

Openings And Their Impact On The Visual Aspects Of House Facades In Mosul City

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Abstract— This paper discusses one of the most distinctive issues of architecture debates about visual aspect (privacy) in architecture. It aims to measure the impact the openings of house facade on visual aspect (privacy) in Mosul City. The objectives of this research attempt to examine the correlation between the openings of house facade and its achievement of visual privacy. the study investigates a conceptual model for opening of facade and formulates the properties of visual aspect. The study adopted a qualitative survey. Sample selection for qualitative survey uses the stratified method to select the samples in this study. A group of houses were selected within four time periods in the city of Mosul. For qualitative analysis, the methods used rely on direct observation and visual documentation. This analysis deals with configuration differences of the house facade. Findings from the results of this analysis support the research assumption that size of openings in the house facade have direct impacts on achieving visual privacy. The study makes an important contribution to address the dialectical relationship between the openings and visual aspect (privacy) by ending the conflicting theoretical approaches regarding the impact of openings on visual privacy.

Keywords: Privacy; visual aspect ; openin ; Façade; configuration

I.INTRODUCTION

The visual aspect plays vital role in shaping traditional house to response family cultural and religious needs. The spatial organization of modern architecture will be developed physically and culturally in terms of visual privacy from traditional architecture that consist of six different layers in privacy's level including public, men social, women social, semi-private, private, and personal private. Thus, this study wind up that visual aspect had deep impacts on spatial configuration of traditional house and also a attitude prevailing all aspects of life. So, privacy means to fulfill the residents' higher level of requirements based on their cultural values.

The openings play role as one of the factor in physical properties to construct and fortify the ability of space in achieving a more sustainable and safe residential environment. This enables to demonstrate the relationship between socio-cultural aspects of social sphere in houses and local communities (Mahalla). Therefore, the neglected traditional values due to the opening of social spaces to the outside provide unlimited accesses to indoor social environment. This will enhance the visual penetration into the residents' privacy. Their study wrap up that the house is an efficient system in response to the varying needs of the social group to maintain the privacy as a crucial aspect of the social activities within the home. (Abdelmonem ,2014) *The Visual Aspects of a House Façade*

A house is a cultural phenomenon. It can be influenced by surrounding environment, site properties, resources, and building techniques. Hence, the many cultural traces of the past in socio-cultural and socio-economic structure of a society, affect the configuration of a house (Rapoport, 1969). These can affect the formation of house design and forming its façade (Sari et al., 2011). While, many studies have

analyzed the factors affecting the design of a house façade by using various methods due to the variation in form and the arrangement of façade elements. Therefore, this segment will verify the relevant literature to clarify fundamental characteristics of house façades in terms of providing the visual privacy.

Openings

The parameters of openings can be classified into two primary factors as windows and entrances. The design and materials of openings including windows, doors and other openings are the most significant factors in the appearance of the architectural form (Unwin, 2003 ; Hudsonville, 2006). For example, the basic element in façade architecture the window is a sign of human life and act as the eye of the building. It articulates between interior and exterior while provides look outward (Azizi, 2011; Meiss, 2004). On the other hand, the openings such as doors and windows give a façade its uniqueness by their various arrangements which provide the characteristics of the place and give clear visual characters to building's face (Elkadi, 2005).

Windows:

According to Azizi (2011), windows are the essential elements of the house that bond the inhabitant's spiritual and psychological affiliation to the outside world, besides

bring sun warmth, fresh air, and a sense of nature as well as authentic beauty to the

house inhabitants. Windows are located mainly in the height of the vision line to making

it easier to look through it. Thus, it also is an effective factor to protect the privacy of

interior spaces (Bemanian & Saremi, 2015) because it is one of the more physical ports vulnerable to the passage of the visual axis. For that reason, the importance and the need

for the presence of windows in most of the spaces cannot be dispensed or canceled

whatever the possibility for the visual penetration through it. Also, the way of shield

from the visual penetration used to diminish the window efficiency regularly causing it

used momentarily or in part. While the factors of windows includes the size, shape,

dimensionality, position relative to the vision level, location within the facade line, ratio the area of windows to facade, iron protection, type of glazing, and direction of opening parts opens up again in front of the visual penetration (Bemanian & Saremi, 2015; Musa & Talib, 2014; Rahim, 2015).

The physical dimension of length, width, and depth of a element define its proportion while the scale of a building is determined by the size of its elements. As a result, the relevant values for window size can be categorized as small ($X \leq 0.50$ m²), medium ($0.50 \text{m} < X < 2 \text{m}^2$), and large ($X \geq 2 \text{m}^2$) (Al-Shwani, 2011). Moreover the height of windowsill from the land line is one the factors affecting the visual privacy for façade because an increase in height leads to achieve visual privacy for residents inside the dwelling because windowsill act as a threshold joining the inside and outside of the house (Azizi, 2011). As a result, the relevant values for window size can be categorized as small ($X \leq 0.50$ m), medium ($0.50 \text{m} < X < 1.8 \text{m}$), and large ($X \geq 1.8 \text{m}$).

Furthermore, window shape is the characteristics outline or surface configuration of a special form (Ching, 2015), as it is powerful for characterizing, recognizing, and categorizing facade elements which affects the visual privacy (Vaziritabar, 1990). Rectangle, square, circular and triangle are the most significant window shapes in the primary forms (Ching, 2015). Whereas the configuration of windows is the feature of shape that relates to the recognition reduction of its dimensions or the proportion of the element's dimensions. Thus, the significant value of window configuration can be described as a liner, punctual, and solid. Consequently, the location and position of windows will be affect perception of visual privacy (Rahim, 2015; Basim, 1986). The traditional houses used high-level windows (approximately 1.75m high) from ground floor to protect the family members from outsiders (Mortada, 2011; Rahim, 2008). So, the significant values for this aspect are: above eye level, same of eye level or below of eye level for the position of window inside the facade it exists on the ground floor level, the first floor level, or at second floor level (Othman et al, 2016).

Table 1.1 Summary of Windows Parameter (Factors and Values)

Parameter	Factors	Possible Values
Windows	Windows Size	Small ($X \leq 0.50 \text{ m}^2$)
		Medium ($0.50 \text{ m} < X < 2 \text{ m}^2$)
		Large ($X \geq 2 \text{ m}^2$)
	Windowsill Height	$X \leq 0.50 \text{ m}$
		$0.50 \text{ m} < X < 1.8 \text{ m}$
		$X \geq 1.8 \text{ m}$
	Windows Shape	Rectangular
		Square
		Triangular
		Circular
		Others
	Window Dimensionality	Liner
		Punctual
Solid		
Position Relative to the Vision level	Above of view line	
	Same of view line	
	Below view line	
Location Within the Facade	Ground floor	
	First floor	
	At level two floor	
WWR	$X \leq 20\%$	
	$20\% \leq X \leq 40\%$	
	$40\% \leq X \leq 70\%$	
Window Iron Protection	Found	
	Not found	
Type of Glazing	Normal	
	shaded	
	Two-way mirror	
Direction of Opening Parts	For inside	
	For outside	
Vertical Fin	Found	
	Not found	

The entrance is designed with the consideration to protect the privacy of family members (Musa & Missuat, 2014). It is another outlet of the visual penetration outlets and especially when it is between the inner spaces of the building and the external spaces. The use of doors, bilateral doors and other can change the ability of the door to achieve the visual penetration by changing its location. Another way, the entrance of gust must be separated from the entrance of family members in order to obscure the nondesirable vision (Musa et al, 2014). Besides that, the area of entrance such as the width of entrance

has a direct impact on the visual privacy between residents and strangers. So, the relevant values of this factor are: small, and large. Next, entrance location is another factor that determined the configuration of the path and the pattern of activities within the space (Ching, 2015). The location of the entrance within the mass should respect the visual privacy of nearby space. Hence, for entrance location factor, the relevant values are centered within frontal plane of a building or be concentrated on side, or randomly distributed. On the other hand, the factor on type of entrance determines the level of privacy in terms of façade element. As suggested by the design guideline, there are two types of entrance includes one leaf door, and double leafs doors.

Meanwhile, according to Mortada (2003), the shape of the entrance is one of the visual properties of a facade that can directly influence the privacy. The relevent values for the factor entrance shapes are arcade (but the door is straight) and rectangle (Khayat, 2006). Furthermore, Ching (2015) states the size of the elements determined height of a building. So, at level one floor and at level two floor are two categories of entrance size as stated in the design of the entrance. Another effective factor in determining the level of privacy is the placement of the entrance within the facade line (Khayat, 2006). Ching (2015), suggests three alternatives such as flush, projected, and recessed about the placement of the entrance within the facade line.

Moreover, material act as an effective indicator of its privacy by play an important role in determining the building's appearance (Al-Sanjary, 2008, Khayat, 2006) and provide the characteristic features for a house facade (Kress & Leewen, 2006). The relevant values for entrance material includes wood, steel, glass, and PVC. Next, the achievement of the visual privacy in terms of facade elements is measured by the entrance relationship to the street line factor (Othman et al, 2016; Khayat, 2006) because each building has at least one functional entrance directly visible and accessible from street (Palo alto, 2002; Hudsouville, 2006; Missouri, 2008) with numerous approaches consisting of frontal, oblique, and spiral to link the building entrance to the street line (Ching, 2015). Therefore, the relevant values for this factor are parallel to the street line, perpendicular to the street line, and oblique to the street line.

Table 1.2 Summary of Doors Parameter (Factors and Values)

Parameter	Factors	Possible Values
Doors	Function of Door	Door for Guest Service
	Area of Door	$X \leq 2 \text{ m}^2$
		$2 \text{ m}^2 \leq X \leq 3 \text{ m}^2$
	Location Within the Mass	In Center
		On Side
		Random
	Door Type	One Wide Door
		Two Narrow Door
	Door Shape	Rectangular
		Arcade
	Door Scale	At level of One Floor
		At level of two Floor
	Placement Within the Facade Line	Flush
		Projection
		Recessed
	Materials	Wood
		Steel
Glass		
PVC.		
Relationship with Street Line	Parallel to Street Line	
	Perpendicular on Street Line	
	Set back from Street Line	
Entrance Accessibility	Direct Access to Street	
	Indirect Access to Street	
Relationship with Neighbors Entrance	Opposite	
	Adjacent	

II.CASE STUDY:

Mosul is the second largest city in Iraq. It is located in the northern part of the country and has a population of about three million people. Over the years, the city has maintained a rich cultural and religious diversity, and it has historically played a prominent role in regional trade. As a result, it has attracted more residents, flourished, and grown in size.

III. MATERIAL AND METHOD

Measurement of variables and sample selection: To measure the variables three basic aspects must be clarified:

- The type of measurements that are used to measure the variables
- Way to collect the information for the measurement purpose
- The selection of samples

The measurements of the variables are the qualitative measures that define the possible values.

This type of measurement is in agreement with the nature of these variables.

For the purpose of the study and to fulfill research objectives, some-step research method will be conducted using the following steps:

Firstly, checklist factors to determine the research parameters for qualitative analysis. the checklist factors are a set of variables in the theoretical model that includes main parameters. They were derived from the architectural literature and reinforced by relevant factors and guidelines mentioned in openings of house façade design. these parameters were collected in one coherent framework for visual and formal analysis.

In this paper, the chosen samples are distributed into four zones. A total of 20 samples chosen from each zone to represents the cross-section of the whole population. In this paper, probability sampling is used to eliminate the altered houses units in old zones and newest units in the particular zone. For that reason, the samples were chosen from each classification based on few processes. Firstly, the zone's history and its growth within the city is analysed through historical documents to ensure that the selected zone is associated to the particular period adopted on the blueprint of the city. Next, the licenses of municipality buildings were checked to identify the number of floors, kind of houses, façade width, and construction techniques. Then, a simple and short interview was conducted with inhabitants to insure the date of construction and get the necessary approvals for photographic documentation and measure few elements found in house façade. Lastly, social and economical factors were considered in selecting the samples to pledge resemblance in term of the quality.

Collection of Documentation Data and Visual Data

There are two methods used for documentation and data collection namely direct observation and visual characteristics and supported by measure dimensions of some elements of house façade and drawing its. the visual data observations were enhanced by a photographic, films, videotapes, drawings and diagrams to record and document each house façade. Some features of house façade elements such as windows and doors, were included in the documentation procedure. The documentation and observation of visual data in similar qualitative research designs present a strong base for data interpretations.

Therefore, to collect the data through observing the visual characteristics during site visits uses a fieldwork tool known as the house façade checklist factors form. Besides that, the dimension several elements in houses facade also measured to draw architectural drawings. This method intends to clarify the dissimilar levels of assortment and resemblance between façades and to verify the impact of openings.

IV. RESULTS:

the main methods of qualitative analysis of the house façade parameters are physical observation, visual investigation and formal analysis. These analyses are produced to evaluate the characteristic of openings of the facade and degree of similarity and differently for each parameter in the checklist factors, followed by comparative analyses between periods through the formal analysis. Hence, the qualitative analysis produced the following results:

Windows

- The sizes of the window are considered in the traditional period as small in 70 % of cases because the size is affected by the social factors and environment. Nevertheless, the efficacy of the size of the window was clear in achieving the principles of visual aspect (privacy). The windows size in the period from 1930 to 1980 plus the period of 1980 until 2003 have changed to be larger. These turns occurred as an outcome of the industrial development additionally to the cancellation appearance outside the building and interior courtyard. Lastly, after 2003 the size of window continued to be enlarged as a code of globalization which does not respect the people privacy in the local architecture through using a huge screen of glasses in the front facade in 30 % of the cases (Figure 1.1).



Figure 1.1 Size of window in traditional period , colonial period and period (1980-2003)

Source: Author

- The height of the window-sill in the traditional period before 1930 was more than one meter for the 90 % of the cases; however, increasing this height led to reach visual privacy for inhabitants inside the house. This height gradually turned to be less than one meter in the period 1930 until 1980 as a 70 percent of the cases, as well as from 1980 to 2003 rated as an 80 % of the cases. In the end, the window-sill height within facade design after 2003 is less than one meter for the 60 % of the cases which makes it easier to procedure the visual penetration (Figure 1.2).

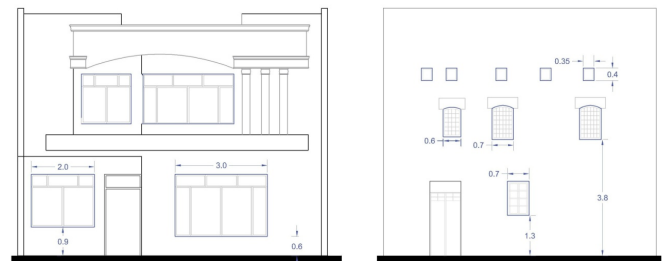


Figure 1.2 Height of Window Sill In Traditional Period And Period (2003-2016)Source: Author

- The dimensionality of windows in the traditional period before (1930) is punctual within solid surfaces because the aim was an environmental and social. This idea gradually turned to linear windows in the period (1930-1980) (90%) as well as in the period (1980-2003) as a rate of (80%) of the cases. Finally the dimensionality of window within façade design in period (after 2003) totally changed to a kind of glass solidity dimensionality (which is considered as total different) and this leads to increase the visual penetration of these windows.

-location the windows within the facade in the traditional period is found in the first floor as a rate (80%) of the cases; So as to prevent peeking from outside. in the period (1930-1980) the widows was found in the ground floor as a rate (60%) of the cases. located the windows as a rate (70%) of the cases on the ground floor in the period (1980-

2003). Finally the windows location was found at two floor in period (after 2003) as a rate (40%) of the cases because of the functional requirements (Figure 1.3).



Figure Error! No text of specified style in document..3 Windows Location Within the Facade in Traditional Period , Colonial Period and Period (1980-2003) Source: Author

- (WWR) in the traditional period is (less from 20%) for (80%) from cases. in regard in the period (1930-1980) the WWR is between (40-70)% for (70%) of the cases as well as the period (1980-2003) as a rate of (70%) of the cases the WWR is between (40-70)%. Moreover, in the final period (after 2003) about (90%) from cases for (WWR) is between (40-70)% . whereas that (WWR) is the ratio of window area to the facade area. In other words, increasing this percentage means the invasion of privacy from the stranger and neighbors.

- Vertical shading device in the period (1930-1980) was found as a rate (20%) of the cases. while this percentage was increased as a rate (40%) of the cases in the period (1980-2003) as result of climate factor. in period (after 2003) the rate of using the vertical shading device is (30%) of the cases. existence the vertical device around the windows helping on provide the shadows on the opening and the same time protect it from the visual penetration from neighbors.

Doors

- The most of the houses in the traditional period before 1930 were separated the guest entrance from the entrance of family members in order to obscure the undesirable vision. In the period between 1930 until 1980 a 60 percent of the cases of the guest door which separated from family door. In addition, in the period from 1980 until 2003 was rated as a 70 percent over the cases of the guest door which separated from the family door. Finally, in the fourth period after 2003 guest entrance is separated from the entrance of family which is rate as a 70 percent of the cases. As individuals started moving towards the guest's entrance which should be separated from the family as the social considerations such as achieving of privacy.

- The area of door in the traditional period is (2 m²) for (70%) from cases. in regard in the period (1930-1980) the area of door is between (2-3m²) for (70%) of the cases as well as the period (1980-2003) as a rate of (70%) of the cases the door area is between (2-3m²). Moreover, in the final period (after 2003) about (40%) from cases for door area is between (3-6m²). Increase the area of the doors as a result of influence of western culture, which led to increase the visual connection between the inside and outside.

- Location of the entrance within the mass: the main entrances location in the traditional period before 1930 was located at one side of the front facade was rated as a 60 % and in the middle as a 40 %. The spatial arrangement of entrances indirect accessibility and interior spaces are the main reasons of broken the arrangement of the main entrance. This meant that the entrance door offered privacy by separating the outside from the inside activities. While, in the second period of 1930 until 1980 and in the third period of 1980 to 2003 this idea was totally changed when the main entrance was located in the mid of the front facade which was rated as a 60 % and integrated by attachments of decorative. Finally, in the fourth period after 2003 the entrance become a focal point in front facade and guiding the observer to the house

spaces. Therefore, it is normally to be defined by a decorative mass and attract look towards it by passers-by (Figure 1.4).

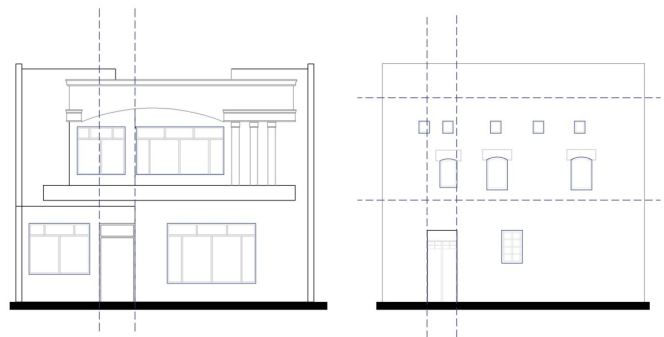


Figure 1.4 Location of The Entrance Within The Mass In Traditional Period And Period (2003-2016) Source: Author


The scale of door in period (1930-1980) at the level of one floor as a rate (80%) of the cases. This rate is the same in third period. in fourth period (after 2003) the scale of door at the level of two floor which is out of human scale (large in size) as a rate (70%) of the cases. as a result of effects of western culture, which led to increase the visual connection between the inside and outside to become a focal point in front façade and guiding the observer to the house spaces. Therefore, the huge size of doors translated the openness towards the outside. in addition, it will increase from the chance for visual contact.

-The placement of door within the facade line in traditional period was recessed as a rate (80%) of the cases. when the door is recessed its lead to configure the frame around the door and gives a kind of visual privacy. whereas in second period (1930-1980) and third period (1980-2003) the placement of door within the facade line was flush as a rate (60%) of the cases for each period. Finally in fourth period (after 2003) the placement of door within the facade line was flush as a rate (70%) of the cases.

- Relationship of the door with the street line: the outcomes showed that entrances of the house facade in the traditional period before 1930 were solid, simple, and within the human scale in size, and directly connected with street line were rated as a 90 percent. While, in second period of 1930 until 1980 a new concept of entrance appeared to be on a semi solid, defined platform, rise on a deck, and sets back from the street line by a transition zone of garage or green areas. Thus, the concept of outer boundary wall appeared as a solution of privacy for indoor facilities when the design typology gets changed from courtyard types to outward looking style. Additionally, in the third period from 1980 until 2003 the main doors relationship with street line stayed as the previous time. In the end, in fourth period after 2003 a new style appeared as the main door exists in the first floor; however, it is mean that the main floor arias from the street one floor. Consequently, around a 60 percent of house doors are above from street line, raised on a surrounded and defined pedestal by attachments of decorative.

- Accessibility of the entrance: the accessibility of the house entrance with the street in traditional period before 1930 was indirect as it was rated as an 80 % as the entrance was tilted on the main access to give privacy. While, in the second period from 1930 until 1980 this idea was totally turned to another type of indirect accessibility. So, the wall of the outer boundary appeared as result of privacy that sets back the building mass from street line. Therefore, the main entrance of the accessibility was through transitional space (front garden), and this idea enhanced in third period. Lastly, after 2003 a 50 % appeared as a new type of indirect accessibility that came into the view by locating the main entrance on the first floor.

Table 1.3 The Comparative Results of House Façade Windows in Different Evolution Periods of Mosul City


Windows					
Factors	Sub Factors	1900s-1930	1930s-1980s	1980s-2003s	2003s-2016s
Windows size	Small	✓			
	Medium				
	Large		✓	✓	✓
Windowsill height	$X \leq 0.50$ m				
	$0.50 \text{ m} < X \leq 1$ m		✓	✓	✓
	$1 \text{ m} < X \leq 2$ m	✓			
Windows shape	Rectangular	✓	✓	✓	✓
	Square				
	Triangular				
	Circular				
	Others				
Window dimensionality	Liner		✓	✓	
	Punctual	✓			
	Solid				✓
Position relative to the vision level	Above of view line	✓			
	Same of view line		✓	✓	
	Below view line				✓
Location within the facade	Ground floor		✓	✓	
	First floor	✓			
	At level two floor				✓
Ratio the area of windows to facade	$X \leq 20\%$	✓			
	$20\% < X \leq 40\%$		✓	✓	
	$40\% < X \leq 70\%$			✓	✓
Window iron protection		✓	✓	✓	
Type of glazing	Normal	✓		✓	
	Shaded		✓	✓	✓
	Two-way mirror				✓
Direction of opening parts	For inside	✓	✓	✓	✓
	For outside				
Vertical Fin			✓	✓	

The findings in this paper indicate there is significant influence of the windows parameter in determining the achieving of visual privacy. Findings from correlation analysis prove that any change in the windows parameter will directly affect the achieving of visual privacy. The degree of transformations for windows is high in the second period (1930-1980), moderate in the third period (1980-2003) and very high in the last period (after 2003). Findings through morphology analysis point out that almost all the traditional buildings have small windows and height above 1.70 m with punctual-linear dimensionality, rectangular shape, first floor location, windows area less 20% from the facade area, and have iron protection. Windows became the most desirable feature in house facades after the introducing modern shaded glazing windows that prevent the view to the inside of house during the third period (1980-2003). In addition, the characteristics of house façade windows were influenced by the idea of openness toward other cultures after the liberation in year 2003. Therefore, outsized windows with large panels and huge screen glasses were found in front façades in many cases, but the windowsill were almost below 1 metre height, have solid window dimensional, lower than view line, windows area more than 40% from the facade area, do not have iron protection, and not had vertical device fin.

Similar to windows, the overall findings indicate that entrances parameter is an impact factor in determining the achieving of visual privacy. Thus, any evolution in the entrances parameter for sure will affect the achieving of visual privacy directly. The findings show that the degree of transformations for entrances is very high in the second (1930-1980) and last period (after 2003), in contrast, it is quite low in the third period between 1980 and 2003.

Therefore, the morphology analysis as stated previously show that entrances are simple and solid for almost all the traditional building which has two narrow doors that was recessed, the size within the human scale, made up from wood material, and directly connected with the street line that adjacent to neighbours entrance. Some of these characteristics were altered by an evolution in developed areas into defined platforms such as semisolid, larger, raised on a deck, and set back from the street line. Besides, a new approach of monumentality was launched with outsized entrance that has level of two floor and has additional transparent glass panels on the top of main entrance in the fourth period after year 2003 in Mosul city. As a result, large number of houses has large entrances that exceed human scale and are semitransparent, one wide door, projection door, raised on a defined pedestal that surrounded by decorative attachments, and were set parallel to street line.

Table 1.4 The Comparative Results of House Façade Doors in Different Evolution Periods of Mosul City

Doors					
Factors	Sub Factors	1900s-1930	1930s-1980s	1980s-2003s	2003s-2016s
Func. of Door	Door for Guest Service	✓		✓	✓
Area of Door	$X \leq 2\text{m}^2$	✓			
	$2\text{m}^2 \leq X \leq 3\text{m}^2$		✓	✓	✓
Location Within the Mass	In Center		✓	✓	✓
	On Side	✓			
	Random				
Door Type	One Wide Door			✓	✓
	Two Narrow Door	✓	✓		
Door Shape	Rectangular	✓	✓	✓	
	Arcade				✓
Door Scale	level of One Floor	✓	✓	✓	
	level of two Floor				✓
Placement Within the Façade Line	Flush		✓	✓	✓
	Projection				
	Recessed	✓			
Materials	Wood		✓		
	Steel	✓		✓	
	Glass				✓
	PVC				✓
Relationship with Street Line	Parallel to St. Line	✓			
	Perpend. on St. L.		✓	✓	
	Set back fr. St. L.				✓
Entrance Accessibility	Direct Acc. to St	✓			
	Indirect Acc. St		✓	✓	✓
Relation with Neighbor Entr.	Opposite		✓	✓	✓
	Adjacent	✓			

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