

Fig. 21: Layers of experimental project in Jinan (take ground floor for example.) (Source: by author.)

users are more inclined to move. This preference is enhanced by the comprehension that the influential factor on housing quality is never limited to the interior layout.⁴⁸

With the releasing of the formal guidance, the tentative design was expressed in “House of Tomorrow II” in the same month. Following the basic principle and design method of CSI, it was concentrated on the discussion on material and technology of interior partition, bathroom unit, kitchen unit, raised floor, and pipelines.⁴⁹ All the components were supposed to be provided by native producers in order to reduce the cost and promote its popularisation.

Although the Jinan government had an ambitious plan of putting CSI housing into practice⁵⁰, its realisation was limited to a single experimental project until now. This project was started in May 2011, with a four-storey building of approximately 3,700 m², accommodating eight families (Fig. 20). A vertical well and raised floor guaranteed the separation of piping and wiring from the structure. The internal space was subdivided by the non-load bearing partitions, which preserved the possibility of future change (Fig. 21). Although the basic principles of CSI have been practised, obvious problems could not be ignored. Firstly, this project was in an extremely high-class area - the average area for each apartment reached 400 m², which was far beyond the average living standard in China or Jinan. Mr. Wang Quanliang, the director of “Jinan Housing Industrialisation Center”, attributed it to the limited alternatives, since CSI housing was not widely acceptable.⁵¹ For the acceptance

problem, Mr. Liu Chuncang also expressed his anxiety since he thought CSI housing had natural disadvantages. “The height of the whole building will be raised inevitably by the hollow space preserved in the ceiling or floor for pipelines, and the floor area ratio will decrease correspondingly. In the project with strict height limitation or high floor area ratio, CSI will be the last choice of businessman.” Furthermore, the ineffective promotion by the government was the other reason why CSI housing was not popular.⁵² Secondly, the project had four suites well decorated, while the rest was left as rough housing which could be decorated by the users according to their individuality. This choice seemed to be backwards to the rough housing period. At the end of May, 2014, this project has not been open for sale. Consequently, its usage cannot be acquired at the moment. However, it is clearly revealed that the popularity of CSI housing, from theory to design, still has a long way.

DISCUSSION: DESIGN FOR FLEXIBILITY

Flexible housing is the production of social background. This point of view has been proved in its development history mentioned above. However, it could be found that although the specific situation changes in different branches, there are still consistent approaches being preserved. These methods are practiced not only at home, but also abroad, in which the way that flexible housing has been, or may be, achieved could be traced.

Separation | It is a paradox that flexibility and inflexibility coexist. The pursuit for flexibility is always based on the arrangement of inflexible components. Separation is necessary to make the distinction clear. It is limited to the structural aspect.

⁴⁸ Interview with Mr. Liu Chuncang, who is the associate editor of the above-mentioned guideline.

⁴⁹ Interview with Prof. Jiang Haitao, who is the designer of “House of Tomorrow II”.

⁵⁰ It was reported in the document of the government that Support Building was planned to reach 100,000, 500,000 and 1,000,000 m² in Jinan by 2011, 2012 and 2013.

⁵¹ Interview with Mr. Wang Quanliang.

⁵² Interview with Mr. Liu Chuncang.

Throughout China, the expression of separation is shown in various forms and in different stages. Traditional housing expressed a separation of individual life from the social system. The latter was extensive and compulsive, whilst the user's individuality could be comparatively flexible. The area adjustment in branch 1 indicated the separation of construction from its allocation. Although the whole dwelling was constructed with an inflexible area and exterior, it could accommodate a flexible number of families. The control of living standards was just achieved in this way. Separation in branch 2 emphasised a sociological aspect - the individual should be separated from the collective. It also expressed that the owner was entitled to control his property. This point of view was even more obvious in China where research paid attention mainly to the interior. In a different way, the separation in branch 3 was in the scope of physical behaviour - the short-lived building components were suggested to be separated from the durable parts.

In the researches done abroad, separation also exhibits booming achievements. The diversification could be interpreted with Le Corbusier's projects, in which a wide sense of separation was particularly practised. In his design for Domino, an extreme simplified system was designed with only "two horizontal concrete slabs supported by columns and connected by stairs"⁵³. With this system, he expressed a multiple separation of load-bearing from non-load bearing, mass-produced from customised, common structure from specific function, etc.⁵⁴ His separation of individual from community was clearly expressed in the design for the "Unite", from around 1947 to

1952. In this project, the collective was represented as "a huge reinforced concrete cage", while individual parts made up the 337 structurally independent (and thus acoustically isolated) dwelling units which could be insert into the cage. In his early drawing for Algiers in 1929, he practised a separation of the individual from the city. With a blurred concept of community and the city, the design took a whole city as a long building, which was an urban transportation facility, as well as living facility. It was characterised by the bare horizontal platforms without any decoration. His concept was to design several free platforms instead of completing the building. People could buy or rent a portion to build their own house, workshop, or for any other use. He also had a series of minimal housing plans, notably Maisons Loucheur, which were based on the separation of the use of space in day and night.

Compared with the fragmented practices, the contribution of Support Building is prominent since it includes a series of organised separations from the city, the district, the community, the building to the independent family. This concept is clearly revealed by the working process of Open Building, which divides the living environment into five layers. The lower layer is comparatively flexible, while the upper layer is comparatively fixed⁵⁵.

Indeterminacy | Indeterminacy is created so that the dwelling, or a certain portion of it, could have multiple uses. Throughout the whole development process in China, this concept has been practised mainly in spatial aspects. Take the traditional Chinese residences, for example, all rooms were inclined to be spatially identical so that they could be used as any function. In large-span dwellings in Branch 2, universal space was designed for the user's personal

⁵³ Stanislaus von Moos (2009). *Le Corbusier Elements of a Synthesis*. Rotterdam: Uitgeverij 010 Publishers. pp. 38.

⁵⁴ Ibid. pp. 38. "He believed that the elements of this simply system could be easily mass-produced. Once erected in war-ravaged areas, it would be up to the individual owner to supply the massing parts of the bare skeleton."

⁵⁵ Stephen Kendall & Jonathan Teicher (2000). *Residential Open Building*. London: E & FN Spon. pp. 16.

interpretation, as a specious hall, or subdivided into several small rooms. It can be concluded that indeterminacy allows space to be interpreted in multiple ways by various occupants over the course of time.

History has given many vivid examples of individual buildings, or even a group of buildings, which have been re-interpreted as housing. Graham Towers even believed that “there is almost none which cannot be converted to housing”. According to him, at least six building types, (namely offices, schools and colleges, churches, pubs, industrial buildings, and shopping centres), can be used as residential buildings after being slightly altered.⁵⁶ It is found that the six types mentioned above are all constructed with over-sized dimensions, when compared with housing. That is why the re-interpretation is possible. He never mentioned the possibility of changing residential dwellings to a non-residential function. The main reason for this is the change has to deal with complicated structural problems to achieve a three-dimensional larger space. This change is almost impossible to be achieved without painstaking preparation in the design stage.

Adding other features is the other method towards indeterminacy. It is interesting to compare a mini tailor shop with an apartment. They have similar dimensions but cannot be easily interchanged. The contrary “typical feature” impedes them. A tailor shop needs to be recognisable and accessible for its clients. Conversely, a dwelling needs a quiet and intimate location. Once interchange is conceived, these two different features have to be balanced. For instance, this possibility could be preserved by adding an additional entrance for the ground floor apartment so that it could be reached directly from the community road. In the Wuxi Experimental Project, Prof. Bao Jiasheng did practised

this. This point of view could also be achieved with internal changes. Take the bedroom for example. When compared with other spaces, it is more private and isolated for its owner. Provided it may be used as part of a hall, it has to preserve the openness to a certain degree. Some projects use flexible partitions as a strategy. Through folding or unfolding the partition, the space is changed from open to comparatively isolated; subsequently, the change of function is achieved. This method was practised in “Stepped Garden Housing”, which has been discussed in Section 2.

It has been discussed that over-sized spaces and changeable feature are two characteristics of indeterminacy. How can indeterminacy be interpreted successfully by users when this process is not guided by an architect? Herman Hertzberger has made an important contribution as he suggested that the stimulus should be provided by the architect so that the individuals may respond to them in the given situation. Meanwhile, several stimuli were provided, for example columns, piers, perforated building blocks.⁵⁷ His concept was fully realised in Diagoon Dwellings in Delft, Holland.

Changeability | Flexibility is normally achieved by change. Besides the functional transformation, it also refers to the alternation of physical fabric of the building: by changing partitions and related components or by joining together rooms or units⁵⁸.

Existing research in China paid emphasis on the former. The research on the changeable components has been conducted since 1990s with the intense work on partition, which was, in most cases,

⁵⁶ Graham Towers (2005). *An Introduction to Urban Housing Design: A Home in the City*. London: Routledge. pp. 150-156.

⁵⁷ Herman Hertzberger (1991). *Lessons for Students in Architecture*. Rotterdam: Uitgeverij 010 Publishers. pp. 152.

⁵⁸ Tatjana Schneider & Jeremy Till (2007). *Flexible Housing*. London: Taylor & Francis. pp. 5.

non-load-bearing board with light weight, of a small thickness, high intensity and with good insulation performance. Furniture was also be used. Ms. Ma Yunyu's DIY components and Mr. Zhao Guanqian's research on universal boards were two typical representatives at that time. With the development of industrialisation and more in-depth research on housing, some building components were advocated to be made as integral units since 2000s, which could be mass-produced, such as integral kitchens and bathrooms. Furthermore, inspired by the practice in Japan, the changeability of short-lived components began to be practised, which has been discussed in Branch 3. This research, although limited in scope, indicated a bright future. It could be found that the changeability of physical aspects was based on three basic principles: to simplify the changing process, for example dry work is advocated; to avoid harming the durable structure; and to acclimate the overall trend of industrialization, which was represented by the promotion of integral units.

Changeability was practised in a completely different way by joining together rooms or units which has been discussed in Branch 1. What's particular is that change in this field is accompanied by management problems - how to acquire the existing occupants' support, and how to deal with the rearrangement of property after the readjustment of the unit area. These problems are especially prominent in private housing, and make this change far from an easy architectural task. This method has an early beginning in China, but complete re-divisions decline as private housing flourishes. It is even hard to find a project with positive results in China. However, the Keyenburg project in Rotterdam set a successful example. It was built as a social rental housing, accommodating tenants who wanted smaller spaces. There were 152 units as per the original design in 1985, all of which were in the basic elements of 41.85 m² in

the top floor and 48.6 m² in the non-top space. The possibility of re-division had been preserved in the holes on the splitting walls. In 2004, the re-division was conducted for extending the living area for each building. As social housing, it avoided the complicated consultation with various owners. The re-organisation was achieved successfully by combining two adjacent suites into a bigger one or re-dividing three small apartments into two.

Post-occupancy Investigation on Typical Projects

In the last two chapters, flexible design in different social backgrounds has been discussed. It is encouraging that remarkable achievements, especially abundant projects, have been accomplished. These projects are full of possible changes assumed by the architects, while their actual situations of use are, to a certain extent, unknown. After years, their facades may fade, their pipelines may be ageing, and the design may be out of fashion, and correspondingly, various changes would be expected. Could these changes be controlled in the original design? Are these projects enhanced after the changes? Do the users have positive responses? These questions are far from being answered. This chapter continues the discussion with the post-occupancy investigation of two typical cases, one in China and the other in the Netherlands, realised under the concept of Support Building, which has significant influence on flexible housing in China.

SECTION 1: INTRODUCTION

The selection of cases | The selection of cases is based upon three criteria. Firstly, selected cases should be representative of the whole population. In addition, it is better if they were built as early as possible so that any obvious changes can be expected. Secondly, it is helpful if the materials about the background and building process of the selected cases were completed. Thirdly, in order to obtain

sufficient samples, experimental projects with more units are prioritised.

With these criteria in mind, the “Wuxi Experimental Project” (Wuxi, China) was selected due to its groundbreaking significance. Being recognised in Nov. 1985, it was the first Support Building in China that played a model role for the practice and research on flexibility around the 1980s and 1990s. According to a preliminary visit, considerable changes were speculated through the inhabitants’ creative renovation on the facade.

Meanwhile, the “Molenvliet project” (Papendrecht, the Netherlands) was selected as a counterpart. As the initiator of Support Building, Prof. John Habraken’s contribution to theory and education was indisputable, however, his real project was seldom discovered. It was widely accepted that his conception was first completely appreciated by his fellow associate, Mr. Frans van der Werf, in the Molenvliet project in 1976. Derived from a prize-winning design, this project coalesced the merits of Support Building in an all-sided scope of Tissue, Support and Infill level. In addition, it was also a successful project for user participation. In this project, a strong sense of design in a logic way and creating flexibility in this process, has been expressed. Thirty-eight years after realisation, it still attracts wide attention as a classical case.

It is undoubted that these two projects are comparable with each other. Besides sharing the same theoretical root, their comparability is represented via the following three aspects. On the Tissue level, the two cases followed the strategy of “buildings surround open space”. On the Support level, both projects learned and enhanced good nutrition from traditional housing, and designed private gardens for the ground floor and a spacious terrace for the upper levels. On the Infill level, both projects placed a particular emphasis on the user’s power of control in the decision-making process. The comparability confirmed the selection of these two cases.

Methodology | The investigation on the “Wuxi Experimental Project” was conducted in May, 2014, followed by the survey on the Molenvliet in September of the same year. Although slight differences were unavoidable, the two investigations shared the same study process as the following six steps.¹

Firstly, basic information of the projects and the record of previous revisits were acquired through a thorough literature review. As a result, the primary assumption of the investigation was tentatively gained.

Secondly, the preparatory visit was paid through the method of non-interventional observation. Although without direct intervention to users, the overall situation of the projects was further understood, and this attributed to the improvement of the research objective. For example, the popular activities involving the shutting off of the balcony in the “Wuxi Case” motivated the research regarding the use of balconies.

Thirdly, the design concept was deeply studied through a face-to-face interview with the architects. The question list was prepared in advance for each project, consisting of targeted items without the confinement of the interviewees to the pre-designed questions. Conversely, the two interviews all started with the architect’s free talking, and turned to the question lists as complementation.

Fourthly, the current living situation was acquired through a face-to-face interview with users. There were sixteen and fifteen families studied, respectively, for each project. The interview for each family lasted a minimum of thirty minutes. Interviewee selection was to some extent a random process. Their interest in the investigation was the essential prerequisite. In addition to this, the variety of interviewees, such as the type of their house, the educational background of the family members, the existence or absence of renovation, was also taken into consideration.

I believe that a non-directive interview² is the most effective way to obtain complete feedback. In this process, the questionnaire and question list was deliberately neglected to avoid any predesign disturbance to the users. The only question was “would you please tell me something about your house”. I was convinced that through the users statement, their concern and priority could also be obtained.

This method was tentatively practised in the “Wuxi Experimental Project”, however it did suffer a setback. Fortunately some householders with a strong sense of participation were found. They controlled the renovation independently, although they did not receive any professional education

¹ The investigation routine was largely inspired by the post-occupation evaluation process, which was designed by Albert J. Rutledge. Albert J. Rutledge (1985). *A Visual Approach to Park Design*. translated by Wang Qiushi, Gao Feng (1990). Beijing: China Architecture & Building Press. 192.

² This method was practised in Philippe Boudon’s revisit to Le Corbusier’s Passac. Philippe Boudon (1972). *Lived-in Architecture: Le Corbusier’s Pessac Revisited*. translated by Gerald Onn. Cambridge: The MIT Press.

on architecture. Some participant revealed genius and reasonable long-term plans for the future change of their apartments. They were able to explain their activities in a logical way. However, it was inevitable that some inhabitants spoke in a chaotic way. They focused on the disadvantage of the project, as well as their dissatisfaction regarding the architect and government. If I kept silent, they may come to the national policy and wealth gap. Those factors were closely connected with housing; however, they were out of my research. Consequently, the intervention with some direct questions was of necessity in some cases. For example, “have you done any renovation to your house in the past years”, “is this furniture or component made by yourself”, and so on.

Based on the lessons mentioned above, a completed question list was prepared for the interviewees in the “Molenvliet project”. The architect’s logical concept of decision-making was the other reason attributed the list, which was organised in four sections: basic information; Tissue level; Support level, and Infill level. Not all interviewees were asked to answer the same questions. In the process, I gradually realised that several original questions were not interesting, whilst some new questions were necessary. The additional questions were varied depending on the family - the interviewees motivated them.

All the interviews were recorded, and drafts and photographs recorded the actual living situation of each family.

Fifthly, the primary results acquired in the interview with users were discussed with the architects and other professionals who were familiar with these projects.

In the study of “Wuxi Case”, both Prof. Bao Jiasheng as the architect, and Prof. Wu Jinxiu, who did the post-investigation on this project in 2000, were interviewed, respectively. The former interview

answered my question regarding this project; whilst in the latter, the common problems revealed in these two investigations were discussed.

In “Molenvliet Project”, this study consisted of two discussions in addition. One was with the architect and the secretary of WERKGROEP KOKON (the Housing Corporation), in which the preservation of the project was discussed. The other was with the architect and Prof. John Habraken. In this appointment, the main problems found in the two investigations were discussed.

Sixthly, the result was analysed and re-organised. To highlight my opinion, the analysis in following sections focused on typical families. However, it was justified to record the identified change and actual living situations in all the families involved. Consequently, two booklets embodying these details were enclosed as the appendix.

SECTION 2: MOLENVLIET PROJECT

1. Basic information

Winning the design competition in 1969 was an important step that shaped Frans van der Werf’s career as a housing architect. His logical thought was reflected systematically through the design in the decision-making process, whilst his resilient belief of building as an act was fully represented through the Support/Infill scheme, practiced in both external and internal living environments. In 1976, a small section of the design was comprehended in a 3.3-acre site of Papendrecht. The accepted project was organised around four courtyards and accommodated 122 rental families. In addition, Prof. John Habraken appraised it as “the first blown Support/Infill project”.

2. Architect’s Concept

Frans van der Werf | Frans van der Werf is a Dutch architect and urban designer who possesses a deep enthusiasm on Support Building. His inherent intelligence regarding this topic was exemplified in the final project presented for his degree in Delft University of Technology in 1965. Although without knowledge of Support Building, he had expressed a similar opinion, such as advocating the polarisation of private and public spheres and criticising housing design without conferring with currently occupants. He also believed in developing neighbourhoods as layers of Tissue, Support and Infill. His attention on Tissue was compensated through the further research on the spatial morphology of “existing neighbourhoods in both France and England”³. Post-graduation he was represented in the competition project in 1969, which was the prototype for the “Molenvliet Project”.

Meanwhile, Prof. John Habraken happened to conceive the research of Support Building within the Tissue level; thus, Van der Werf’s research was a great attraction to him. The common interest resulted in their liaison and led eventually to the report known as SAR 73. As a follow-up of SAR 65, the major contribution of SAR 73 was not restricted to it extended Support/Infill scheme to a wider scope, but instead it played an important part in the completed decision-making process covering various levels of scale from the city, the community, the building and to the interior layout. The higher level was comparatively fixed, whilst a certain degree of flexibility was preserved for the lower level. Using this method, the small-scale initiatives were prompted. The emphasis on decision-making was particularly reflected in “Molenvliet Project”, in which the specific method of SAR 65 and SAR 73

was adapted as being a helping hand in design and communication.⁴

Decision-making process | The completed decision-making process in “Molenvliet Project” consisted of four levels with different scales and, most importantly, different intervention bodies.

At the top level, the decision in **Overall plan level** was under the control of authority and addressed the comparison of built and non-built zones (water, green, etc.) as well as the placement of artery and branch roads within the whole realm. Based on the overall plan, a further decision was made by the urban planners on the **Tissue level**. This decision determined the morphology of both open space and building zones concerning the location and size. The decision for the **Support level**, covered all “parts of building which are common to all occupants”⁵. It was interpreted as being composed of foundations, load-bearing walls, floors, roofs, piers, and common pipes. The architect acted as the main decision-maker. Ultimately, the user’s individual preference and decisions were expressed in the **Infill level** that was represented as floor plans, facade layout, etc. (Fig. 1).

⁴ SAR (Stichting Architecten Research or Foundation for Architects’ Research) was a nonprofit organisation, which was established on September 23, 1964. “Vital to the image of the SAR was the development of methods that were to clarify the design process and facilitate decision-making for all parties involved in the building process.” This research office was known as two lines of studied. “The first line touched the generalities in contemporary housing construction: the various ‘means of communication and coordination’ at the level of the autonomous building, also known as the SAR 65 method”. The second line “involved fitting supports into a city’s urban-design scheme” and “resulted in the ‘tissue method’ expounded in SAR 73”. Ibid. pp. 142-285.

⁵ Stephen Kendall & Jonathan Teicher (2000). *Residential Open Building*. London: E & FN Spon. pp. 7.

³ Koos Bosma, Dorine van Hoogstraten, Martijn Vos (2000). *Housing for the Millions: John Habraken and the SAR (1960-2000)*. Rotterdam: NAI Publishers. pp. 275.

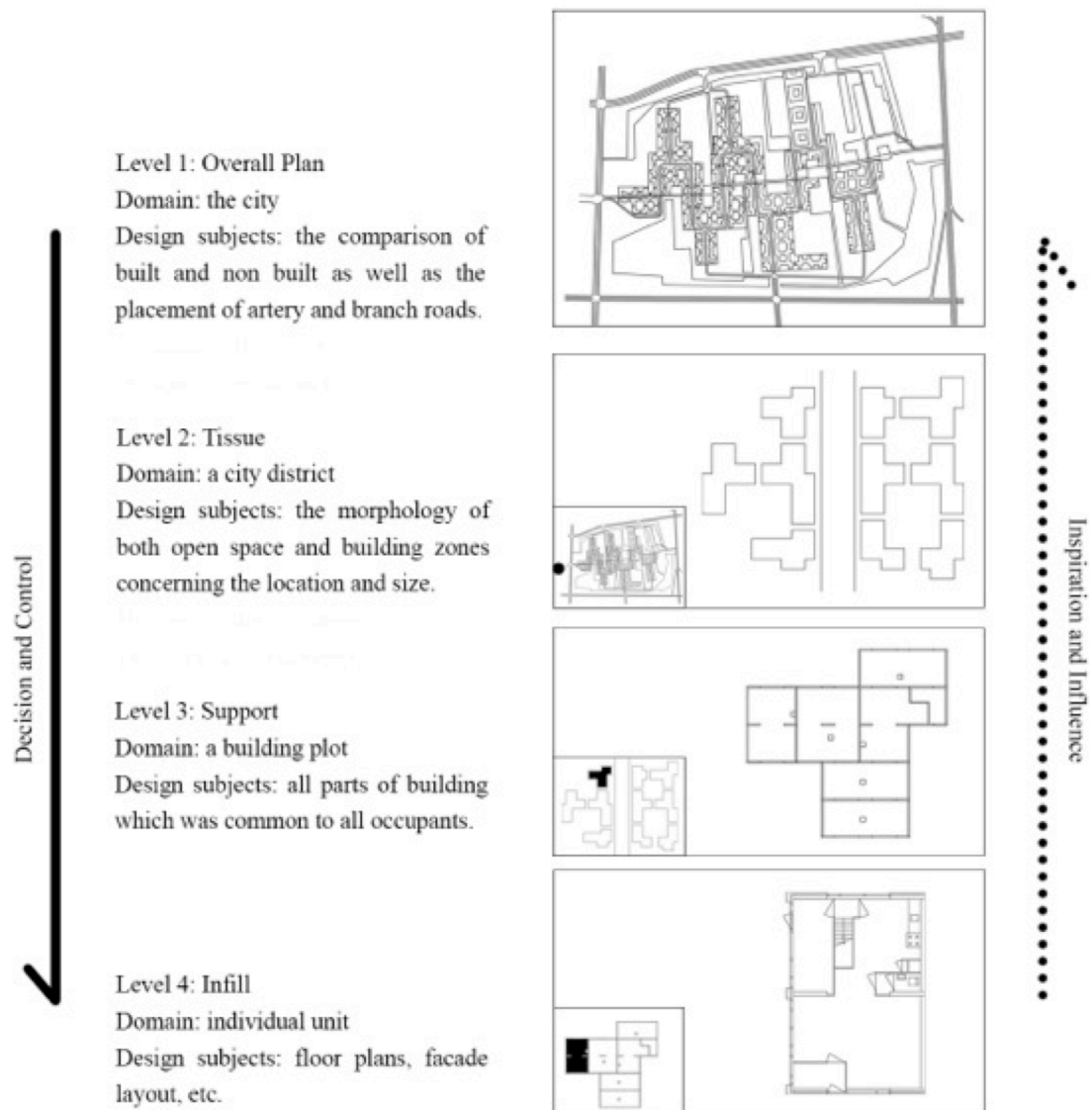


Fig. 1: Decision-making Process. (Source: by author.)

These levels were never isolated. The strategy determined in the higher-level formed “part of the framework for discussion and resolution in the next”⁶ as well as allowing a certain freedom. Furthermore, an opposite top-down decision making process allowed the inspiration and influence to work second a bottom-up process. In this process,

small-scale initiatives were highly appreciated.

(.....) We must have the structure, which allows a lot of Infill afterwards. The structure is fixed but the Infill is free. That is the gift of an open building - to create a structure providing freedom for infill in three levels (within the whole district). The tissue designed by the urban designer, consists of 30 hectares, but the local authority normally makes the decision. It is the Support of the whole structure. Then, when you design the building,

⁶ Frans van der Werf (1980). Molenvliet - Wilgendonk: Experimental Housing Project, Papendrecht, The Netherlands. *The Harvard Architecture Review: Beyond the Modern Movement*. 1 Spring.

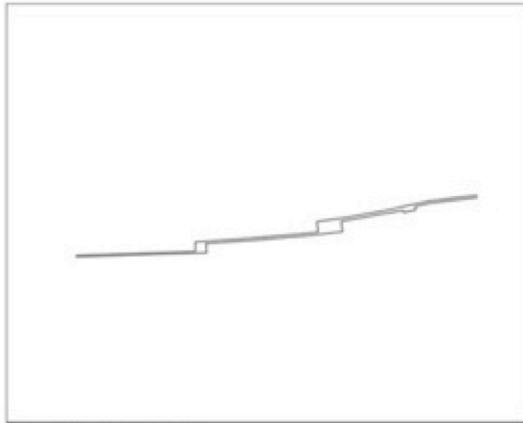


Fig 2a: Central artery.

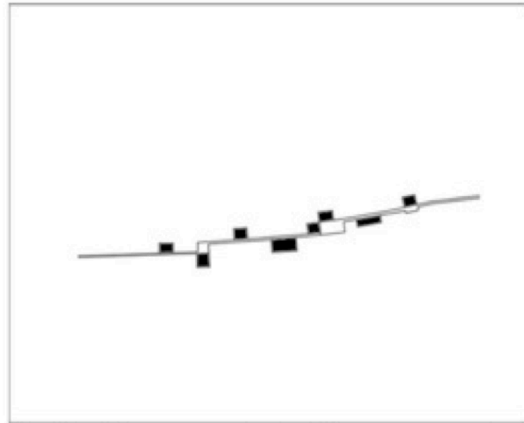


Fig 2b: Necessary service facilities were arranged.

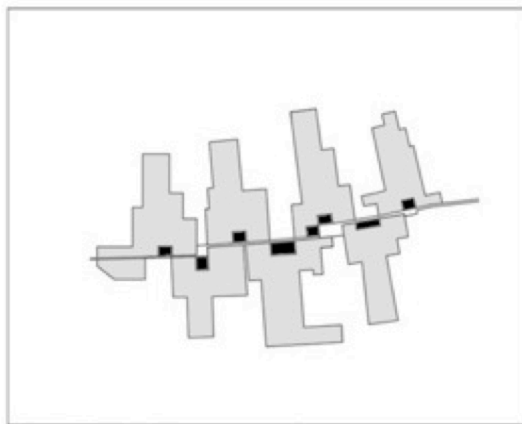


Fig 2c: Building zones and green space were arranged in an alternated form.



Fig 2d: The ring road surrounding the district.

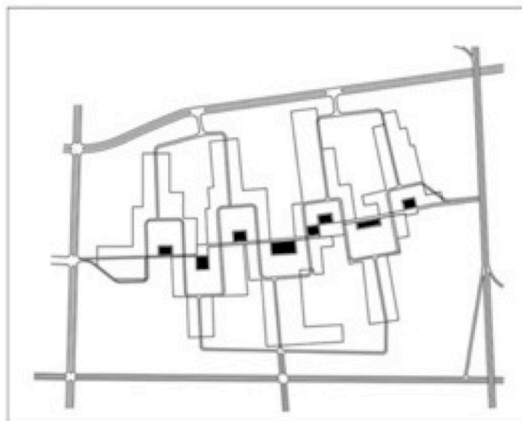


Fig 2e: Streets within building zones.



Fig 2f: Overall layout with buildings and water.

Fig 2: Overall layout. (Source: by author.)

there is already a theme in place. This theme is determined in the design for Tissue. However, architects are free to fill in buildings in case they follow certain rules fixed in Tissue level. The building is the Infill of the Tissue.

Lastly, the layout of each family is completely free.

In this process the decision-making is from the large scale to the small scale: you make first the structure, and then



Fig. 3a: Open space with linear form.

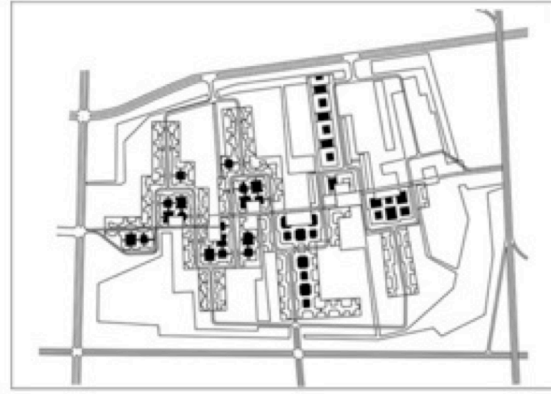


Fig. 3b: Open space with concentric form.

Fig. 3: The forms of open space. (Source: by author.)

the infill structure. First the urban tissue is made, followed by the buildings, and then the layout for each family. However, the inspiration and influence is from the lower level to the higher level. That means when we work in an open building structure, like the year in Papendrecht, it is important to know what people want (.....). (For example) when we design a building, we have to know if it will accommodate very small units, small families, or very poor families, or there will be more or less rich people. Then we can get the appropriate dimensions.⁷

Overall plan level | The overall plan of the prize-winning work was never realised. However, as a part of the decision-making process, it is necessary to begin with the discussion on the strategy in overall plan as well as its indication to Tissue (Fig. 2).

The rules fixed in this level consisted of three aspects. Firstly, a central street was laid in the middle of the site, which was identical to the main street in a typical rural village. Along the central artery there was an arrangement of necessary service facilities, which were also used for neighbourhood activities. Secondly, the

building zones and green space were arranged in an alternated form. Seven housing clusters were positioned around the service facilities. Each cluster occupied 3-4.2 ha, accommodating 250-400 families. Meanwhile, the open space for water and greenery was identified. Thirdly, a hierarchical circulation network was designed that included a ring road surrounding the whole district and streets within specific building zones. The former, which was designed for fast traffic, “provides a convenient access to the separate building zones”⁸. The latter, which was shaped by adjacent buildings, was designed for slow traffic and walking. The zigzag path road restricted cars from driving too fast.

With the rules mentioned above, a draft for the whole district was worked out, whereby the Tissue theme was indicated. This fixed theme could be concluded as a “building surround open space”, whilst flexibility was illustrated in two aspects. The open space was designed as both a linear and concentric form. Secondly, the dwelling could be diversified since it might be located along the large green area, along

⁷ Interview with Mr. Frans van der Werf. September 19th, 2014.

⁸ Frans van der Werf (1980). Molenvliet - Wilgendonk: Experimental Housing Project, Papendrecht, The Netherlands. *The Harvard Architecture Review: Beyond the Modern Movement. 1 Spring.*

the central artery or inside the tissue (Fig. 3).

Tissue level | Under the theme of “building surround open space”, the realised Molenvliet selected four courtyards and a street for the 3.3 acre site. The tissue model was developed with three rules in mind.

Firstly, the courtyards as the concentric open space were adapted to promote neighbourhood communication, and to achieve high density (Fig. 4).

(.....) What is the main difference between a linear open space and a concentric form? The linear space is one-dimensional and has more traffic. Whilst the concentric space has at least two dimensions, and is more for staying there. People ask not only linear space as traffic road, but also quiet and concentric space where you can sit and talk. Many activities can happen in the (latter) environment. Children can play there after school; there is easy contact between neighbours; people may talk with their friends or guests.

(.....) When you build in rows, you have less density. When you build in squares, you will double the density. It is interesting for people who want high density but not high-rise buildings. (....) This project has three times the density that we have in the normal buildings in Holland. It has 100 units per hectare.⁹

Secondly, the courtyards are neither closed nor isolated. Conversely, alleys were designed to connect both the adjacent courtyards and courtyard with the street. Once needed, these alleys could also be blocked conveniently by adding some doors (Fig. 5).

⁹ Interview with Mr. Frans van der Werf. September 19th, 2014.

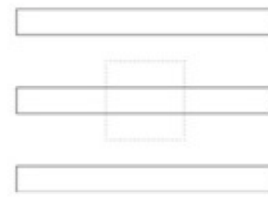


Fig 4a: Building in rows.

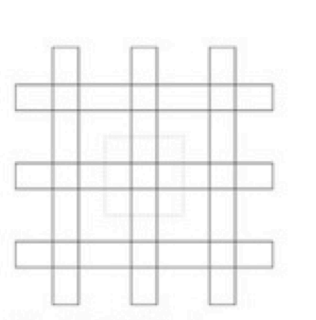


Fig. 4b: Building in squares.

Fig. 4: The forms of “building in rows” and “building in squares”. (Source: by author. According to Frans van der Werf (1980). *A Vital Balance. The Scope of Social Architecture*. (ed C.R. Hatch). New York: Van Nostrand. pp. 30.)

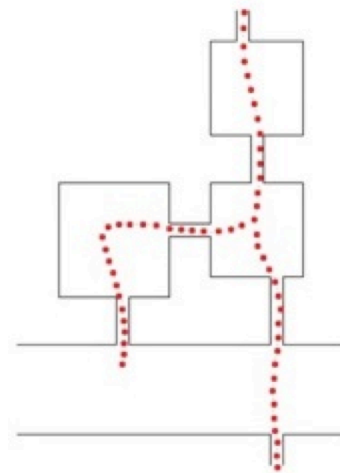


Fig. 5: Ways created by alleys. (Source: by author. According to material provided by the architect.)

Alleys in different direction means you can go in different ways within the neighbourhood. If we have a courtyard with only one entrance, it is very closed and restricting. But if you have more exists, you are more related with others. Christopher Alexander said “it is important to have

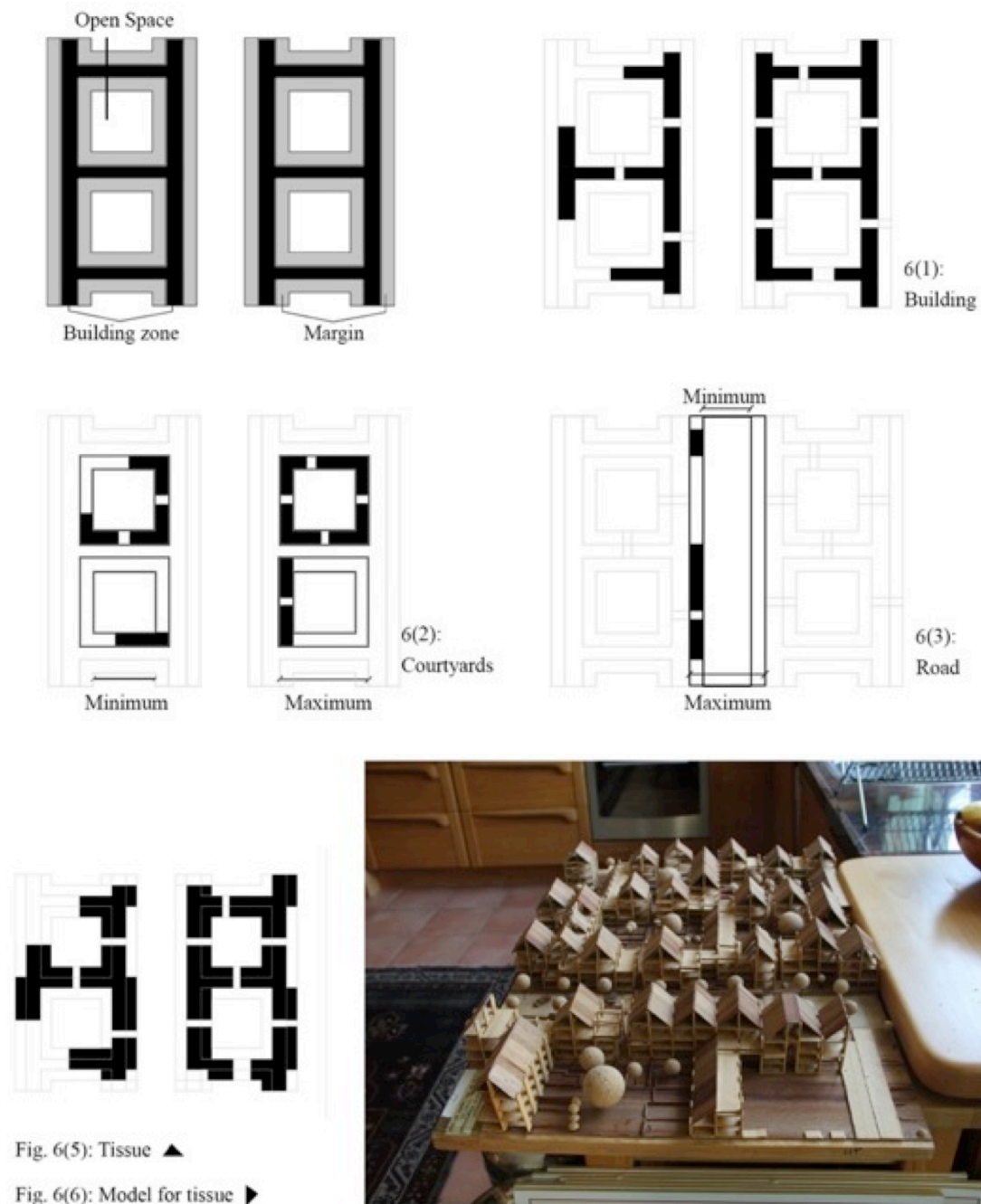


Fig. 6: Design for tissue level. (Source: by author. According to material provided by the architect.)

connections with other neighbourhoods.” (.....) Children love that, with their small bicycles. (.....) It is also very important for fire protection. If you want, you can close a courtyard by making some doors in the alleys.¹⁰

¹⁰ Ibid.

Thirdly, the cars were planned to be parked in the street. This form is attributed to a car-free neighbourhood, and in addition indicated a slow speed on the street. Influenced by Christopher Alexander, the footway along the street was raised¹¹.

¹¹ In Pattern 55 “raised walk”, Christopher Alexander suggested that the walking road should be at least 18 inches (457.2 mm) above the driving

Cars are not allowed in the courtyard. It has to be parked in the street. So the street is a parking street instead of a through-going one. The whole street is used for parking. People who are driving on this street cannot drive very fast, because there might be cars coming in and going out all the time.¹²

The three rules mentioned above attributed towards a Tissue model, in which the open courtyards, surrounded by buildings, were arranged along the parking street. SAR 73 re-interpreted this model as consisting of three zones: the building zone, the open space, and the margin between them. The location and dimension of the first two zones were fixed, while flexibility was embodied in the margin, which could be built or could remain empty. With various use of the margin, different results could be achieved. For the dimension of the courtyards, for example, the architect decided that entrance garden should be condensed and the garden courtyard should be extended. As a result, the inner margin of the former was occupied by a building, while the margin within the latter was left as open space. The other example could be found in the street, the width of which was suggestive to be increased for parking. As a result, the artery occupied the margin along the street. The calculation of dimension was also expressed in the third dimension, which regulated the possible height of dwellings. The advantage of this form could be highlighted when many architects worked within the same tissue (Fig. 6).

Support level | The basic morphology of the building has been generated at the Tissue level. In the Support level, three

road so that the pedestrians would feel safe even though the cars may pass them. This concept is accepted by Molenvliet, but the height is a little lower, with only 300 mm. Christopher Alexander, Sara Ishikawa, Murray Silverstein (1977). *A Pattern Language: Towns, Buildings, Construction*. Oxford University Press. pp. 627-634.

¹² Interview with Mr. Frans van der Werf. September 19th, 2014.

steps designed the collective parts of the building.

Firstly, a structure with a maximum of four storeys¹³ was designed with load-bearing walls, floors decks, and pitched roofs. All the bearing walls had the same dimension and were facing the same direction. Two kinds of dwellings were generated - “one with load-bearing walls perpendicular to the facade, and the other with walls running parallel to them”¹⁴. After a research on adaptability in both types, 4.8m lengths were adapted as the main dimension. Meanwhile, uniform floor decks with openings for collective piping were provided. Secondly, open galleries were adapted, whereby neighbourhood communication was expected. In addition, the possibility of combining adjacent apartments was preserved in the long gallery.¹⁵ Thirdly, the whole building was divided into 122 units. Inspired by the pattern of “differentiation in dwelling size”¹⁶, the original proposal of the local housing association, which planned to build only two-room apartments, was challenged. Corresponding to this, a complex

¹³ “Four-story limit” was regulated in Pattern 21 to “express the proper connection between building height and the health of a people.” And it was reestablished in pattern 96. It was followed by “Molenvliet Project”, the highest building of which was with three storeys and an attic. Christopher Alexander, Sara Ishikawa, Murray Silverstein (1977). *A Pattern Language: Towns, Buildings, Construction*. Oxford University Press. pp. 627-634.

¹⁴ Koos Bosma, Dorine van Hoogstraten, Martijn Vos (2000). *Housing for the Millions: John Habraken and the SAR (1960-2000)*. Rotterdam: NAI Publishers. pp. 277 - 278.

¹⁵ Interview with Frans van der Werf. September 19th, 2014.

¹⁶ In pattern 35, Christopher Alexander advocated the mix of household types with “one-person households, couples, families with children, and group households”. With this pattern, he believed that “a variety of people whose differences and diversity would enrich the life of the neighbourhood”. Christopher Alexander, Sara Ishikawa, Murray Silverstein (1977). *A Pattern Language: Towns, Buildings, Construction*. Oxford University Press. p. 441-446.

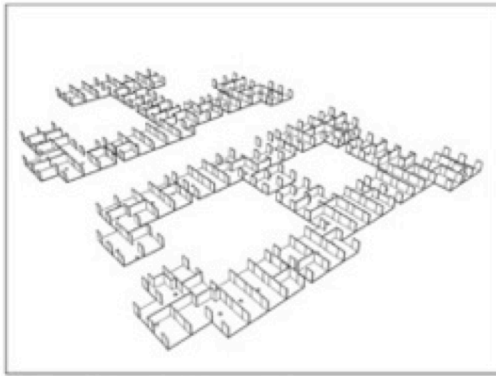


Fig 7(1): Supoort in the ground floor.

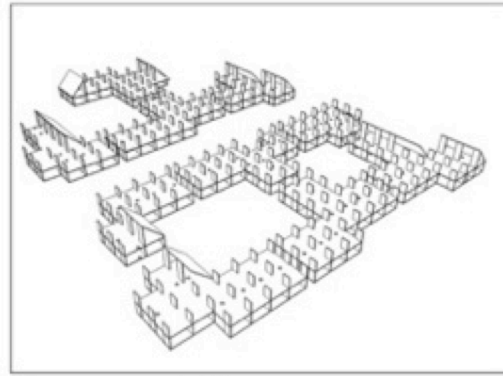


Fig 7(2): Supoort in the first floor.

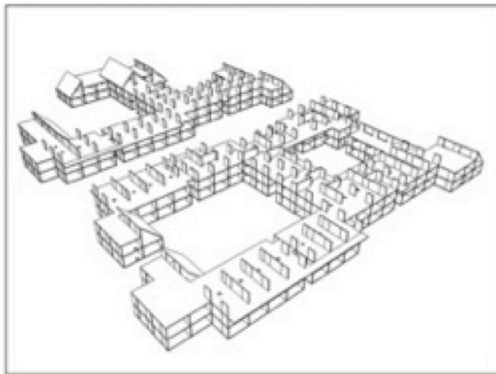


Fig 7(3): Supoort in the second floor.

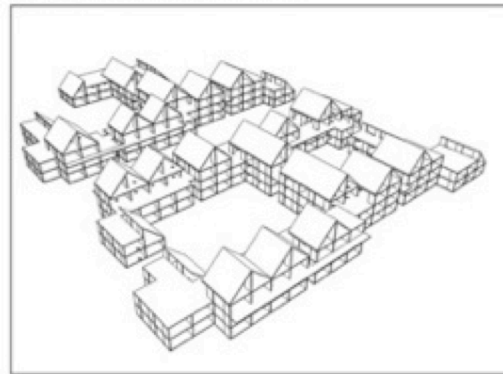


Fig 7(4): Supoort in the third floor.

Fig. 7: Design of Support level. (Source: by author. According to material provided by the architect.)

community was constructed, which accommodated dwellings with one to six rooms. Thus, the number of dwellings was increased from approximately 80 to 122.¹⁷ The support design indicated a specific interpretation of the rules within the tissue level. Besides the morphological aspect, it was considered particularly for people with a low-income. The pursuit for low cost was clearly implied in the aforementioned three steps. The structure was deliberately simplified - all the load-bearing walls were of the same dimension, so were the floor decks; the public staircases were substituted by an open gallery; an amount of duplex apartments were designed to avoid redundant open gallery, which was with comparatively high price (Fig 7).

¹⁷ Frans van der Werf (1980). Molenvliet - Wilgendonk: Experimental Housing Project, Papendrecht, The Netherlands. *The Harvard Architecture Review: Beyond the Modern Movement*. 1 Spring.

Infill level | Within the base building designed in the Support level, the tenant's control of their dwellings could be achieved in the infill level, mainly through determining the interior subdivision and some outside elements within a fixed framework.

Differing from the self-organised activity, the architect worked individually with every selected family in Molenvliet and helped to design their own apartment. Two appointments were arranged for every family, each of which lasted for a minimum of thirty minutes. The first was to accomplish a primary and rough layout concurring to the user's requirement. After a week the house was vacated for the tenant to "reflect upon their floor-plan and wishes" as well as "talk with their children, relatives, neighbours and friends" for advice. In the second meeting, the modification of the primary draft was allowed, whilst further details, such as "where to put the furniture,

how much lights was necessary”, was addressed. Furthermore, the tenants could determine other facade elements in the second meeting.¹⁸

In the movie on Molenvliet Project, a regular participation was recorded as follows. Both the architect’s role as a consultant and the user’s role as a decision-maker were unmistakably exposed in this conversation. The architect’s main work was to impersonally elucidate the possible choices so that the users could decide independently. Even to the most hesitant users, the architects insisted that the tenants themselves should make the decision.

Architect: On this drawing the house assigned to you by the house association, is situated on the second floor, on the same level as this gallery. There’s a door leading onto this terrace. It is bigger than it looks. Downstairs is a stair well and upstairs we have the attic. Now I’d like to know what you want here and what you want there.

Tenants: We’d like the kitchen here, with some storage space.

Architect: So you want storage space next to the kitchen? And you want to eat in the kitchen as well?

Tenants: Yes.

Architect: Of course you must also be able to enter the house, so we’ll allow for a hall here. You’ll have your living room upstairs. If you plan it here, it faces the street. And if you plan on the other side, you look out over the

courtyard and the school. The back is to the west and this is the east. What do you want?¹⁹

However, the exception could have been originated when some absurd ideas were produced. In this condition, the architect had to intervene the users to avoid the obviously negative results and make the future layout reasonable. The way of the interference was to guide them instead of enforcing. In the interview, Van der Werf gave a specific example.

In Papendrecht, there was a young man. He came to me, and said, “I will live here in the new project, on the second floor. I have fifty square meters and a big terrace”. I said, “please sit, I will make a layout for you”. He said, “no, I hate space (.....), I want an apartment which is empty”. I thought about how to deal with him. Then I asked, “Do you have a mother”. He said “yes”. “Will she come sometimes to your house?” “Yes.” I said “Well, I can manage an empty apartment for you, it is no problem. You can have an open toilet. But if your mother came, how will you do for her?” That man said “oh, yes, I did not think about it”. Then I suggested “let’s put something around the toilet, for her” The man looked at me and said, “wonderful idea, I hate space, but it is a good idea. Nothing else, I hate space”. I said, “OK, it is up to you. But the housing corporation will give you a shower. I imagine you put a shower there. After your shower, you will have to clean the water on the floor of the whole apartment. I guess we may also put something around the shower, and put a hole on the floor so the water goes down. It may be easier for you. But it is up to you.” He started to have problems with me, because he does not want space. I felt that and I

¹⁸ A basic frame was normally designed by the architect who also provided eight selective colours. The tenants could decide if the specific area was filled with panels or glass, and which colour should be painted on the panels and frame. Interview with Frans van der Werf.

¹⁹ Film “*Molenvliet, Papendrecht, the Netherlands, 1982*”. Producted by Jacques v. d. noordt.