

**The Abstract of**  
**『The life styles and the uses of the house space**  
**in the Shanghai Residents Study』 \***

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**CHARACTERSTICS OF HOUSES IN SHANGHAI**

**1. Distribution of house types**

In the recent days of Shanghai, the most favorite house type is the two room-one living room type. The proportion is 37.4% of the total survey participants. The next is the two bedroom type of 14.3%, the three room-one living room type takes 11.4%, and one room type, one room-one living room type, and one and a half room type take 6.4%, 8.0%, and 5.5%, respectively. Recently, the dwelling condition in Shanghai has been improved, so that the adoption of the layout with a large sized room is gaining its popularity. For example, the four room or more type houses show 5.7% distribution.

**2. Property area and floor area of houses**

After the reformation of the housing policies, the standard area of house design in the real estate market has been raised significantly. The property area of the smallest house is generally over 50m<sup>2</sup>. A large one reaches 200m<sup>2</sup> and some are ever larger. The present state of the analysis on the Shanghai houses is as follows:

(1) Most of the Shanghai houses have property area less than 70m<sup>2</sup>. According to this survey, the average property area of the entire houses of this survey is 74.3m<sup>2</sup>. The houses of 30m<sup>2</sup> or less property area are 7.9% of the total surveyed houses. The houses of 31~50m<sup>2</sup> of property area are 19.3%, 51~70m<sup>2</sup> is 26.3%, 71~100m<sup>2</sup> is 31.7%, 101~150m<sup>2</sup> is 10.9%, 151~200m<sup>2</sup> is 3.2%, and 200m<sup>2</sup> or bigger is 0.7%.

(2) The average floor area is 31.22m<sup>2</sup>. The proportion of the houses of 20m<sup>2</sup> or less floor area is 8.3%, 21~35m<sup>2</sup> is 22.7%, 36~50m<sup>2</sup> is 28.2%, 51~70m<sup>2</sup> is 18.9%, 71~100m<sup>2</sup> is 16.9%, and 100m<sup>2</sup> or larger is 5%.

(3) The average areas for major rooms are; living room-15.8m<sup>2</sup>, dining room-10.3m<sup>2</sup>, master bedroom-15.4m<sup>2</sup>, second bedroom-12.7m<sup>2</sup>, third bedroom-12.3m<sup>2</sup>, first

bathroom-4.6m<sup>2</sup>, second bathroom-5.1m<sup>2</sup>, first kitchen-5.8m<sup>2</sup>, second kitchen-5.9m<sup>2</sup>, balcony-4.5~4.8m<sup>2</sup>. Some houses have two balconies.

(4) The house construction in Shanghai has been accelerated. During 1950~1959, the accumulated property area of the houses that were completed is 5,631,400m<sup>2</sup>. This figure is 3.37% of the total house property area of Shanghai that was built since the establishment of the Republic of People's China. The number became 4,648,600m<sup>2</sup> (2.78%) during 1960~1969, 9,804,700m<sup>2</sup> (5.87%) during 1970~1979, 41,522,500m<sup>2</sup> (24.84%) during 1980~1981, and 105,525,900m<sup>2</sup> (63.14%) during 1990~1999.

### **3. Relationship between the property and floor area and house types**

The ratio of the floor area to the property area of the multiple level houses in Shanghai is generally 80% on average (70~90%), and the ratio of the high-rise houses is 75% (65~80% or higher).

Depending on the time of construction, the design standards show variations. Hence, there exist differences among the house types of a kind. According to the statistics of this survey, the floor area of the one room-one living room type is 30m<sup>2</sup> or less, the floor area of the two room-one living room type is 40m<sup>2</sup> or less, and the majority of the three room-one living room type has 50m<sup>2</sup> or less of the floor area.

According to the statistics of the standard house data that City of Shanghai recently generated, the average property area of the one room-one living room type is 60.77m<sup>2</sup> and the average floor area is 48.67m<sup>2</sup>. For the two room-one living room type, the average property area is 60.77m<sup>2</sup> and the average floor area is 68.25m<sup>2</sup>, and the numbers are 109.9m<sup>2</sup> and 88.09m<sup>2</sup> for the three room-one living room type.

### **4. Depth, width, and floor height of the houses**

The Linong (里弄) houses that were built before 1949 show deep and wide dimensions. The early Shikumen (石庫門) Linong houses have a relatively deep depth of 15~16m. The width is around 3.6~4.2m. The newer Shikumen Linong houses, the neo Linong houses show the depth shortened by a small margin. The depth became 13m. The width of the neo Linong house is comparably large, 4m. Some reached 4.2~4.4m. The Garden houses and the apartments have variations in the depth and width. A number of rooms of the Garden houses have the widths of 4~6m. For apartments, the room width is 4~5m.

The company houses that were constructed after 1949 were to provide the blue color worker with living service. The quality of a house was improved significantly from the

tent houses or the temporary houses that were used before 1949. However, as a whole, the house quality has been improved gradually. The widths of the Shanghai houses were 2.8~3m in 1951, 3.2m on average in 1956, and 3.4~3.6m on average after 1957. During 1960~1970, the widths of the houses were 3m, 3.3m, and 3.6m. Newly constructed houses present the width range of 3.45m, 3.6m, 3.8m, 3.9m and 3.9m. The widths of the living rooms are 3.9m, 4.65m, 6.45m, and 6.6m in general. Because it was considered to be appropriate that the depth of the bedroom shall accommodate two beds, the depth of the room is around 4.3~5.2m. In the 1980s, the design of 'a large living room and a small bedroom' style was popular, which resulted in the decrease in room depth. After 1949, in order to save land due to population growth, the depth of the house and the room continuously increased by raising the building density. The depth was 7,8m in the early 50s', and 9 or 10m in the late 50s' and 60s. The house plan design of increasing the depth was favored and the average depth was 11~15m. A small garden was built in between the units to provide ventilation and lighting. The popularity of the slab-type houses in the market in that time period already reduced the depth. However, a decent number of houses presented the comparably deep depth, 20m, because of lots of high-rise houses.

## **5. Kitchen and bathroom**

Since the Linong houses before 1949 did not have bathrooms, the resident had to dispose the chamber pots every day. Only the wealthy households had bathrooms in the house. After 1949, City of Shanghai started a large scale house construction projects. The design of the kitchen and the bathrooms corresponded with the change of house design standards over time.

In the early days of founding of China, the house construction focused on improving the poor dwelling conditions of the blue color worker. According to the census of that time, most of the households were dual income families and the level of the house design standard was relatively low. The average building area was 30m<sup>2</sup> per household. The average kitchen area was 10m<sup>2</sup> shared by three or four households. There was only one toilet stool in the bathroom, which was shared with a number of households. In 1954, attention was paid to the experienced Soviet Unions, they insisted on apartment construction. The average floor area was 70~80m<sup>2</sup>, the kitchen was 4.5~7m<sup>2</sup>, and the bathroom was around 4m<sup>2</sup>, 6.6m<sup>2</sup> at the largest. A bathtub, a toilet stool, and a washbowl were installed in the bathroom. The 1954 house design standards were used through 1957. Due to the natural disasters over the three years, 1960~1963, the house

design standards had become less strict. Accordingly, the kitchen and the bathroom were shared by two households. The bathtub and the washbowl were eliminated in the bathroom, and the toilet stool was only installed. The slogan “Newer production and simpler living!” was proposed after 1964. The focus of house construction was on “Faster and more to take care of the homeless”. The figures in the construction standard were reduced from 50m<sup>2</sup> to 30m<sup>2</sup> per household. The kitchen was transformed from the single household use to the type shared by two or three households. The bathroom was shared by two or three households. The only item in the bathroom was the toilet stool. In case of the houses with even lower standards, interior bathroom was no long built and a disposal facility was located at a corner of the hallways of each floor. People started using the chamber pots again.

In 1970's, the house standards were shifted to the one entrance per household, and individual kitchen and bathroom type. The kitchen area was 3~5m<sup>2</sup>, and the bathroom area was 1.88~2.33m<sup>2</sup>. In the 1980s', due to the improvement in people's life quality, the kitchen and the bathroom drew attentions. The Institute of Private Architectural Design of Shanghai performed investigation on the kitchen and the bathroom of the domestic houses and suggested new standards based on the demands. The individual kitchen and bathroom is necessary. The net area for the kitchen needs to be 4m<sup>2</sup> or larger and the bathroom needs 2.5~3.5m<sup>2</sup>. In the late 1980's, all the bathrooms were equipped with a bathtub, a washbowl, and a toilet stool. With the wide spread of washers into the general public, the area of the bathroom expanded to be 4.5m<sup>2</sup> and the kitchen area became 5m<sup>2</sup>. Of the newly constructed houses in Shanghai, the kitchen area is usually 6~8m<sup>2</sup> and the bathroom area is 4~8m<sup>2</sup>. At present, the completion rate of the houses in Shanghai is 70%. In other words, 30% of the city residents are still living in houses without individual a kitchen or a bathroom.

## **SPACE USE IN HOUSES IN SHANGHAI**

### **1. The function of rooms in houses in Shanghai**

The function of rooms in houses has a close relationship with the items such as the size of the family, the building area, and the floor layout. Generally speaking, if the family is small, the floor area is huge, the building area is large, and there is a number of rooms, each activity of the resident can relatively be placed in a certain room as well as the function of the room can remain single purposed. Without the case, the function of the

room is unclear, various types of activities have to be conducted in a single room, and the life of each resident may be disturbed. As the quality of lives improves, the average housing area possessed by the Shanghai resident increases, the house completion rate increases, and the efficient design of the room structure type is accomplished. Under the principle that the room function is to be categorized, the separations between common and private room, activity and rest room, dining room and bedroom, living room and bedroom, and clean and garbage are gradually established.

In 1999, the housing area per each person in Shanghai has become  $10.2\text{m}^2$ . However, this figure has a variation for different family sizes; the average area of one-person-family is  $38.67\text{m}^2$ , a family with two persons is  $44.79\text{m}^2$ , a family with three persons is  $53.58\text{m}^2$ , a family with four persons is  $63.53\text{m}^2$ , a family with five persons is  $58.67\text{m}^2$ , and a family with six persons is  $50.85\text{m}^2$ .

In Shanghai, the maximum house area of the traditional family of three or more generations is  $180\text{m}^2$  while the average is  $56.34\text{m}^2$  and the minimum is  $14\text{m}^2$ . For a nuclear family of a couple with a child, the maximum floor area is  $250\text{m}^2$ , the average is  $54.3\text{m}^2$ , and the minimum is  $5\text{m}^2$ . For a couple without a child, the maximum floor area is  $86\text{m}^2$ , the average is  $39.95\text{m}^2$ , and the minimum is  $20\text{m}^2$ . For a single parent family, the maximum floor area is  $86\text{m}^2$ , the average is  $39.95\text{m}^2$ , and the minimum is  $10\text{m}^2$ . For a family with a number of children, the maximum floor area is  $200\text{m}^2$ , the average is  $65.97\text{m}^2$ , and the minimum is  $20\text{m}^2$ .

In Shanghai, the age of the head of family and the size of the possessed house floor area are reflected in the home owning status for different family types. For the heads of family of 30-year-old or younger, the maximum floor area is  $200\text{m}^2$ , the average is  $54.82\text{m}^2$ , and the minimum is  $14\text{m}^2$ . For the heads of family of 30~45-year-old, the maximum floor area is  $240\text{m}^2$ , the average is  $55.45\text{m}^2$ , and the minimum is  $11\text{m}^2$ . For the heads of family of 45~60 year-old, the maximum floor area is  $250\text{m}^2$ , the average is  $55.11\text{m}^2$ , and the minimum is  $5\text{m}^2$ . For the heads of family of 60 year-old or older, the maximum floor area is  $90\text{m}^2$ , the average is  $38.54\text{m}^2$ , and the minimum is  $10\text{m}^2$ .

In Shanghai, the distribution of the types of the residential housing based on the collected samples of this survey is follows as; one room-one living room type takes 8.2%, one and half room type takes 5.6%, two room type takes 14%, two room-one living room type takes 37.9%, two room-two living room type takes 4.4%, three room

type takes 2.2%, three room-one living room type takes 11.9%, three room-two living room type takes 3.8%, four room type takes 0.6%, four room-one living room type takes 1.2%, four room-two living room type takes 1%, five and more room type takes 3%. According to the room type analysis, the distribution of the family size residing in one room type housing is as follow; one person family takes 16%, two person family takes 13.3%, three person family takes 61.7%, four person family takes 5.0%, five person family takes 3.6%, and six person family takes 0.3%. A proportion of 38.5% of the single person families live in a one room type housing, and 36% of two person families and 42.6% of three person families live in two room-one living room type housing. As the size of a family increases, the ratio of residing in a larger scale housing type increases. For example, only 0.1% of the single person families, 10.6% of the two person families, 63.7% of the three person families, 18.6% of the four person families, and 6.2% of the five person families reside in the three room-one living room type housing.

Since there exists no definite consistency among housing types, size of the families, and utilities in Shanghai, certain activities cannot be arranged in appropriate rooms. The functions of the rooms in the Shanghai houses are follow as:

1. A proportion of 12.6% of the Shanghai families dine in bedrooms, 15.8% in kitchens, 37.2% in living rooms, and 21.7% in dining rooms. The rest does not show a fixed preference.
2. A proportion of 24.5% of the functions of living rooms is pure guest reception. 9.6% living rooms are used as rather a corridor and 49.6% has a combined use of dining and guest reception.
3. Master bedrooms are used solely for sleeping place of the 45.6% of the Shanghai residents. 12.5% of bedrooms are used for dining area, 39% are used for study area, and 27.1% are used for guest reception.
4. A proportion of 14.1% of the Shanghai residences have an area designated for pure study room. 72.1% and 14.3% of the adults read books in bedrooms and in living rooms, respectively. A proportion of 72.4% of the children read books in bedrooms and 7.3% in living rooms while 7.6% read books in parent's bedrooms.

## **USE OF HOUSE FLOOR AREA OF THE CITY RESIDENTS**

### **1. Furniture of the city residents**

In general, the furniture of Shanghai residents consist of a wardrobe, a bed, a drawer

attached to a bed, an ornament cabinet, a TV stand, a dining table, a bookshelf, a desk, a chair, a sofa, and a table. According to this survey, a proportion of 24.9% of the Shanghai residences own a dresser, 31.7% own a cloth hanger, 55.8% own a drawer, 23.5% own an ornament cabinet, and 5% own a piano.

Among the Shanghai residence, most of them have combined furniture, a proportion of 55.0% of the whole residences, and 43.4% have single unit furniture. A proportion of 1.6% of the residences has both types of the furniture. Most of the furniture in the Shanghai residences is movable, but 18.4% of the residences have the furniture fixed in the rooms during interior setups. A proportion of 41.8% of the residences have both movable and immovable furniture.

Most of the furniture in the Shanghai residences were purchased in 1992 or 1993 and they are planning on switching them with new furniture in about 2005. In case of the piano, the earliest purchase was made in 1984, and more than 60% of the pianos were purchased after the 90's. The pianos purchased before 1990 is 33.3% and after 1997 is 36.7%.

The furniture purchase of the Shanghai residences has a close relationship with the change of the housing conditions. A proportion of 48.6% of the residence answered that they purchased furniture when they moved, 11.9% purchased their furniture during house remodeling, only 14.7% purchased when they got married, and 17.9% purchased new furniture when they felt the need because of the age of the old furniture.

## **2. Household electric appliances of the city residents**

According to the statistical data from Shanghai, the possession of electric appliances per 100 households in 1998 is follows as; 82.2 cassette players, 128.2 color TVs, 48.8 VCRs, 25.4 VCDs, 21.2 audios, 68.6 air conditionings, 62.8 microwaves, 53.8 instant water heaters, 103 refrigerators, 229 electric fans, 91.6 washers, 13.2 computers, 58.6 cameras, 6 cellular phones.

Based on this survey results, besides the electric appliances listed above, the possession rate of a water purifier is above 20.6%, a dish-washer is above 2.9%, a video game is above 19.3%, and a heater is 31.6%. Recently, as the kitchen surroundings get improved, the TV purchase somewhat increases. The households that has more than two TV sets is 38.5% of the total survey group and 9.7% of the residences have more than three TV

sets.

Looking at the time of purchase of electric appliances, the earliest purchase of TV sets is traced back to 1974. Most of the TV sets were purchased in the 90's. The TV purchase continued to grow, such that the TV sales increased at a rate from 6.0% to 11.4% in the last 5 years. In 1998, a proportion of 11.4% of the households bought TV sets. The largest VCR purchase occurred in 1990; 16.4% of the households bought VCR's. In 1992 and 1993, 14.3% and 10.1% of the households purchased VCR's. Most of the purchase of audio, VCD, water purifier, and air conditioning occurred after 1995. The households that purchased assembly audios after 1995 are 73.7% of the total households with audio sets while the purchase of water purifiers, VCDs, and air conditionings show 87.7%, 91.4%, and 83.8% of the distributions of the same matter. The spread of personal computer is very rapid in the recent years of Shanghai. The personal computers that were purchased in 1998 and 1999 hold over 53.8% of the total personal computers. The sales of refrigerators started growing in 1985. The refrigerators purchased in 1985 hold 89.3% of the total refrigerators.

### **3. Furniture arrangement in houses of the city residents**

A wardrobe, a bed, and a drawer attached to a bed are located in the master bedrooms while a desk, a bookshelf, and a computer desk are placed in the secondary bedroom. According to this survey, the ratios of a desk, a bookshelf, and a computer desk being located in the secondary bedroom are 36.8%, 33.0%, and 44.3%, respectively. Sofas are mostly located firstly in the living rooms and secondly in the master bedrooms. The proportions of sofas in the two rooms are 37.6% and 32.3%, respectively, of the total sofas. Pantries are mainly placed in the kitchens but they are also found in the master bedrooms, secondary bedrooms, and living rooms. When the pantries are located in only one of the areas listed above, the proportions are 36.3%, 9.4%, 5.5%, and 8.9%, respectively. The pianos are located in the living rooms of most of the Shanghai residences. The proportion of the pianos located in the living rooms is 35.3% and 7.8% of the pianos are placed in the study rooms. The rest are placed in the bedrooms.

### **4. Electric appliance arrangement in houses of the city residents**

Most of the TV sets are located firstly in the bedrooms and secondly in the living rooms. Based on this survey, a proportion of 84.3% of the households have their TV sets in the master bedrooms and 37.6% have them in the living rooms. The refrigerators are placed mostly in the kitchens or in the living rooms. They can also be found in the master

bedroom in some residences. The refrigerators in the kitchens are 35.6% of the total refrigerators surveyed, and 32.1% and 13.3% are located in the living rooms and the master bedrooms, respectively. The washers are mainly placed in the bathrooms. The proportion is 56.0%. The secondary area for the washer is the balcony where 21.6% of the washers are located. A proportion of 5.5% is found in the master bedrooms and 3.5% is located in the living rooms. The air conditionings are mostly placed in the bedrooms or in the living rooms. The proportions of the air conditionings located in the master bedroom, the living room, and the secondary bedroom are 41.2%, 8.9%, and 7.5%, respectively. Due to the improvement of life quality of the Shanghai residents, 41.9% of the household has two or more air conditionings. The primary location for the water heater is the kitchen. The proportion is 61.4%. 34.8% of the water heaters are found in the bathrooms. The proportions of the water purifiers located in the living rooms, the kitchens, and the master bedrooms are 51%, 19.9%, and 11.7%, respectively.

## **5. Use of house space of the city residents**

In general, the house activities of the city residents consist of the routine activities, dining, and sleeping, which mainly occur in the living room, the kitchen, and the bedrooms that form the general house space.

### **(1) Design characteristics of the use of the house space**

This survey has revealed that the arrangement of the furniture and electric appliances are restricted by the size, the width, and the depth of the rooms, and it has a close relationship with the functions of the rooms and the preference of the residents.

One of the considerations in designing the room layout is paid to the corridor. The width shall not be less than 1m, and the clear width shall be usually 1.1m. It should be wide enough for two persons to walk shoulder to shoulder, for a single person to walk with baggage in both hands, and for a single person to pass through next to a bike parked in the corridor.

According to the current Chinese house design standard, the area occupied by furniture and electric appliances shall not be too big in a room. Too much of furniture and electric appliances makes the room look stuffy. In general, the area occupied by furniture shall not be more than 50% and the maximum limit is 55%.

### **(2) Use of the hall area in the houses**

Generally, any furniture shall not be placed in a hall as a pathway but a washer or a

refrigerator can be located in a small corner area. A square hall of 4~5m<sup>2</sup> can accommodate a dining table. A large hall can replace a living room as a family gathering and social area. In general, a dining table or a TV is placed in the middle, and chairs or sofa are located against the wall. In the newly constructed houses, the sizes of the living rooms are 18m<sup>2</sup> or greater and they have multiple functions. They include functions of the entrance, the audio-visual leisure room, and the dining area. In a house where there is a separate dining area, a relatively large portion of the living room is reserved for dancing or exercise. The main pieces of the living room furniture are a TV stand, a decorated dresser, a sofa, and a table. For those who own the piano, the living room is the place for it.

### **(3) Use of the bedrooms in the houses**

A bedroom is a major space for the Shanghai residents. For one room type housing, the bedroom provides space for the majority of the house activities. A table in the bedroom is used for dining, gathering, and reception. The parents sleep on the bed at nights and the children can play on the bed during the daytime. The area underneath and on top of the bed is for attached storage cabinets. Miscellaneous furniture can be placed against the walls.

For two room type housing, a house provides space for routine house activities. A house consists of a larger master bedroom and a smaller, independent secondary bedroom. A single bed for the secondary member of the family, a table for dining, gathering, and study, and a sofa for reception and chatting are located in the master bedroom. When the child starts going to school, the secondary bedroom is assigned to the child for his or her study and the locations of the single and the double beds can be swapped.

When there is a need for a more number of rooms, the hall area can be minimized or eliminated. In this case, one of the rooms can be used as a living room. The bedrooms are solely used for sleep or study of the family members. The furniture in the bedroom consists of a bed, a drawer attached to the bed, a desk, a dresser, a big cloth cabinet, and a TV stand. The dresser can be relocated when enough space is available in the bathroom.

### **(4) Use of the kitchen in the houses**

In Shanghai, it can be seen that multiple households share a common kitchen area. The common kitchen area with a large number of the households has one sink and a number

of gas stoves, underneath or on top of which, pantries are installed for storage of various types of condiment. When the number of the households is small, a relatively big cooking table and food storage cabinets can be installed.

A kitchen for a single household is an area for storage and cooking and the center of all house labor. The kitchen area can be divided into a storage area with a refrigerator, a washing area with a faucet, and a cooking area with a gas stove. The utilities in the cooking area consist of a gas stove, microwave, a hood, and so forth. The use of the kitchen area is based on the storage and preparation of food, initial processing, washing, refined processing, and cooking process. The processing line on the cooking table is arranged in an order of the initial processing table, the sink, the refined processing table, and the dishing table. The tableware and the condiments are stored in the pantries, the rack, the cross plate, the cabinets, or the baskets, which are located underneath and above the cooking table. In general, the pantries are installed 1.5m above the floor and the cooking table is at 0.8~0.9m from the floor. The width of the cooking table is 0.5~0.6m.

The cooking tables can be put into three different categories based on their types; (a) ‘-’ shape: storage, sink, and cooking tools are arranged in the ‘-’ shape and placed against the walls in a small kitchen area, (b) ‘L’ shape: storage, sink, and cooking tools are arranged at the ‘L’ shape corner along the walls in a limited and a somewhat square-looking kitchen area, (c) ‘U’ shape: separate sink is located on one side, and storage and cooking area are put together on the other side of a relatively large kitchen area. According to the survey, the most popular cooking table type in Shanghai is the ‘L’ shape with 48.8% of distribution, the second popular one is ‘-’ shape with 36.4%, and the least popular one is the ‘U’ shape with 14.8%.

#### **(5) Use of the bathroom in the houses**

According to the statistics of the Real Estate Administration, currently, the proportion of the multiple households sharing a common bathroom is approximately 30%. Based on this survey, a proportion of 12.7% of the total households that participated in the survey share a common bathroom with others, and 8.1% of them share both kitchens and bathrooms.

The households that are equipped with the bathroom utilities, such as a bathtub, a flush toilet, and a washstand is 40.7% of the total participated residences. A washbowl stand

is installed in the 36.7% of the total households. The installation of the bathroom utilities is limited by the size of the bathrooms. In the earlier days, the bathrooms were equipped with a toilet only or a toilet with a faucet to combine the shower and the lavatory because the allocated space is only 2m<sup>2</sup>. In the newly constructed houses, most of the bathrooms have all the three utilities, a tub, a flush toilet, and a washstand. Even a washer is installed in the bathroom with a relatively larger space.

#### **(6) Use of the balcony in the houses**

Most of the completed houses in Shanghai include one or two balconies. For a house with one balcony, it faces the south and is located outside of the living room or the bedroom. The primary use of its space is for drying clothes, or exercise and rest. Due to a dense house layout, some of the open-balcony is used as an extension of the living room by installing walls. Sometimes, they put a small bed to turn the area into a children's room or place a desk to use the space for a study room. Sometimes, they use the balcony area as a playing ground for the children and store children's bikes and toys. In the newly constructed houses, in order to enhance the real estate value of the house, they build a closed-balcony and the residents use the balcony space for a rest area with sofas or chairs. For a house with two balconies, the other balcony is usually located next to the kitchen or the bathroom. The balcony is used as a supplementary space for the kitchen or bathroom activities. For example, the initial food processing of the kitchen, or the washing and cleaning activities can be conducted in the balcony.

#### **(7) Transportation and its arrangement**

In Shanghai of 1998, the households participated in the survey owned 132.8 bicycles, 13 motor-bicycles, and 1.4 motorcycles per 100 households. They are usually parked in the public lots. The proportion of the households parking their bicycles, motor-bicycles, and motorcycles in the public lot is 52.6%, 74.2%, and 64.9%, respectively. In the mean time, the number of households that own a vehicle or work in the transportation industry is increasing. According to this survey, the proportion of the households that own a vehicle or work in the transportation industry is 3.9%.

#### **(8) Items of that cause cleaning**

The items that cause cleaning are books and newspapers (28.3%), toys (31%), shoes (10%), clothes (12.3), and food (8.1%).

## **CHARACTERISTICS OF HOUSE SPACE USE OF SHANGHAI RESIDENTS**

Noticeable differences in house space use exist for occupations, incomes, and number of family members.

### **1. Occupations and usage of houses of city residents**

According to the analysis on the distribution of house types per family head's occupation, most of the private company presidents, military officers, and foreign company employees reside in garden houses, and high percentage of the government officers, Education/Health/Science Institution research workers, and local company employees reside in company houses. Many of the foreign company employees live in apartments, and most of the military officers live in neo-Linong type housing. A proportion of 25.4% of the domestic company employees reside in old-Linong type housing and 16.5% of the local company employees live in old-Linong type housing. A proportion of 16.3% of the financial or commercial industry employees reside in old-Linong type housing.

A proportion of 40.4% of the domestic company employees reside in the two room or less type housing, only 21.9% live in the two room-two living room or better type housing. The ratio of the financial and commercial industry employees living in the two room or less type housing is comparably low; 29.1% live in the two room or less type housing and 31.3% live in the two room-two living room or better type housing. A proportion of the foreign company employees residing in the two room or less type housing reaches 32.4%, which is assumed to be resulted from the young age of the house heads. The Education/Health/Science Institution research workers and the government officers mostly live in the two room-one living room type housing and the ratios are 43.9% and 41.1%, respectively. The situation for the military officers is in a better shape; a proportion of 50.1% of them live in the two bedroom-two the living room type housing. The private company presidents own the largest houses; a proportion of 64% of them reside in the two room-two living room type housing. The manager-level employees show a worse distribution than the government officers; a proportion of 29.8% of them reside in the two room-two living room type housing. The Department of Education research workers show an even worse distribution than The manager-level employees; a proportion of 27.6% live in the two room-two living room or better type housing.

### **2. Family types and use of house space**

### **(1) Housing types for family types**

In Shanghai, a proportion of 38.7% of the single member family live in the one room type housing, a proportion of 47.4% of the family of a couple live in the two room-one living room type housing. Most of the nuclear families live in the two room-two living room or better type housing; their proportion is 36%. Due to the size of the family, the traditional family and the family with children reside in the two room-two living room or better type housing; their proportions are 37% and 43.6%, respectively.

### **(2) Housing types of young couples**

According to this survey, a proportion of 83.3% of the young couples live in the two room-one living room or less type housing; 58.5% reside in the two room-one living room type, and 16.5% live in the one room-one living room type housing. A proportion of 1.9% of the young couple has less than 14m<sup>2</sup> house floor area, 6.44% has 14~20m<sup>2</sup>, 23.8% has 20~30m<sup>2</sup>, and 67.9% has over 30m<sup>2</sup>. A proportion of 5.2% of the young couple plans on an expansion in the next 2~3 years, 24.2% has a plan in 3~5 years, 41.5% has a plan in 5~8 years, and 27.4% has a plan after 8 years. The young couples show better distribution of the housing types than the old couples, which reflects the house purchase trend of the younger couples and the change of the level of consumption. It also indicates the noticeable improvement of the residents' housing style in Shanghai.

### **(3) Room assignment of family members**

In the recent days, there is a fundamental change in the child room assignment of a family with children. According to the survey, most of the families assign a separate room to a child when the child enters into the third grade at the age of 10. A proportion of 6.5% of the families does not have enough space for a separate room for a child so that they build a loft or use a curtain to separate the child's room from the adult's.

### **(4) Room for the aged and children**

There is no significant distinction in the arrangement of the rooms for the aged and children from the general bedrooms.

The main function of the room for the aged is sleep and storage. Since the aged have frequent visits to the bathroom at night and they have weak sight, the design should attach importance to night lighting in order to enhance the efficiency.

In general, the room for children contains small sized furniture and lots of toys and it needs enough room for children to play. Due to Family Regulation in China, a couple can now have only one child. Chinese parents take child education seriously. They usually assign a better room to the child. They arrange such furniture and electric supplies, as a piano and a computer, that a child need for study in a child's room.

The location of the child's room in a house needs adjustment as the child grows. During the elementary school period, children like to play a lot, so that their room is usually located next to the entrance; friends may come to play but they do not necessarily disturb the activities of the parents'. When the child goes to a junior-high, the child is under great stress for the pressure of entering into a good school of higher grade. Often times, the child room is relocated to inside of the house to provide a stable study environment.

#### **(5) Staying with nanny**

A proportion of 51.4% of the Shanghai family has an experience with nannies. A proportion of 13.6% of the nannies lives with the family, 36.9% commutes, and 0.9% lives with the relatives of the family.

#### **(6) Living with parents**

Only 13.7% of the couples in Shanghai wish to live with their parents after marriage. Most of them want to keep distance with their parents. A proportion of 3.5% stated that they do not wish to live with parents and try to stay away from them as far as possible.

### **3. Location and use of house space**

The analysis on the average house area per district in Shanghai reveals following results. In the central ten districts, the average house floor area is less than 50m<sup>2</sup>. In the newly developed districts such as Fudong, Jiading, Minhang, and Baoshan, the average house floor area is usually less than 60m<sup>2</sup>. The land restriction is less strict in the rest of the districts since they are far away from the central districts. The average house floor area in those districts is less than 80m<sup>2</sup>.

Most of the houses in a few central districts in Shanghai show the two room-one living room type. For example, a proportion of 84.7% of houses in Huangfu district present the two room-one living room or less type, and 82.7% in Nanshi reside in the two room-one living room or less type. The houses in the outer side of the central districts show comparably expanded house types. The ratio of the households residing in the two

room-one living room is 72.9% in Changning and 78.9% in Yangfu. The newly developed district in the central districts, such as Fudong, shows a small distribution of the two room or less type houses. The ratio is 27% of the survey participants. In Jiading, only 21.1% reside in the two room or less type housing. Even though the statistical error of the survey result may be great for the district in the suburb since the data sample is small, the construction of the one room or less type is very rare and the three room-one living room or better type houses shows a high distribution ratio.

According to the two analysis presented above, there is a tendency of larger scale houses as the location moves away from the central district.

## **EXAMPLE OF SPACE USE OF THE TRADITIONAL HOUSE OF CITY RESIDENTS**

### **Linong<sup>1</sup>(里弄) Houses**

The Linong houses in Shanghai, which refers to old-Linong, neo-Linong, garden-Linong, and apartment-Linong, are the housing styles that were constructed before the establishment of the People's Republic of China and they are still used in the current constructions. A great number of labor workers lived in a tent or a temporary house before the establishment of the People's Republic of China. The construction of the Linong houses provided housing units, which were relatively comfortable. In general, the residents of the Linong houses had a constant source of income and maintained a stable domestic economy. In 1949 after the establishment of the People's Republic of China, those Linong houses were taken away from the original property owners and distributed to the ordinary workers. Because of too many people and not enough houses, several households lived in one unit of the Linong house and as a result, the dwelling condition was poor. However, it was still far better than living in a tent or a temporary house.

At present, most of the residents of the old-Linong houses are labor workers. In the earlier days, usually, five or six households lived on one floor and total ten to twelve households in one unit of a three-room type old-Linong house. Fourteen to fifteen households lived in a five-room type old-Linong house. These days, the five-room type house is very rare and most of them have been demolished. In the latter period, usually,

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<sup>1</sup> 'Linong' means a bystreet in Chinese. Hence, the 'Linong House' refers to the small houses between bystreets, compared to the houses in huge housing complexes. In this report, both words 'bystreet' and 'Linong' are used according to the contents.

four to five household lived in a one-room type old-Linong house, eight or nine in a two-room type, and ten or more in a three-room type.

The house area of old-Linong house is not too big; the average is 10~13m<sup>2</sup>. Each household has just simple and basic furniture; a cloth hanger, a drawer, a table, a chair, a refrigerator, a TV, and a bed. Even the old-Linong houses that have relatively large area, are the two room-the three room types only. The floor height is somewhat high; sometimes, it reaches 3.6m. A number of households builds a loft at 2m height to store miscellaneous items or boxes, or to place a bed for family members or guests. A house with a guest room is typically the two-room type house and the guest room is located above the living room. Usually, the younger sleep in the loft and the older in the lower level. Most of the old-Linong houses offer a common kitchen. The kitchen has six to eight stoves and one sink. Each household has a faucet of their own. The water pipe has six to eight faucets with meters, which can be rarely seen in other places. There is no bathroom in the old-Linong house. Each household uses a chamber pot and disposes it in the collecting facility in the street.

For the neo-Linong house, a unit for a single household is rare. Three or four households usually live in one unit. Each unit has two or three bathrooms, usually one for each household. In the worst case, two households share a bathroom. The common kitchen is unusual. When there is no kitchen in the second or the third floor, the patio in the back yard can be modified to a kitchen. Some cook on the lower level. Two or three households use the common kitchen on the lower level. Since the neo-Linong residents usually have two or more rooms or a large room divided into two, the overall dwelling condition is relatively fine. Furniture arrangement is not so different from the three-room type house.

Some of the garden houses have been transformed into office houses by now. A unit occupies a building, and a large room is used for a conference room and a small room for an office. Those, who own an entire unit are personages, enterprisers, high-level managers. For the ordinary public, multiple households live in one unit, and the common kitchen becomes necessary.

At present, the apartment-Linong house does not have much difference from the company house. There are one-room type and more multiple room type houses. The bedroom area is around 20m<sup>2</sup>. The sleeping and the activity areas can be easily divided

by furniture or folding screens. A kitchen and a bathroom is allocated, and their areas are 5~6m<sup>2</sup>. The building area of a big unit is over 200m<sup>2</sup> with five to six rooms, one nanny room, two bathrooms, and a kitchen. This type of house is not hard to find. An apartment-Linong can be occupied by multiple households; two or three households use a unit. The room area is around 20~25m<sup>2</sup>; the room is big. It is flexible to arrange furniture and divide functions of the room. The floor height is around 3.2~3.3m, the design of storage is quite dense, and the overall dwelling condition is fine. When multiple households live together, each household places miscellaneous items in the living room or corridor. A unified management is not available and the common area can easily be a mess. The residents of the apartment-Linong are high-class people. A director of the Department of Administration is an example. Reflecting the good dwelling condition, many households hire nannies. The space use of the apartment-Linong house and the housing arrangement of the company house, especially commercial housing, is basically identical.

### **1. Company House**

The Company house appeared after the establishment of the People's Republic of China. Prior to the 90's, the allocation of the company house is based on job duty, years of employment, salary, and number of family member. When some one makes an extraordinary achievement, government support is awarded in assessing the criteria. In other words, the priority is given based on the assessment points earned at the time of distribution and the point can be improved. Since each corporation creates funds to construct the house of this type, the dwelling condition has a relation with the social and economical level and the economical capability of the residents, and differences in the dwelling condition exist between corporations. In general, the company house of a government organization appears better than that of a school, hospital, or science institution.

In case of a college professor, an instructor or a newly promoted associate professor resides in the one room type housing. An experienced instructor, an associated professor, or a newly promoted young professor resides in the two room type housing. An experienced associate professor or a professor occupies the three room type housing. There are a small number of the four room type housings in the company house. The professionals who made a special achievement and the upper level officers live in larger units in company housing. Generally, in China, a lower level manager of a company matches a college instructor, an upper level manager matches an associate professor,

and a director matches a professor in terms of salary and housing assignment. A blue-color worker needs a twenty years of employment history to match the treatment of a college instructor. The dwelling condition of a blue-color worker has a close relation with the economical capability of the company that he works for. The companies with a financial difficulty would not provide a decent solution to the housing problems of its employees. In a poor condition, the average housing area per person is less than 4m<sup>2</sup>. The usual company house of a financially stable company is a mid-sized (two room-one living room type) or a largely sized house (three room-one living room type). Even a newly married employee can be assigned to a mid-sized house.

### **3. Newly constructed houses**

Since the 90's, City of Shanghai executed the reformation of the housing policies, and discontinued assigning the welfare housing to turn the housing allocation into a commercial and cash-based trade. In Shanghai, the commercial housing, as a means of house trade, has continued on improving. A house used to be provided by the company or government based distribution. Now, it has to be purchased in the real estate market. This shift has a relation with the higher incomes and the consumption concept of the Shanghai residents. A great number of newly married couple purchases a largely sized three room-one living room type housing. Newly constructed commercial houses have large floor plans. The residents obtain the property ownership and remodel and decorate the houses. The use of house space is accomplished scientifically and effectively by a planned design.

The arrangement and the design of the mid-high level houses in the newly developed housing complex shall be carried out at a higher level than the house design standards for the current model house complex. They also have to accommodate the consumption level, trend, and philosophy of the 21<sup>st</sup> century. Newly developed housing complex shall fully embody the civilized housing characteristics, such as inhabitancy, comfort, and safety. Hence, when compared with the current houses, the housing area must increase fairly, the dwelling functions must improve efficiently, and all the utilities and appliances must be equipped. There are five major aspects to it.

- a. Standards for area; House floor area increases fairly. Areas of different sizes are arranged efficiently. Space area for dwelling, dining, hygiene, and storage increase relatively.
- b. Standards for functions and environment; Floor area types and space arrangement include adjustability and flexibility depending on differences in demands and changes

of life styles of households. Floor plan arrangement is efficient. The separations between common and private area, dynamic and static area, clean and garbage area, dining and living room area, and activity and rest area need to be embodied. Interior lighting is sufficient. Ventilation is appropriate. A fair amount of daylight is required. Sound proof and lighting is improved. Fine quality of sound, lighting, temperature, and air are provided.

c. Equipment and utilities; Equipments for kitchen work and personal hygiene are arranged efficiently. Ergonomical effect is considered. Pipeline is laid out collectively. Pipes are concentrated. Meters of water, electricity, and gas are placed in the exterior. More electric outlet is installed. Exclusive lines for telephone, air conditioning, and TV are provided by increasing the electric capacity.

d. Standards for structures and safety; Structural safety, efficiency, and economy are considered. Flexibility in space use and room for remodeling are provided. A large room and large space are adopted aggressively. New construction energy saving wall finish is applied. Security and protection facility are provided. An interphone is installed.

e. Pleasant environment and definite separation between floors; Efficient transportation is established. Public service is completed to meet the cultural and material needs. Scenic view is provided in the exterior pathway and activity area. Trees and flowers are planted to form green area. Artistic and pleasant environment is provided to make the residents feel like living in the nature. Contemporary three-dimensional green system is established. Balcony, roof deck, sky bridge are turned into green area and become a part of the entire living space.

## **OPINIONS ON HOUSE DESIGN FOR SHANHAI RESIDENTS**

### **I. VALUE PREFERENCE IN HOUSE PURCHASE OF CITY RESIDENTS**

Based on the study on the real estate market in Shanghai, the process of house purchase of the Shanghai residents includes the factors related to the value preferences. The primary factors are the price of the house, the type of the house, the location, the environment, the surface design, and the property management.

#### **1. Price of the house**

The source for house purchase comes from personal savings, income from transfer of the existing property (including the compensation for dismantlement), common housing fund, and loan from a bank. Those, who look for a house of 300 thousand Yuan or less, are 63.25% and those, who can afford and wishes to purchase a house of 500 thousand

Yuan or more, are 9.25% of the total participants of this survey. The desired house unit price that is wished by 76.8% of the survey participants is 4000 Yuan or less per 1m<sup>2</sup>. Only 9.72% of the participants can afford or willing to pay for a house unit price of 5000 Yuan or higher per 1m<sup>2</sup>.

## **2. Type of the house**

The houses that have not been sold show somewhat low unit price range: 3000~4000 Yuan per 1m<sup>2</sup>. The major reason for these unoccupied houses are found in the ineffective design of the house types, such as too small living room area, lack of lighting, and, too small kitchen or bathroom area. As more and more people purchase houses, they believe that once they choose a house, it will be a long-term commitment that they have to live with. Hence, they would not take a risk of living in an uncomfortable place just for the initial low payment. The low price cannot alter their desires to live in a place with a proper house type or in a place that they prefer. Currently, they may not afford their ideal homes, but they continue on saving more money or get a bank loan to earn their dream homes in the future. In addition, the house design standard has been improves and there is no more public common housing distribution. The supply of the newly constructed houses in the real estate market will keep on growing.

As noted in this study, for the newly constructed houses in 2000, the design plan focuses on dwelling functions, fine scenery, and distinction from other building complexes. Golden Corner and Silver Border(金角銀邊) design concept is embodied in architectural arrangement. And the effort to maximize the green area can be found. A small sized high-rise apartment adopts a single connection mode among two or three units per floor and provides various types of floor areas and layouts for the natural lighting between buildings. Skip-floor type design method was quite popular in 1999, which brought luxury types of large sized models of 180~250m<sup>2</sup> and small sized models of 150~180m<sup>2</sup>. As the function of operational availability has become more important in the work balcony, the area attains 2.5~4m<sup>2</sup>, and the washer and water baskets find their spaces. The popular “S” shape separation walls enable the furniture to be arranged in a clever fashion to use the space more efficiently. The closets are widely adopted and a minimum 2~3m<sup>2</sup> area is assigned for them. Generally, the architectural style has been shifted from European to modern and the color of wall painting draws more attention. The material characteristics of glass, cast iron, tile, and stainless organize the architectural features, such as, protrusive windows, air conditioning cover plates,

balcony, and so on forth. As a result, architectural finish is detailed more briefly and lightly. Landscaping can be found in a house complex greater than a certain size, and unify the artificial and architectural features.

The Real Estate Research Center of the Institute of Social Science of City in Shanghai conducted a research on the trends of house purchase of the Shanghai residents. The most preferred housing style by the Shanghai residents is a multiple level style, which holds 76.3% of the total survey participants. The proportions of the residents that favor the small high rise and high-rise style is 14.43% and 8.8%. These two numbers rapidly grow in the recent days due to the fact that many people believe that the housing of these styles has a long life and a good resale value. The stairs between floors do not seem to bother them. The two room type housing has the largest demand of 60.77%, and the three room type and the rest holds 30% of the demands.

### **3. Location**

What the city residents consider in choosing location is the convenience in work and home life. Since location has long been an important factor for real estate, new construction of subway and major arterial roads will bring an increase in the values of the real estate in the vicinity, and the concept of 'Roads prosper Real Estate' becomes a major method of reorganizing the structure of old towns. A location with an easy access to a subway station and convenient traffic becomes one of the favorite areas for the real estate development, and becomes an important factor for the city residents in choosing a location. As the quality of life improves in the recent years in Shanghai, people start paying more attention to their health and children's education, and a small house complex near famous hospitals and major school start selling quite well. As the development in Fudong city became more active, people stopped saying, "I'd rather have a bed in Fuxi than buy a piece of land in Fudong". The new development brought more jobs in Fudong New City and Fudong became the favorite town for Shanghai people to move to.

Recently, as more residential towns have been constructed in between the city exterior and interior belt highways with completed public services, public transportation, and fine shopping malls, people didn't have to go to downtown for shopping any more. Since a new development requires a certain scale to make it an economical success, the developers can secure enough profit to keep the housing price appropriately low, which attracts more people to move into the new area. According to a study, those who wish to

purchase a home in between the city exterior and interior belt highways hold 60% of the all the survey participants and the rest wants houses within the interior belt highway. Those who own private transportation and wish to reside outside of the exterior belt highways hold 2% of the survey participants. The land development in Shanghai City focuses on the fact; maximum utilization of the fine land which results in the location of a dwelling town becoming the major issue in competition for high value and upper level housing.

#### **4. Environmental concerns**

As economical growth and pollution in the city area become a social issue, environmental concerns draw more attentions and green consumption, green production, and green operation take a part in real estate business. The environmental concerns have been placed in the minds of Shanghai residents, and a great amount of attention began to be paid to more green area, design of fine scenic surroundings, and standards for humane scale. The houses designed with this humanism-based approach are favored by more people. They are priced high, and they are even able to upgrade the social consciousness of the residents. In addition, due to this environmental concern, houses that are close to parks, a large-scale green land, and water can draw more people's attention, and raise the prices, which, in return, satisfy both developers and residents. Environmental concerns are major factors in competition for high value and upper level housing in Shanghai. The Department of House Construction and Management of Shanghai has already specified the green ratio of a small housing complex to be more than 30%. The developers constructed a fine small housing complex with a green ratio of 45%, some even 50% in order to raise their green values. In the past, there was an attempt to raise the building-to-land ratio and the floor area ratio through an agreement with the Housing Planning Office. However, after observing low occupancy rate, this unsuccessful housing style has vanished in the process of the development.

#### **5. Surface design**

Shanghai is an immigration city. It has formed various cultural circumstances over time. The construction of the houses in Shanghai has adopted a great deal of experiences from foreign house designs. The foreign cultures have had significant influences on the architectural style, the surface modeling and finishes, and the materials for the exterior walls due to the inflow of funds from foreign investors and the participation of the foreign developers. A small housing complex was wrapped with a European style reminding a high quality, high-class housing complex in a developed country. The

complex was favored by many people. Some of the small complexes in suburbs had a great success in the housing complex development market by utilizing the low land price and developing a tenement cottage houses, like the neo-Linong style in an attempt to inherit and expand the Linong style. This type of development and management approach has a great deal of focus on accomplishing the high quality houses by applying the architectural style, the surface design and finishes, the materials for the exterior walls. The surface design has become a major issue in the competition of the real estate market.

## **6. Property management**

An appropriate property management allows residents to relax at home and enjoy working, relieves doubts of the residents after signing the contract, and enhances the competitive power of the property. The level of a property management has an impact on the decision making process of the buyers. Under the identical conditions, a secured and a better property management promises a higher price. Some of the major real estate developers establish their own property management business and enhance the property management to improve their company images and expand their share in the local real estate market. However, when a developer establishes a property management business and it is in charge of the property management for the houses that it has developed and constructed, it becomes a problem that the responsibilities for the construction defects can be easily shifted to the property management department in the same company. Hence, in order to prevent low quality construction taking a place in the market, property managements shall be separated from the development.

## **II. ANALYSIS ON GENRAL TRENDS OF ROOM STRUCTURE DEVELOPMENT IN SHANGHAI**

The house design in the new century shall be focused on dwelling culture, human, and environment to solve the new problems that the house construction industry will face. The advance of the society, the changes of demands in human lives, the advance of technology, the change of concept about home, the change of the age structure of the society, the change of household structure, the adoption of computer and information technology, the development of new energy and new materials; they are the factors that will bring new changes in the future house design. The trends of the general design

development due to the listed factors are as follow.

### **1. Expansion of staggered floor house design**

In 1998, staggered floor apartment house design attempted a shift from the multi level to the high rise in the house styles. The success of the staggered floor apartment houses was even beyond the expectations of the experts. Wangyuan(望源) edition staggered floor registration patent caused the staggered floor sensation. There exist a north-south staggered floor, an east-west staggered floor, and a two level staggered floor and a three level staggered floor. Of all the above, the common factor is the multi-level. Since a staggered floor design forms a structure of a skip-half-floor built up from the bottom from each interior side, the staggered floor design includes the advantage of the usual skip-floor design; separation between the interior common and private area. At the same time, it also increases the merits of the lack of stair occupying area from the usual skip-floor design and the arrangement of the bearing wall. Considering those aspects, the future staggered floor house design will find its breakpoint in the high-rise construction.

### **2. Return of slab-type floor high-rise**

In the last few years, the reason that the high-rise houses sales, which was unsystematically marketed within the internal belt highway of Shanghai, was slow was that the natural lighting was blocked among the units on a level, and the room layout was different. The market of the small slab typed high-rise houses in many of the small districts of Shanghai gained its strength. If the problem of the safe passage between the units of a floor in the small slab typed high-rise houses is resolved, it will show a new direction for the development of the room layout design of the future Shanghai houses.

### **3. Reformation to 'Large living room and small bedroom'**

In the design of a housing complex, the area of the integrated type should exceed the goal of 8m<sup>2</sup> per person set by the government. The average dwelling area per person is to be 15~25m<sup>2</sup> based on a three room and two living room type and a two room and two living room type. A certain number of two room and one living room type housing should be arranged. Certain demands from households with high incomes shall be well considered. For example, the living room is to be around 30~35m<sup>2</sup>. The master bedroom needs to be 20~25m<sup>2</sup>. The available area for activities in the dining room should be 10m<sup>2</sup> for a family size of 3~6. The kitchen is about 7m<sup>2</sup>. One of the two bathrooms of 4m<sup>2</sup> should be located in the master bedroom for the host couple, and another bathroom of 6m<sup>2</sup> requires a function of a washroom as well. The reading room size needs to be

8~10m<sup>2</sup>, but it allows flexibility. The appropriate size for the storage room is 3~4m<sup>2</sup>, and one or two balconies are inevitable. In summary, the total floor area required around 93m<sup>2</sup> for a three room-two bathroom-two living room type house. For a multiple level house, the proportion of the area taken by the rooms is 83% of the total area and the building area for a three room type house is around 110m<sup>2</sup>. The above description includes the functions of each room type and the area index of a house, and represents the standard for a mid or upper class residences of the dwelling district of Shanghai. The area index of other types of houses can be obtained by altering the above standards to satisfy the demands of various economical classes of residences.

#### **4. Reformation of ‘Vague two living room type’**

Recently, the huge popularity of the ‘Vague two living room type house’ in the dwelling district of Shanghai brings visually brighter living rooms. However, this ‘Vague two living room type house’ interferes with functionality. At the same time, due to the enhanced connectivity between the kitchen and the living room, the adoption of the house with two bathrooms gained more popularity. Its application expands from a three room-two living room type to a two room-two living room type, and the concept of separation between dry and wet areas is widely accepted (one of the bathroom to be 6 m<sup>2</sup>). The exit door turns into the main entrance. Too many doors facing the living room become an issue. The shift from the parallel arrangement to the arrangement in series gets broadly adopted. It is expected that an effective design of a door, a bathroom, and a living room will be continuously developed.

#### **5. Popularity of the height restriction of multi-levels**

In 1998, many of the width of the room layout became generally wider and the usage functions were improved. At the same time, the ‘small and fatty’ bedrooms without increase in the total area were promoted and the area of the living rooms expanded. In the mean time, the balance of the vertical to horizontal ratio was lost. The future story height is expected to be set at 2.8m to meet the market’s demands and the new code requirement on the multiple level house construction.

#### **6. Effect of enjoyment in the balcony**

It has already been a prevailing trend to assign a multiple purpose balcony next to the kitchen in many of the Shanghai households. And a scenic balcony is gaining its popularity as well. They are highly favored for their practical aspects and circumstantial effects. In a developed country, the desired environment of the kitchen is achieved by

paying attention to the lighting and its direction with integrated considerations, being careful with daylights and the view of outside, providing tools for communicating with neighbors through windows, allowing watching for children playing in the garden, and making it possible having conversations with other family members and feeling secured while working in the kitchen. The bathroom is an important place in a house in the other countries as well. In addition to its original purpose, the bathroom shall bring in a fair amount of lighting and green to enhance the comfort and pleasure while taking a shower. The house design of the new century will accommodate such new concepts and approaches.

#### **7. ‘Excavated inside type’ house design**

On a basis of respect for and investigation on the market, ‘excavated inside type’ house design trend was initiated with the characteristics of functional reinforcing, restrictions on the total area, and pursuit for the new trends. In addition, a sound growth of the real estate market is in a steady progress.

### **III. RESIDENTS’ OPINIONS ON CURRENT HOUSE DESIGN**

The survey about the house design in Shanghai is based on the opinions’ of the buyers of the real estate market, and the content of this survey was produced in consideration of two major aspects; the first aspect is the major reactions from the buyers and the second aspect is the functional space design and the usage of house space.

#### **1. Reaction to the house construction and design**

The reactions to the house construction and design can be put into the following nine categories:

- a. Overall quality
- b. Space separation
- c. Existence of balcony
- d. Waste of space
- e. Pathway utilization
- f. Space for washer installation
- g. Sound proof
- h. Lighting
- i. Floor height

The responses to the above questions are as follow:

- a. 26.6% responded overall quality is low.
- b. 43.7% responded space separation is ineffective.
- c. 10.4% responded there is no balcony.
- d. 11.1% responded there is huge waste in space.
- e. 16.9% responded pathway is not usable.
- f. 22.6% responded there is no space for washer installation.
- g. 39.7% responded sound proof is not satisfactory.
- h. 26.8% responded lighting is not enough.
- i. 15.1% responded floor height is low.

Due to the variation in architectural style, there exist discrepancies in responses. Based on architectural styles and shapes, the reactions and the demands of the residents' are different. For example, 30.9% of the residents in the garden house responded that 'overall quality is low'. This negative response is caused by the old building ages, considering the construction of the garden house occurred in the earlier days. Also, on the other hand, the responses from the garden residents reflect their higher expectations on dwelling condition. For instance, those who live in a non-proper housing show such strong reactions to the overall quality category that 75% of them responded in a negative voice. The 'space separation' category draws negative responses from all types of housing styles, which implies that the old style room layout does not satisfy the demands from residents any more. The negative response to the 'sound proof' category is relatively high, which reflects that Shanghai residents started paying more attention to securing privacies.

## **2. Opinions on the functional space design and the usage of house space**

Opinions on the functional space design and the usage of house space can be categorized as follow:

- a. Number of doors in living room.
- b. Arrangement of bathroom door.
- c. Arrangement of furniture in bedroom.
- d. Ventilation in kitchen.
- e. Building orientation.
- f. Privacy with facing bedrooms.

The responses to the above categories are:

- a. 23.6% responded there are two many doors in living room.

- b. 28.3% responded bathroom door is ineffectively arranged.
- c. 17.3% responded furniture arrangement bedroom is poor.
- d. 20.5% responded ventilation in kitchen is poor.
- e. 18.4% responded building orientation is poor.
- f. 16.7% responded privacy is disturbed by facing bedrooms.

It can be noted on the analysis on the architectural style and the room layout that the responses on the functional space design and the usage of house space come mostly from the resident that have opinions on low-rise houses. Some of the opinions are contradictory to the common senses. For instance, more residents in high-rise and mid-rise housing residents negatively responded to the ‘building orientation’ category than residents in multiple level or low-rise housing. However, the highest proportion of the negative response comes from the super-high-rise housing residents. This is attributed to the special efforts that the City of Shanghai put in to improve the building orientation of high-rise and mid-rise housing in the recent days. It started paying back. A great number of residents showed negative responses to ‘number of doors in living room’, and ‘arrangement of bathroom door’ categories that deal with the various types of room layouts. A relatively large number of residents responded that furniture arrangement bedroom is poor in the one room type, the two room-one living room type, and the three room type housings.

#### **IV. SUGGESTIONS FOR HOUSE DESIGN AND CONSTRUCTION IN SHANGHAI**

Shanghai is the largest city in China. The size of its economy is the biggest, and the average household income is the highest. And yet, there exist two different analysis results about the house purchase trend in Shanghai; the first analysis indicates that the housing style should pursue a largely sized room layout since the average household income in Shanghai is higher than any other cities in China due to Shanghai’s economic growth. Correspondingly, the dwelling area per person and the overall housing quality should be higher than the national averages. On the opposite hand, the super largely sized room layout should be avoided and the effective consumption standards should be established as soon as possible since the population density is quite high and the problem of the lack of the enough land arises. The improvement of housing quality must be achieved by using the houses effectively per unit area, not by simply expanding the total house area. Especially, support must be provided to those family that basically needs to own a room per a family member, to establish the appropriate house ownership

concept realizing the current land use situation in China, i.e., there is too many people in a limited area in China. Excessive possession of house should be avoided.

### **1. Improvement of flexibility in housing unit area usage**

Since the population density of Shanghai is quite high, newly constructed housings need to be a multiple household style. The multiple household style needs consistencies in room and corridor layouts. However, each household has different demands on the floor plan size of a unit, the spatial arrangement of the house elements, the furniture arrangement, and the interior decorations since their family structures, occupations, hobbies, and life style vary. The design of a house requires consideration to systemization during construction and flexible space use during occupancy. Given the flexibility of enough choices, alterations, arrangement, and decorations, many households can be satisfied with their various demands on dwelling conditions. This is a typical characteristic of the newly constructed houses in China. In order to enhance the flexibility of the floor plan of a unit, a large space system, a support and fill system, a lattice system, and a neo-nuclear system, which inherit relatively huge flexibility, can be achieved in the house design of the room separation, the pipeline layout, the punched exterior wall, and the floor area of unit. Under the consistent economic growth and technical advance, the floor plan of a unit can reinforce the essence of a house and the reformation of the housing policies improves the flexibility of the floor plan of a unit.

### **2. Warranty on functional durability**

In general the life cycle of a house building structure is around 50~60 years and, sometimes, it goes beyond 100 years. In order to maintain the mutual durability of the architectural and structural features of a house under the sound structural system, the constant desires of altering the dwelling conditions and the exterior finishes need to be satisfied and the possible future renovations and expansions must be considered during the initial design by providing enough room. For example, a floor space may be expanded, a retail area on the lower level may be transformed into a parking lot, a single living room may be divided into a living room and a reception room, and a single story unit may accommodate a skip-floor-system.

### **3. Emphasis on local distinctive features**

A house is one of the elements that form the city view. City of Shanghai inherits unique weather, geological features, natural resources, and cultures. Design of a house must take the unique local features into consideration. The orientation of a building, air

circulation, saving energy, transition of the traditional style, and open or closed stairs, use of a balcony, and choices of material will bring a whole new variety to the stereotyped housing aspect of the city.

#### **4. Improved land use ratio**

Land is one of the essential resources so that saving land is one of the most important national policies. How to create a gorgeous and comfortable dwelling environment within the limited land is a challenge for a designer. The traditional way of design is to increase the length or adjust the width. However, the demand on a living room with a plenty of lighting and the complaints about a small garden made the advent of the protrusive houses inevitable. Though the width is narrow and the depth is long, for such and such reasons, many times, the long and narrow garden ended up wasting the land. Therefore, the width and the depth are not the only criteria to measure and to determine the efficiency of the land use in the house design. If a balcony at the north end and a sloped roof are used, the gaps between sunlight can be reduced and the land use can be saved.

#### **5. Improvement of landscaping**

Landscaping environment indicates the status and the conditions of the surroundings of the house. It also offers interaction with the neighbors and safety protection. Landscaping environment presents separation from other's glance, noise, and disturbance. Landscaping environment consists of glory and house view. In order to improve the landscaping environment, the design shall integrate the architectural and landscaping aspects, expand the exterior space into various levels of activities, and separate the routes between pedestrians and vehicles. It also requires arranging the spaces for different age groups, surrounding other feature with pleasant atmosphere, adopting the unique local characteristics, succeeding the historical architectural style, and combining the enriched architectural boundaries with the beautiful green garden. This integrated design of the housing complex and the landscaping plans are quite effective in improving the traditional landscaping and planning a new residential town.

#### **6. Effective use of space**

In fact, the effective use of space is a matter of the effective use of fund, land, and energy. The consideration for the effective use of land in Shanghai, under the circumstance of the limited available land, is very meaningful in transforming the house design from two-dimensional to three-dimensional aspect. Improving the space use ratio

by changing the floor height may achieve the effective use of the space. The determination of the floor height shall correspond with the fundamental rules of the ergonomics. It would be acceptable lowering the floor height of one of the rooms in order to efficiently use the space. However, simply lowering the floor height shall be carried out under the principle that it coincides with the physiological and psychological demands of the residents and does not jeopardize the overall quality of dwelling. Generally speaking, a largely sized room for common use needs a certain floor height. A small sized room for a single purpose or a storage room may have a lower floor height. The use of potential space should be sufficiently considered in the house design. A potential space refers to the small area that can be usually ignored, such as top and bottom of stairs, above and underneath a bed, and a loft under a sloped roof. The designer utilizes these potential spaces for dwelling, storage, or miscellaneous purposes. Besides, the ratio of the width to the depth of the balcony can be adjusted, the locations of the doors can be relatively concentrated, the exit way can be effectively routed, a space for pathway can be arranged, and the doors can be designed in a diagonal direction.

#### **7. Efficient determination of the floor plan of a unit**

The efficiency of the floor plan of a unit reflects two aspects; one is the layout for the line of flow and the other is the separation and integration of spaces. The dynamic line expresses the relation between the function and the space separation. The dynamic line is a type of the trace of actions. Its speed and smoothness represent the efficiency of the function and space separation. On the other hand, its complication and lengthy extension cause confusion of the function and space separation. The floor plan of a unit usually is divided into two areas. An entrance, a corridor, reception, and kitchen areas are referred as the dynamic area for the following reasons; they include close connectivity with the exterior; they deal with the noise and the waste, and they do not require secured privacy. A bedroom and a study or operation area are referred as the static area since they do not require close connectivity with the exterior. They need a stable atmosphere without the excessive waste. Secured privacy is also desired in the area. The dining room and the bathroom basically belong to the static area. However, since, these two areas need to offer convenience to guests, they belong in the middle of the dynamic and static areas. Efficient layout of the dynamic line and clear separation between the spaces is the fundamental of the house design.

What integration and separation of space indicates is the relation between the activity areas and the rooms. The activity areas are divided as for their usage functions and the

rooms consist of layouts and the furniture. They cannot be confused. Placing the activity areas of various functions in a room is referred as the alternation of space. And, difference in the time of use improves the space usage ratio by various functions mutually borrowing the activity area in the four dimensional space.

#### **8. Focuses on the level of floor plan**

For any given rooms, the element that determines the layout of a room is the shape and the dimensions. The shape and the dimensions of a floor plan have a direct impact on the furniture arrangement, the efficiency and flexibility of the range of activities, and the economy. The shape of a plan in a relatively small room is basically square. The dimensions should allow arrangement of the basic furniture and satisfy the range of the activities.

#### **9. Improvements of kitchen, bathroom, and pipelines**

The improvement of kitchen and bathroom is the essence of the current house design in China. For example, the areas of the kitchen and the bathroom can be expanded depending on the floor plan of the unit. The kitchen appliances are arranged to accommodate the dynamic line of the cooking process. Storage area can be placed in the kitchen and the bathroom. The allocated area for a toilet can be expanded in the bathroom. The kitchen appliances, such as, a refrigerator and a washer can be arranged more efficiently. The pipelines in the kitchen and bathroom can be put together so that they may not be visible. Ventilation and garbage discharge condition can be improved.

#### **10. Cautions for use of a special unit floor plan**

The lower and upper floor units have disadvantages for their locations. They may not be favored by the buyers for their deficiencies of dwelling circumstances. However, the disadvantages can turn into merits by enhancing the unique features with some special modifications. For instance, a bike rack, a storage area, or an activity room can be placed underneath the floor of the lower level by raising the floor. A skip floor, a double floor, or a basement floor design can be introduced in the design of the lower and upper level floor plans. For the upper level units, a terrace type balcony can be placed at the north end or a large exposed balcony or a loft can be added by adopting a sloped roof. These modifications may be more attractive to the buyers.