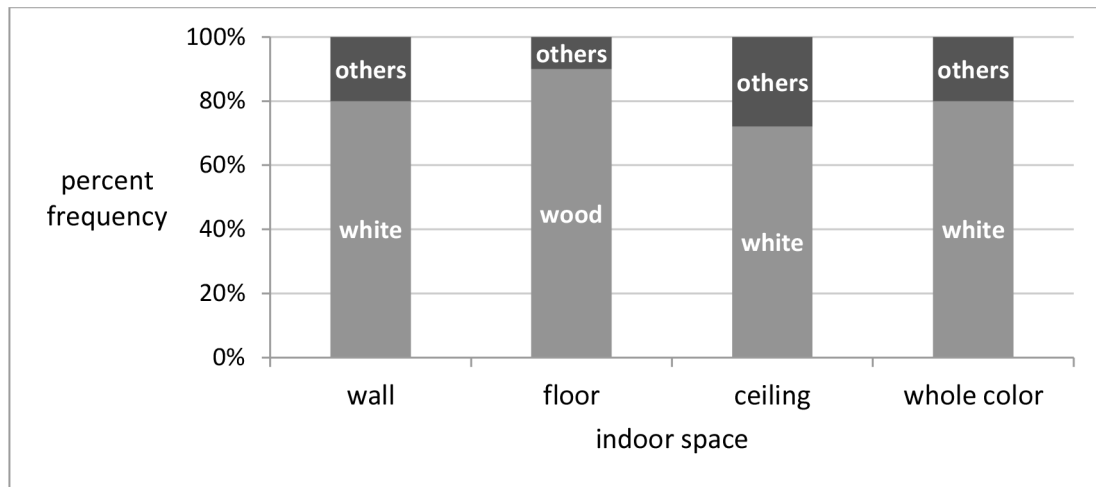


Fig. 9. Frequency Percent of Color and Design of Indoor Surfaces (%)



Fig. 10. White Indoor Space with Parquet Floor
(www.archdaily.com)



- Light of Indoor space: Figure 11 indicates special variety and extension of transparency through semi-storey spaces, empty spaces such as void and porosity in walls. Tables 5 & 6 indicate the correlation of semi-storey usage and porosity in walls for interior designs. Tables 7 & 8 states the relationship between interior transparency

procedures and color of space. Only 24% of the buildings have not used any of these procedures which among them, 58.33% have dark color in indoor space. Consequently, it could be state that in the houses with darker space, making light of indoor space and visual variety may be seen less.

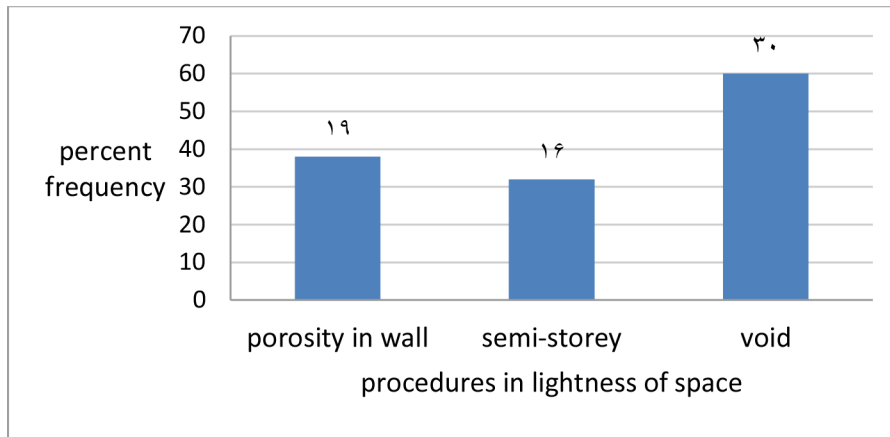


Fig. 11. Frequency of the Used Procedures in Indoor Space in order to Making it Light

Table 5. Semi.Storey * Porosity in Wall Crosstabulation

		porosity		Total
		yes	no	
semi.storey	yes	11	5	16
	no	8	26	34
Total		19	31	50

Table 6. Correlation Coefficient for Semi-Storey and Porosity in Walls

		Value	Approx. Sig.
Nominal by Nominal	Phi	.435	.002
	Cramer's V	.435	.002
N of Valid Cases		50	



Table 7. Interior Transparency * Internal Color Crosstabulation

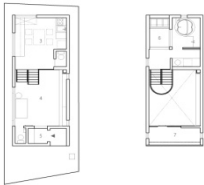





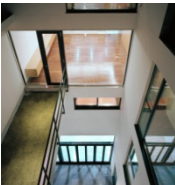

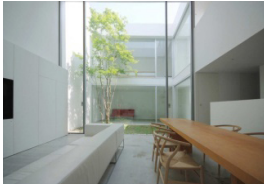
		bright	dark	
Transparency	yes	33	5	38
	no	5	7	12
Total		38	12	50

Table 8. Correlation Coefficient for Interior Transparency and Internal Color

		Value	Approx. Sig.
Nominal by Nominal	Phi	.452	.001
	Cramer's V	.452	.001
N of Valid Cases		50	

Table 9 indicates some samples of each one of the specifications presented at statistical analysis of the samples' form.

Table 9. Some Identified Samples in Formal Typology

Proportions	 <p>Type of Narrow and Elongated Plan</p>	 <p>Wide and Short Cubic</p>	 <p>Narrow, elongated and long cubic</p>
Form of the Roof	 <p>Flat Roof</p>	 <p>Combined Roof</p>	 <p>Slope Roof</p>
Semi-open or Semi-surrounded Space	 <p>Surrounded Balcony</p>	 <p>Open Yard</p>	 <p>Surrounded Yard</p>



Glass Area in Facade	 <p>Entire Glass Facade</p>	 <p>Few Glass Area</p>	 <p>Without Window to Outdoor</p>
Colour and Decoration in Facade	 <p>Without Decoration</p>	 <p>Decoration in Facade</p>	 <p>White Facade</p>
Colour of Indoor Space	 <p>Combination of Construction Materials</p>	 <p>Dark Colour in Indoor Space</p>	 <p>White Walls and Wooden Floor Surface</p>
Being Light of Indoor Space	 <p>Dark and Lack of Making Light the Space</p>	 <p>Semi-storey, Void and Porosity in Walls</p>	 <p>Providing of Variety with Void and Difference in Height</p>

(Authors, pictures from archdaily.com)

CONCLUSION

Contemporary view of architecture and city planning of the metropolis of Tokyo indicates an instable, disordered, crowded and disorganized status. It is because of the unique specifications such as land readjustment, high price of lands, high level of technology, centralizing of great economy at a global level, and high density of information, experience of modernism, effects of innovative and modern architects and also historical

traditions. Hypothesis of this study indicates that there are specific tendencies in architectural forms among the special and visual instability of the city and the wide variety of architectural types. So identifying some special formal types in residential architecture of Tokyo could be possible through statistical analysis of some samples. The gained results from formal analysis of 50 samples of urban contemporary houses, indicates that it is not possible to distinguish a special type of architectural form in the city of Tokyo but it is possible to identify obvious



tendencies in residential architectural forms.

- Noticeable samples, affected by high density and dimensions of plots of lands, have narrow and elongated cubic rectangular form with the height of about three floors. Also there is an inverse correlation between width and proportion and also width and height of the building's volume. As the width decreases, the length will increase and number of floors will increase. This effect can be the results of land readjustment and also the high price of land in Tokyo. The roofs are seen in three major forms: sloped, flat and combined. Considering the traditional roofs, modernization has affected new building designs (related to flat and combined ones).
- Noticeable number of houses has surrounded and closed yards and they are in central type (in the form of house) and as the width of building increases, tendency to produce a central yard for house, will increase. This matter is in contrast with extroverted traditional architecture of Japan. But it indicates a reality that shows tendency to introversion and interruption of the relationship with urban environment. It could be a response to instability and crowded view of the city.
- Tendency to introversion may be seen in low amount of glass working in the main Facade, too. Even though 10% of houses have thorough glass Facade that is extracted from pure transparency of the architecture of modern periods.
- Decorations may not be seen in facades. Facades' designs are so simple and minimal. The most used colors in Facade are white and grey. These simple, minimal and bright facades have no belonging to traditional forms, but have a great connection with modern era forms and thoughts.
- Intense tendency to white colour is seen in indoor surfaces. Of course, floor surface of indoors space is made of parquet with wooden plans. Voids are seen in many houses and semi-storey are noticeable too. There is porosity in indoor walls in some cases. These three cases cause light, free and various special formation in indoor space. These procedures helps increase the spatial quality of interior spaces as traditional concepts of Japanese architecture tried to. Even though, there are some samples that do not have porosity, semi-storey and void and most of them have dark indoor space.

In general conclusion for typology, results states that among high variety and visual disorder of contemporary

architecture of Tokyo, a type of residential architecture may be distinguished that has enlarged cubic rectangular forms with a low-width and height of some floors Facade. In the case of having a suitable width, they have surrounded and closed yard in their volume. The Facades of most of them are simple, without decoration, white or grey with low glass working surface. In indoor space of houses, the main color of surfaces is white and floor surface of houses has wooden design. For lighting the space, voids, semi-storey or porosity are used in the walls. Such a type of closed formal architecture does not have tendency to urban environment and is introverted. Even though other tendencies are seen in minor aspects, such as some samples that have thorough glass working Facade, or have dark indoor space, without void, semi-storey or porosity in walls.

Recognition of formal tendencies influenced by special features of a developed metropolitan with great traditions like Tokyo, could lead developing countries like Iran to have better decisions in architectural and urban designs. Developing countries experiencing modernity need other experiments on formal typologies achieved from other countries with some similarities.



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