

Fig. 28: The change of function. The apartment was divided into two parts at the very beginning. The western part was the user's home while the eastern part was a tailor shop. At last, the entire suite was changed to a washroom. (Source: by author.)

#### 4. Discussion:

Compared with Molenvliet, the Wuxi case is in a less desirable situation. The reason for this can be analysed by comparing the changes in Skin and Space Plan levels<sup>71</sup> in both cases.

**Skin** | Changes in the building skin were found in both projects, although the Wuxi case did not outline these changes in the original design.

<sup>71</sup> Brand Stewart (1994). *How Buildings Learn: what happens after they're built*. New York: Viking. p. 12-23.

As rental housing, a large-scale renovation of Molenvliet was conducted centrally by the housing corporation fifteen years ago, in which the facade was completely renewed. The "Support" components were only cleared and repainted, while the "Infill" parts went through obvious changes. For example, the windows and doors were refreshed, some French windows were altered, the triangular part of the facade was redesigned, and the wooden handrails were substituted with iron ones. While my investigation was being conducted, the rebuilding of collective courtyard was in



Fig. 29: Molenvliet Project after renovation of facade. (a) Picture shot in 1976. (Source: provided by Mr. Frans van der Werf. (b) Picture of the same façade shot in 2014. (Source: by author.)

progress. In addition, the housing corporation even decided to add some internal elevators for families living in the duplex.<sup>72</sup> The user's original preferences regarding windows and doors were preserved to the greatest extent, while the selection of colours and some materials was neglected. Different from the original design, which was extremely rich, the current appearance is comparatively plain. However, the appearance of the project has been given a new life as a result of the maintenance work (Fig. 29).

In contrast, the changes in the Wuxi case were random and autonomously conducted by the users to deal with specific problems. For example, some families on the top floor renewed the roofs to deal with the leakage problem. The change of windows was accompanied by changes to the internal partition, or to avoid the feeling of being interfered with. Some walls outside the kitchen had holes put into them to accommodate new equipment. Furthermore, some spacious terraces and entrance gardens were covered with a roof and transformed into a storage room or enclosed balcony. The users treated it as a forced solution to deal with the leakage of terrace, the lack of storage, or to satisfy the

demand for ventilated space when hanging laundry. The random alterations had a negative influence on the appearance of the project, and the original features were compromised greatly by these changes.

The difference in the situations of these two counterparts has generated a discussion on the maintenance of the building skin, which is both a collective envelope of the entire building, and the private enclosure of individual families. Correspondingly, the regeneration is supposed to represent the opinions of both sides. Molenvliet has provided a wonderful example, in which an organised result was revealed. Conversely, the Wuxi case presented a wide range of materials, which proved the user's diversified demands. In addition, being built in a period of transformation, the Wuxi case was badly managed, which had led to the current state of poor maintenance.

**Space Plan** | In each of the two cases, the re-organisation of the interior was conducted by the users themselves. Correspondingly, an important problem was generated: how can the architects guide these changes without attendance. The central point was to present the separate of "Infill" from "Support". As a result of restrictions caused by the condition of the construction, it was only suggested to move a few partitions in the Wuxi case. In

<sup>72</sup> Interview with the secretary of WERKGROEP KOKON (the Housing Corporation).

practice, however, the interiors were seldom changed. More than half of the interviewees rearranged their kitchen, which was designed as the “Support”. The situation in Molenvliet was much more optimistic since all the interior partitions were in the rank of “Infill”.

It was discovered that not all the users in the two cases had knowledge of “Infill” within their house. In Molenvliet, the inhabitants checked for changeable partitions by knocking on their walls: the board was obviously free and the concrete could not be changed. In the Wuxi case, some occupants fulfilled this task by checking the thickness or composition of the walls.

I know very little about the building structure, although I know that the wall in the living room is not load-bearing because it is relatively thin. As for the wall in the kitchen, I am not sure. I attempted to knock down a small part of the wall in the kitchen in order to check if there were any steel reinforcements. If I find that it is a load-bearing wall I will not demolishing it.<sup>73</sup>

The indistinguishability of “Infill” is also an obstacle for users when planning their renovation projects. A three-member family in the north part of Building 102 (Wuxi case) was a typical example. Unsatisfied with the subdivision of bedroom, the parents planned to remove an internal wall. However, the plan was suspended since the structure of the targeted wall, which was actually in the rank of “Infill”, was uncertain for them.

I am afraid that the structure of the whole building will be affected when I knocked down the wall. I know that my neighbours with similar layouts have knocked their walls, but I am on

the ground floor. The stability of my apartment may have an influence on the structural safety of the whole building.<sup>74</sup>

The importance of professional guidance was particularly essential in the case mentioned above. In addition, further information guiding the changes would be necessary, such as an illustration of possible changes, the availability of related building materials, and even an outline of the construction techniques. Consequently, there should be a discussion of the flexible aspects of each project. This concept has been practised by some of the more creative architects of the 1970s, amongst which Erik Hultberg was the most prominent for his “user manual”. In this manual, not only was the structure of the house introduced, but also detailed information regarding future changes, such as the factory and model number of windows, doors and balconies, the placement of the kitchen and bathroom, and the installation of partitions, etc. The design methods concerning internal spaces and related regulations were discussed as well. Besides the discussion of the interior, this manual also presented design methods for the collective open spaces and private gardens.

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<sup>73</sup> Interview with Family A1. April 28<sup>th</sup>, 2014.

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<sup>74</sup> Interview with Family C1. April 28<sup>th</sup>, 2014.



# Design Manual and Flexibility in the Future

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In Chapter 2 and 3, flexible housing typology has been discussed through its development history. In Chapter 4, the most important types have been detailed and explained by case study, and their effectiveness was primarily revealed. The final chapter continues the typological discussion, in a conceptual way. It begins with a manual for flexible design, in which the existing methods are generally listed and briefly explained. After that, possible applications are suggested in response to current social problems, which are specified as high price, multi-generation families, and indifferent neighbourhood relationship. The enlightening methods summarised in the first section are quoted as reference.

## SECTION 1: A DESIGN MANUAL

This section deals with flexibility in the scope of collective space, the relationship between units and within an individual unit. The discussion on each topic begins with an explanation of concept, and moves to the list of existing methods.

**Flexibility in the Community** | A well-designed community serves not only for the residents' primary living requirements, such as safety and comfort, but also establishes a convenient community life and a harmonious neighbourhood relationship. That is where flexibility is shown, also.

### Concept:

Flexibility at the community level provides appropriate collective space, which can be interpreted by the inhabitants' common requirements. The users involved are determined by the targeted space, for example the shared garden is connected to its co-owners, the public corridor is related to the families who use it, and the collective club serves all the members of the community.

### Methods:

1.1 Shared garden and balcony: "how much one has to do with one's neighbours depends to a great extent on the type of boundary there is between the gardens"<sup>1</sup>. A shared garden and/or balcony are suggested, but with the clue for separation, and accordingly they can be divided when the relevant families reach a consensus. For example, a low base of perforated block in the middle of a shared garden is a typical clue. The adjacent families can use this as a common bench by adding a wooden surface, or as a support for a low fence, or even as a foundation for a brick wall which separates the two families entirely (Fig. 1).

1.2 Enlarged communal circulation: "vertical and horizontal circulation in most housing scheme is reduced to a minimum. However, a small increase in the size of communal circulation can make it much

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<sup>1</sup> Herman Hertzberger (1991). *Lessons for Students in Architecture*. Rotterdam: Uitgeverij 010 Publishers. pp. 159.

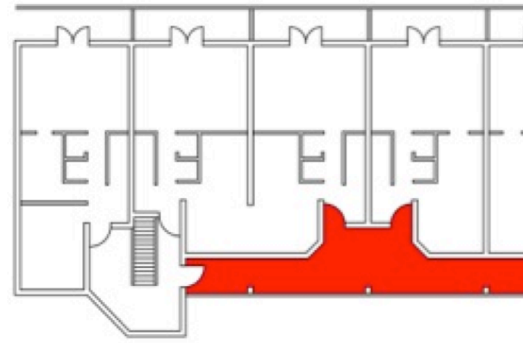


Fig 1: Clues for separation. In his design of Diagoon Houses (Delft, Holland), Herman Hertzberger provided the metal bar structure and the base of perforated blocks as clues for the users' future activities. (Source: Herman Hertzberger (1991). *Lessons for Students in Architecture*. Rotterdam: Uitgeverij 010 Publishers. pp. 161.)

more flexible in use.”<sup>2</sup> The enlarged rest platform and corridor indicates that the neighbours may stay and chat there when they encounter; while the spacious entrance space allows a space in which to communicate. (Figure 2)

1.3 Collective rooms: During impoverished years when the quantitative shortage of housing was still prominent, the collective space, such as the shared kitchen and bathroom, was widely practised to reduce the necessary areas for individual dwelling. The shared rooms now are suggested to accommodate occasional use, for example the shared hall for the weekend party, the club for occasional visitors, and the communal mini hotel for the non-resident relatives. In addition, they can also meet the users' collective requirements, such as the shared kitchen and dining room in co-housing practices. (Figure 3)

<sup>2</sup> Tatjana Schneider and Jeremy Till (2007). *Flexible Housing*. Oxford: Architectural Press. pp. 185.



(a) Extended corridor. (Source: by author. According to original design in Architectural Archives in Rotterdam.)



(b) Photo of the extended space. (Source: by author.)

Fig. 2: Extended corridor in Flexibele Woningbouw (Rotterdam, Holland).

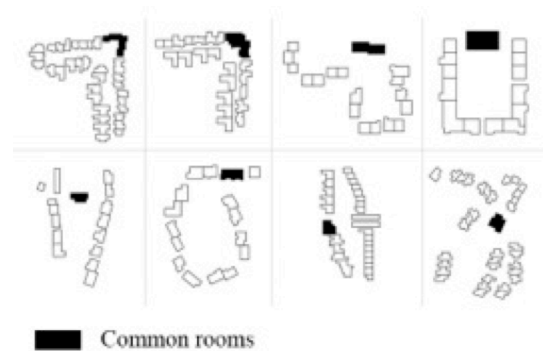


Fig. 3: Common rooms in co-housing projects. (Source: by author. According to Kelly Scotthanson, Chris Scotthanson (2004). *The Co-housing Handbook: Building a Place for Community*. Gabriola Island: New Society Publishers. pp. 254.)

**Flexibility in Extendible Homes** | The inevitable change of family size and corresponding response of housing was recognised by both historical and modern

practices with different emphases. The former paid attention to the change of building structure, while the latter concentrated on the unit relationship. Correspondingly, the discussion of this topic consists of two parts: (a) add-on practices and (b) adjustable apartment relationship.

#### (a) Add-on Practices

##### Concept:

This method provides spatial and structural possibilities for future changes to dwelling dimensions. It is practised mainly in detached housing, and with particular significance for the self-built activity in rural areas, where the whole dwelling cannot be completed<sup>3</sup> at once in some cases, and the division of a large family is common.

##### Methods:

**2.1 Adding detached building or building groups:** This indicates a horizontal expansion, and is practised only when the site area permits. The design for expansion should be firstly conceived in the urban and/or district context<sup>4</sup>, and then in the relation to the original building groups and surroundings. Possible influence on the access and daylight should also be considered.

<sup>3</sup> It is found that some rural dwellings are completed by several construction activities. In Chen Peng's Master Thesis, a reconstruction activity of an ordinary rural family was detailed recorded. The family planned to build a three-storey dwelling. However, as soon as the second floor was completed, they suspended the construction for financial embarrassment. When the family moved in, the building was covered with the temporary plastic material instead of a permanent roof. The living quality, especially the insulation performance, was greatly affected. Chen Peng (2011). *Research on the Case of Peasant Self-built house - the village of Shui Nan Wan in 2010* (农村自建房个案研究——2010年水南湾村). [Master's Thesis]. Wuhan: Wuhan University of Technology.

<sup>4</sup> Avi Friedman (2001). *The Grow Home*. London: McGill-Queen's University Press. pp. 19.



Fig. 4a: Layout of the ground floor. The heating system and bathroom were centralised.

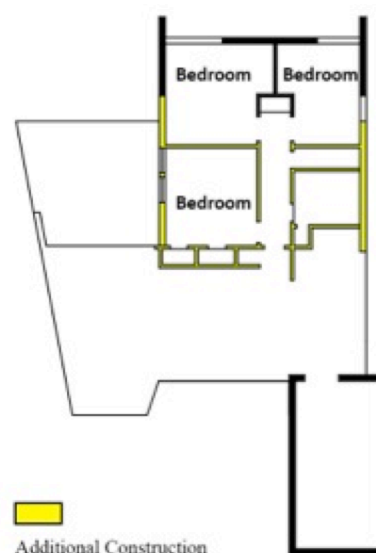


Fig. 4b: Extension in second floor.

Fig. 4: The Expandable Bungalow designed by Gill and Bianculli. (Source: by author. According to Avi Friedman (2001). *The Grow Home*. London: McGill-Queen's University Press. pp. 21.)

**2.2 Additional rooms attached to original structure:** This indicates both horizontal and vertical expansion. The harmony of structural and service facilities is worth particular attention. The increase of living space should have minimal disturbance to the existing structure<sup>5</sup>, and it is economical if the extension can be served by the

<sup>5</sup> Ibid.

original facilities. In addition, vertical expansion should be examined in terms of bearing capacity. (Figure 4)

#### (b) Adjustable Apartment relationship

##### Concept:

This method is especially practical in the condominium. Adjacent units are not absolutely isolated, but instead can be connected, separated, or re-divided through minute modifications. The changes can be vertical and/or horizontal.

##### Methods:

**2.3 Combinable units:** Small units can be combined, while big units can be divided into smaller ones.<sup>6</sup> The involved units can be of equal or different sizes, and with residential or non-residential uses. Horizontal combination can be achieved by opening a reserved hole between units, or re-organising the entrances (i.e. to enclose a part of the public corridor as the shared entrance hall). For the vertical combination, a space has to be reserved for the addition of an interior staircase<sup>7</sup>.

**2.4 Exchangeable rooms:** The space connecting two or more units can potentially be included in any of the units<sup>8</sup>. The exchangeable rooms can be a single room, an individual unit or units. They may originally be used as a collective room, or an independent unit. The possibility of change is practically hidden in the reserved holes, in most cases.

##### Notes for Method 2.3 & 2.4:

- Reserved openings, practised in combinable and exchangeable units, should be carefully conceived. In practice, the opening inside units can

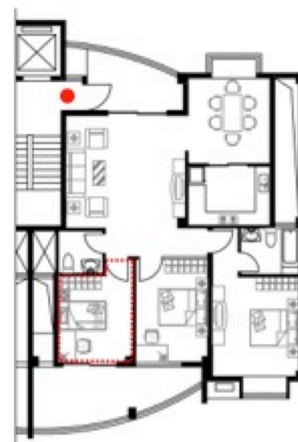
<sup>6</sup> Jia Beisi (1998). *Adaptable Housing Design* (居住空间适应性设计). Nanjing: Southeast University Press. pp. 40.

<sup>7</sup> Vertical extension was practised in Yueyahu Community, which was designed by Prof. Bao Jiasheng. The relative drawings can be found in Chapter 3, pp. 29.

<sup>8</sup> Ibid.



(a) Two separated units.



(b) After combination, a kitchen was changed into a bedroom.

Fig. 5: Combinable units in Xiamen (China). In the design, a kitchen can be changed into a single bedroom after combination. (Source: by author. According to <http://jinxiuxiangantf.fang.com>)

be located between the circulation space, such as the hallway and corridor. In addition, it should also be structurally prepared.

- Duplicating the bathroom and kitchen may be dealt with after the adjustment. The additional bathroom is not a problem in most cases. It will be practical if it serves a specific bedroom instead of the whole unit. Alternatively, the redundant bathroom can be changed to a storage area after removing sanitary facilities and adding shelves. The second well-equipped kitchen may be useful for the

multi-generation family, when completely different food habits are present or the demand for privacy<sup>9</sup> stops the whole family from sharing one kitchen. However, the transformation of the kitchen into being used for other functions should be considered. For example, a spacious kitchen can be changed to a single bedroom<sup>10</sup>, and the open kitchen, together with the adjacent dining room, may be renovated into a double bedroom (Fig. 5).

**Interior Flexibility** | This section explores flexibility embodied in an individual unit. Urban housing, especially the private housing, is less prepared for the combinations and adjustments between units. Consequently, the flexibility, to some extent, depends on the changeability inside an individual unit. This means that this particular topic is especially significant in practice. The existing methods cover two realms, (a) changeable division practising in whole unit and (b) the multiple uses of a specific room.

#### (a) Changeable Division

##### Concept:

Family size and lifestyle are directly reflected in the division of internal space: how many bedrooms are required, how large the living room needs to be, how open the kitchen is and so on. Since family size and lifestyle are different and unstable, changes to the interior might be necessary. The method covers the complete change of the internal division, and partial modification of specific spots.

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<sup>9</sup> An actual example was found in the investigation on Molenvliet project (Family 246), which has been discussed in chapter 4. Just when the investigation was conducted, the family was planning to build an additional kitchen in the bedroom of the householder's mother in order to provide her a little privacy.

<sup>10</sup> Tatjana Schneider and Jeremy Till (2007). *Flexible Housing*. Oxford: Architectural Press. pp. 187.

#### Methods:

3.1 Unfinished layout: Research on unfinished dwellings was undertaken in China from the 1980s, in which the external appearance and the scope of each unit were defined by the architect, while the subdivision was left to the user's decision. This method was supposed to be practised in both pre-occupancy and post-occupancy stages, but practically, most projects subdivide the living space with non-load bearing partitions before the tenants move in. In addition, in most cases, the complicated organisation of pipelines for water and gas forces the bathroom and kitchen positions to be out of the users' choice and cannot be conveniently changed.

3.2 Reserved options in special points: An effective way to inspire users' creativity is to modify dwellings to people's specific lifestyle. It is found that the reserved option is focused on the relationship of three groups of rooms: living room and bedroom; the kitchen and the hall; the two bedrooms. This option is normally represented as incomplete or moveable partitions.

#### Notes:

- Apartment plan: It has been proven that a straight outline is beneficial for flexibility<sup>11</sup>.
- Partitions: Throughout history, there are three kinds of partitions widely used. First is non-load bearing partitions. In practice, the material for changeable partitions covers light gypsum hollow board, joint structure, and others. According to the points taken from field investigations, it is helpful if the changeable partition has obvious differences with the non-changeable partitions, so that the users may recognise them easily.

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<sup>11</sup> Jia Beisi (1998). *Adaptable Housing Design* (居住空间适应性设计). Nanjing: Southeast University Press. pp. 161.

Second is moveable partition. The great majority of early projects were characterised by moveable partitions. These had various forms, such as wooden screens in traditional Chinese housing, and sliding and folding walls<sup>12</sup> in the 20th century. The most prominent advantage is that users can make a convenient change, at anytime, without a constructional approach. Compared with non-load bearing partitions, they are more sensitive to change, but have worse performance in heating and sound insulation. Third is furniture. Antique shelves and entrance screen are adapted particularly when the absolute division is not necessary. In addition, a closet can be used as a partition to save space.

#### (b) Multi-use room

##### Concept:

The multi-use concept primarily focuses on more than one appropriate arrangement of furniture that can be embodied in each room. In addition, an individual room is supposed to accommodate various functions concurrently or diachronically without changing its shape and size.

##### Methods:

3.3 Combinable function: In practice, some functions are accommodated in the same space. This is an effective way to improve the utilisation of space and reduce space requirements. The functions to be combined are tentatively summarised as follows:

- Living room and play room: It is shown that for families with small children, the living room is usually used as a play ground, where a baby can learn to crawl, children entertains themselves with building blocks or even riding their bicycle<sup>13</sup>.

- Living room and dining room: The combination of the living and dining room is commonly employed in compact housing. This way, the circulation space can be reduced and the space will be more flexible in its use.
- Kitchen and dining room: Accommodating the kitchen and dining room into one space is beneficial to improving the communication between family members and saving circulation space. An open kitchen, which has been practised in some projects, is both praised and blamed. The positive opinion recognises that a housewife can look after children, and communicate with other family members during cooking, while the negative opinion doubts its feasibility for Chinese cuisine which involves stir-fry meals, to a large extent. To deal with the shortage, a special, separate room for frying food is suggested<sup>14</sup>.
- Circulation space and storage: The entrance hall and corridor are used as storage space in some cases. By doing so, the utilisation of circulation space can be improved. In addition, the storage space in functional rooms can be reduced and this has a positive influence on the latter's flexibility<sup>15</sup>.
- Bedroom and study room: Using a bedroom as a study room or work room is widely seen in practice. Consequently, the placement of a desk must be taken into consideration during the design process.

<sup>12</sup> Tatjana Schneider and Jeremy Till (2007). *Flexible Housing*. Oxford: Architectural Press. pp. 191.

<sup>13</sup> The study on Chinese lifestyle which was

conducted by Boloni company from 2011 to 2012.

<sup>14</sup> Zhou Yanmin (2008). *Design of Medium-small Apartments (中小套型住宅设计)*. Beijing: Intellectual Property Publishing House Co., Ltd. pp. 16.

<sup>15</sup> Jia Beisi (1998). *Adaptable Housing Design (居住空间适应性设计)*. Nanjing: Southeast University Press. pp. 108.

3.4 Changeable function: It has been seen through investigation that the actual functions of some rooms may be quite different from their original design. This mismatch is worth further discussion, as the changeable function can be revealed and predesigned.

- Balcony: Different from the custom in Europe, Chinese residents prefer to hang laundry on the balcony, which are shut off for sanitary reasons. It was shown that an enclosed balcony may be used as storage, a playroom for children, and as a sunshine room. An appropriate increase of the depth of the balcony is beneficial for these additional uses.
- Kitchen/Bathroom: The redundant kitchen is often changed into a single bedroom or a study room, and the redundant bathroom can be used as storage.

## SECTION 2: FLEXIBLE HOUSING IN THE FUTURE

In the previous section, methods regarding flexibility have been briefly listed. Throughout developmental history, it is found that although the method list has never been significantly changed, the effectiveness is represented differently in response to specific requirements. In this section, three pressing social issues will be discussed, and possible solutions will be proposed in light of flexibility. In each discussion, the related methods (explained above) will be listed for design reference.

**As a remedy for unaffordable housing |**  
Until now, there has not been any official statistics revealing people's actual living situation, such as how large group is accommodated within commercial housing, how people are struggling with the high prices of housing, and how many people are too depressed to dream of their own

house. The average value always shows an optimistic result. However, it never reflects an impartial situation, since the number is largely influenced by the rural housing and the minority which is fortunate to have more than one dwelling for investment. The difficult situation suffered by a considerable number of people, especially in the first tier cities<sup>16</sup>, and is increasingly reflected in news reports. The *New York Times* addressed Beijing as "a place that makes New York real estate look cheap"<sup>17</sup>, and it found that even Xi Jinping, the leader of China, cannot cover the monthly rent of a modest Beijing apartment complex with his salary<sup>18</sup>. After the housing price reduction, the annual salary of the "White Collar" worker in Beijing is barely equal to the cost of a bathroom<sup>19</sup>.

The social problem caused by high housing prices has drawn wide attention. The huge cost of housing, and the subsequent mortgages force people to work under tremendous pressure and live a restricted anxious life. It must be recognised that there are still many people who cannot afford a commercial house nor be accommodated by public housing. The considerable number of migrant workers in the urbanisation process forms the majority of this unfortunate group<sup>20</sup>. Their lack of

<sup>16</sup> The first-tier cities in the mainland of China include Beijing, Shanghai, Guangzhou, and Shenzhen.

<http://baike.baidu.com/view/2005808.htm>

<sup>17</sup> Catherine Rampell (2013). A Place that Makes New York Real Estate Look Cheap. *The New York Times*.

<http://cn.tmagazine.com/real-estate/20131116/t16prices/dual/>

<sup>18</sup> Micheal Forsythe (2015). Xi Gets a Raise, but Beijing Apartments Still Out of His Reach. *The New York Times*.

<http://cn.nytimes.com/china/20150121/c21xi/dual/>

<sup>19</sup> <http://finance.sina.com.cn/china/20140715/103719707986.shtml>

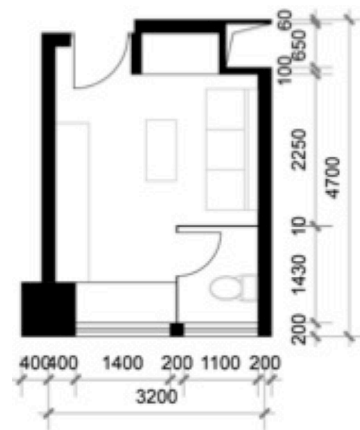
<sup>20</sup> According to related statistics, the living situation of migrant workers is very poor. 29.19% of them lives in the collective dormitory, 20.14% are accommodated with dwellings without kitchen and bathroom facilities, 7.88% lives in their working

permanent residence promises to have a negative impact on social stability.

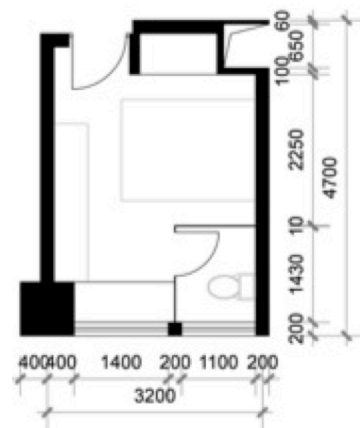
Besides the governmental regulations, reducing the area of individual units is the other effective solution. This concept is practical to both social security housing and commercial dwellings. For the former, it means that more homeless people can be accommodated when the overall construction area is limited. For the latter, it indicates that the middle-class may get their apartments more easily. Reducing the area is not the same as simplifying the service provided by the house, but instead it improves the spatial efficiency, for example to provide combinable and changeable functions within the given space. (Reference: Method 3.3; 3.4)

Minimal housing with 18m<sup>2</sup> in size was developed by Vanke Company in 2011, and is an extreme experiment in this aspect. It sets the whole unit (except the bathroom) free, accommodating the kitchen, study room and bedroom in the same area. A sofa bed is suggested so that the bedroom can be changed into a living room. This design is accompanied by the assumption of a simplified lifestyle (Fig. 6).

Homeowners, regardless of difficulties, “do not want to be reminded that they lived in a small house”<sup>21</sup>. Consequently, further discussion is necessary to deal with the inevitable sense of constraint caused by the limited area. Relevant practices in Japan provide an important reference, which can be summarised as two main strategies. One is to emphasise the relation of the house to its immediate surroundings. This can be achieved through the use of large



(a) Layout in daytime.



(b) Layout at night.

Fig. 6: Minimal housing by Vanke Company. (Source: by author. According to <http://www.vanke.com/>)

plate-glass windows and glass patio doors, which dissolve the confining feeling of conventional walls and expand the perceived limit of the outside space. The other is to blur the limits of rooms, by using drapery, accordion walls, or ceiling-high movable storage shelves as partitions. In a compact house, moveable partitions are widely used to save space and an intimate space can be made conveniently when it is needed. In the slender layout, the fixed parts of these moving partitions are suggested to be used as a visible extension.

Dwellings with limited space are less sustainable for family size's future changes. Although the interior re-division is

station, while 6.45% in the temporary work shed. What's worse, 12.54% rural workers are not accommodated with any living place in the city, and have to return to the suburbs or villages. Cao Jianhai (2010). *Fight with the High Price of Housing* (向高房价宣战). Beijing: China CITIC Press. pp. XXV.

<sup>21</sup> Avi Friedman (2001). *The Grow Home*. London: McGill-Queen's University Press. pp. 14-15.

conceived in some cases, its effectiveness is restricted by comparable size. Consequently, the area extension has to be conceived by combining adjacent units, or exchangeable space. This method is particularly feasible for affordable public rental housing, since it always has a high turnover rate and the area standard is still being improved. (Reference: Method 2.3; 2.4)

### **Design for the multi-generation family |**

Compared with Europe and America, the interdependence between multiple generations is obviously much stronger in Chinese families. This close relationship is generated by mutual needs, as the elder generation assists their children, when the third generation is born, while the younger generation provides for their parents who are too old to live by themselves. According to an investigation of five selected kindergartens in Shanghai, it was found that about 79.4% children were picked up by their grandparents after school<sup>22</sup>. Furthermore, a relevant sample survey, which was conducted in a community in Beijing, showed that nearly of 60% elder interviewees preferred to live with their children<sup>23</sup>. A number of young people settle down far from their hometown and the high price of housing, together with home-purchase restrictions, prevents them from preparing a separate apartment for their parents. Under these conditions, multi-generational dwellings are needed.

On the current market, this type of apartment normally consists of two combinable units: a bigger one for the

younger generation, and a smaller one for the elder generation. The prominent issue is the relationship between these two units: whether they separate or connect. For the biggest separation, each unit is found to have an independent entrance and interior function, to avoid mutual interference. In addition, after the elder generation moves out, the two units can be completely separated into two residential units or a single dwelling with a working space. In practice, this type pays more attention to the elaboration of individual unit, and the combination is normally achieved by sharing an entrance in the horizontal direction, and by building an interior staircase for the vertical direction. Certain experts, on the other hand, insist that an appropriate sharing space is necessary. In the investigation conducted by Tongji University in 2010, it was found that to amalgamate some space is widely welcomed: the forms of “same apartment, hall, kitchen, and separated bathroom and bedroom” and “same apartment, combinable hall, with separated kitchen, bathroom and bedroom” were favoured by 44% and 30% of the interviewees respectively. Also, the users’ preference for common space decreased from bathroom, living room, kitchen, to dining room. In this kind of practice, combination and separation is normally achieved by reserved openings. (Reference: Method 2.3)

Despite there being different emphases, there is a consensus that the related units should be combined and separated concurrently. This is the characteristic, which separates multi-generations dwellings from the other combinable units. For families focusing on the gathering, this separation has to be carefully conceived to avoid contraction caused by different lifestyles and to guarantee privacy. Conversely, in families emphasising privacy, potential communication should be predesigned, since the interdependence between generations is not only physical but also psychological.

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<sup>22</sup> Mao Mingqian (2009). The Requirement Investigation and Design Strategies on “Multi-generation House”: Taking the Shanghai Area as an Example (“两代居”住宅设计研究——以上海地区为例). *Urbanism and Architecture*. pp. 35-37.

<sup>23</sup> Sun Ying, Zhao Yue, Hu Huiqin (2010). Design Strategies to “Residence of Two Generation” in Beijing High-rise Condominiums (北京高层集合住宅两代居设计策略研究). *Architectural Journal*. pp. 90-93.

### **Indifferent neighbourhood relationship |**

In Chapter 3, the living situation in the early years shortly after the establishment of New China was briefly introduced as the background for combinable housing. The minimal living area, shared kitchen and bathroom is widely criticised in the memoirs. Even through the difficult living situation was obvious, the harmonious neighbourhood relationship was highly cherished, while its fading in modern dwellings was bemoaned.

The indifferent connection between neighbours, which is probably generated by the faster pace of life, diversified amateur activities and a trust crisis in society, produced an unreasonable result in the architecture. Both the design of ordinary housing and the pursuit of flexibility paid much attention to the interior space, but ignored the collective environment. Based on this, the architects tried to satisfy all the demands for change within an individual unit. A typical example could be found in the design for the “sociable family”, in which a spacious living room for parties could be achieved by connecting it to a bedroom. However, the daily use of the extended living room was seldom discussed. The other phenomenon could be found in the fitness room at home. According to a family who prepared a special fitness room, they bought a complete set of fitness equipment with great earnestness, but seldom used it. An informal conclusion could be tentatively drawn by these phenomena. Both the architects and users tried to create a perfect dwelling, which provided as much function as possible inside the house. However, it is probably not the only solution. Is it possible for the community to bear certain occasional requirements or changes?

Furthermore, an indifferent neighbourhood is also sociologically impractical, since it isolates individual families from the integrated community, and weakens any mutual assistance. People who lived in the

crude tube-shaped apartments or shared courtyards in the 1970s, had plenty of experience of getting help from their neighbours. However, in the modernised dwellings, they have to struggle with every trial by themselves, although certain problems are difficult to solve. The most prominent phenomenon is that most primary schools close around 4 p.m., while the parents usually finish work no sooner than half past five. Who picks up the children and takes care of them is a common problem suffered by working families. Meanwhile, the retired, some of who are intellectuals, are complaining about their boring life and the feeling of no longer being needed. If they were to be organised for the children, both of these problems disappear. This concept has long been testified in the co-housing activities in Europe, while brightening results can also be expected in a community nursing home, shared library, and amateur class.

In an advanced community, organisational strategies have been carried out to strengthen the cohesion, such as releasing community journals, organising square dances and launching regular activities. Correspondingly, architectural strategies should also be conceived. As with the above-mentioned discussion on flexibility at the community level, a collective or shared space is suggested in the garden/balcony, public circulations as well as collective rooms. (Reference: Method 1.1; 1.2; 1.3)

A further suggestion is given for the collective rooms on the ground floor, which indicates a valuable resource for the entire community. Ground floor locations mean that the space can be used for public or semi-public functions without disturbing the upper levels and it can be half opened to accommodate outdoor activities. Residents may have a square dance after supper or walking their dogs while it is raining. The collective library may be located here; special care may be provided for the elders;

and parents may chat to each other when their children are playing outside. Furthermore, it also indicates the accessibility of vehicles. It is found that old communities have insufficient parking spaces, and the problem contributes to unpleasant communal environment. The liberation of the ground floor will be beneficial towards tackling this problem as it may provide several parking spaces for visitors.

## **Appendix**

1. Booklet about field investigation on Molenvliet Project.
2. Booklet about field investigation on Wuxi Experimental Project.

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