Process of Designing City Housing in Japan

by

Shoji Kurokawa

M.Arch., Waseda University, 1974
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Submitted to the Department of Architecture in partial fulfillment of the requirement of the degree of Master of Science in Architecture Studies at the Massachusetts Institute of Technology.

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ABSTRACT

The purpose of this thesis is to show one design approach to providing more preferable housing for users in Japan.

Chapter 1 gives an overview of trends in Japanese housing construction, describes user requirements, analyzes problems in a case study, and suggests fundamental principles of design to guide future design decisions.

In Chapter 2, the design process is developed by resolving issues at the larger, community level and scaling down to the individual houseplan level.

Chapter 3 analyzes an existing Japanese housing project chosen as a case study, and illustrates alternative solutions based on the design principles described in the proceeding chapters.

Finally, unresolved issues and future housing concepts are discussed in the concluding chapter.

Thesis Supervisor: N. John Habraken
Title: Professor of Architecture
ACKNOWLEDGEMENTS

This thesis was made possible with the advice, help, encouragement and support of many people. I would like to acknowledge and express my sincerest thanks to the following people:

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Prof. Nabeel Hamdi
Prof. Shun Kanda
Prof. Sandra Howell

In particular, I would like to thank my thesis advisor, Professor N. John Habraken, who guided and advised me in this effort during the past two years; and Professor Nabeel Hamdi who gave me the opportunity to focus my interest in housing design through research of traditional Japanese housing. I would also like to express my deepest appreciation and thanks to Dr. Christopher Sawyer-Laucanno, Barbara Smith and John Willand.
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INTRODUCTION

Observation

In response to the pressure of increasing urban population, all the available land within commuting distance by rail of many Japanese cities has been developed. A recent movement to increase density in the city has resulted in many housing projects springing up in former factory sites, and in residential areas formerly made up of single family/low density housing.

In these housing situations, residents require not only adequate space, but also space that answers their own dwelling requirements. Architects, Planners and Developers are neglecting various user needs when only uniform housing is provided. The increasing popularity of housing cooperatives proves that the Japanese public does not expect its housing to be uniform.

Purpose

Judging by the overall design of Japanese housing, it appears that user needs are treated as secondary to so-called economic efficiency. Users are forced to buy "completed" houses constructed with almost no variation in access, houseplan and open space. Reasons such as mechanization of construction, standardization and mass production are given for this type of design. However, multi-tenant housing need not preclude alternative solutions. This is the time to develop alternative design solutions and their related decision making process.
1. PROBLEM ANALYSIS

1.1 User Needs

1.2 Design Problems in a Case Study

1.3 Principles Guiding Housing Design
1. PROBLEM ANALYSIS

1.1 User Needs

Since the middle of the 1970's, it has been said that the crux of housing problems in Japan has become the issue of quality vs quantity.

According to government housing statistics in 1978, the total number of houses exceeded the total number of families by 8%. This means that there are approximately 2.7 million vacant houses nationwide.

In the same year, a poll taken by the Ministry of Construction revealed that 40% of users were not satisfied with their housing and desired such improvements as increased living space, sunny exposure and related amenities. (Fig. 1, 2)

Before the Oil Crisis, housing construction rose steadily. Following its initial drop after the Crisis, construction began to stabilize. The current trend in housing construction is expected to continue as illustrated in Fig. 3.

---

Fig. 1
Percentage of Families Not Satisfied with their Housing
(N=32,092)

Fig. 2
Reasons for Dissatisfaction with Current Housing
(N=12,482)

The dream of most Japanese is to have their own home. Due to exorbitant land costs and overpopulation, most people must settle for mass housing.

It is important to note the recent decrease in rental housing in favor of condominiums, implied in Fig. 3.

Condominiums, said to be a representative type of housing in Japan, have been built primarily in the three largest cities: (Fig. 4)
- Tokyo—with almost 50% of all condominiums built
- Osaka—30%
- Nagoya—5%

This concentration shows condominium housing to be considerably more popular than rental housing in large Japanese cities.

Responding to this trend, the Japan Housing Cooperation, a public authority, has begun to develop condominium standards. For example, the floor area standard for a 3 bedroom, 4-person family condominium is more than 86 m², which is larger than the present housing average. In addition to increased floor area, other elements such as sunny exposure, improved HVAC systems, all-
weather insulation and noise reduction insulation are expected to be major quality improvements.

Fig. 2 illustrates eight areas of dissatisfaction among users. Although each is closely related to one another, they can be divided into such broad categories as: design, technical and social concerns, and economic issues. Floor area, garden area, good exposure, ventilation and privacy can all be considered aspects of design.

Technical concerns include building and mechanical systems maintenance and noise reduction, as they relate to building materials and equipment. Environmental problems caused by vehicle exhaust and industrial pollution are considered social concerns. Construction costs and rent are economic issues.

The architect is most concerned with the four items highlighted in the design category which are the main subjects to be discussed in this thesis.

The issue of "floor area" can be interpreted as the need for alternative floor plans based on different family size and spacial needs. "Garden area" can be understood as the issue of open space. "Sunny exposure" and "ventilation" depend on layouts within the block plan, and configuration of the house plan. "Privacy" is the relation between dwelling space and access.

Previously, this kind of analysis was neglected by developers pressured by so-called economic efficiency. Despite reservations, users had to compromise and buy "completed" houses while dreaming of someday building their own detached house to reflect individual needs and desires. High land costs, excessive commuting time and related inconveniences in Japanese cities discourage this dream.

Given these obstacles, the recent phenomenon of housing cooperatives has appeared. In this in-
stance, a group of people build housing by collectively sharing construction costs and land ownership. Tenants participate in the decision making process as much as possible, a fact which has become a cause celebre. Housing cooperatives would not have grown in such popularity if they did not indicate dissatisfaction with current housing choices.

1.2 DESIGN PROBLEMS IN A CASE STUDY

To further the general analysis in section 1.1, actual problems are studied through analysis of a recent housing project in Japan.

Most housing projects constructed in large cities are high-rise apartments built on small lots, with less and less land available to them. Since almost all available land existing in large cities is covered with high-rise buildings, new housing construction sites are extremely limited. However, in residential areas which have building elevation controlled by zoning codes, low-rise housing has already appeared in Japan.

To illustrate this trend, I chose to analyze a recently completed housing project in Kanazawa, Japan called Moroe Apartments. The project was based on the two criteria described in the preceding paragraph:

a) low-rise housing
b) scale of development at the neighborhood level

Discussion of the characteristics and problems of Moroe Apartments is based on the description, photographs, and plans appearing in the July 1982 issue of JA, The Japan Architect. Therefore, the information available is not detailed, but of a general nature.
MOROE APARTMENTS

1. Block Plan (neighborhood scale)

The architect's consideration for townscape and locality make the enclosing layout of this project acceptable. However, the N-S orientation is not the best solution when considering sunny exposure. Some units have a definite disadvantage when sunny exposure is not appropriate to user needs.

2. Access

Individual staircases for access to each lower unit in a multi-unit scheme is a very new concept in Japan and most effective for providing privacy. For the upper units, a single gallery type corridor provides direct access to all the units. Privacy is a problem in this case. The difference between the ambience of the lower and upper units is too great.

3. Floor Plans

The layout is such that only one floor plan for lower, upper, and corner units is provided. No variations which respond to individual user needs is evident.

4. Open Space

Upper units have no garden, a fundamental need according to the housing polls taken. Public use of the park adjacent to the complex could pose security problems to tenants. The common park area for upper units is not desirable for users whose cars must be parked a distance from their unit, risking vandalism.
Located in the city of Kanazawa, the Moroé Apartments are operated by Ishikawa Prefecture. This part of Japan has a severe climate with high humidity and heavy rains and snows. In addition, the city of Kanazawa has a distinctive culture and lifestyle manifested in characteristically local ideas about housing. These ideas had to be included in the design of the apartment project. In addition, in this instance, Masaya Fujimoto, who represents the Gendai Keikaku Architectural and Planning Office and his group, have applied experience gained in similar work beginning with the Roku-ban-ike Apartments (JA, October, 1976) on many other themes, including intimate contacts with earth and with greenery, continuity with the urban setting, harmony with the entire district, disaster prevention in multilevel dwelling blocks, and adaptability to future change. Of course, to this list must be added the various needs of the dwellers. The goal of their efforts is to produce apartment projects of a richly urban nature. The key concept for the realization of their goal in the case of the Moroé Apartments is that of a multilevel townhouse. The basic unit of the project is a pair of apartments, one on top of the other. The lower maisonette apartments face the street, and each has its own entranceway and front and rear garden spaces. These units are lined up in continuous rows. The front garden spaces are largely consumed by parking lots. The rear gardens, which provide places for contact with earth and plants, are enclosed by means of hedges. The upper single-level apartments face an open passage-way on the third floor. This elevated street-like space (six meters above ground) is a horizontal connector extending throughout the entire project.

Part of the passage houses storage space for baby carriages and other such domestic equipment. In addition, planter boxes have been installed; and there are plans to line the passage with shrubs and flowers. Four staircase towers and a ramp for baby carriages connect the passageways with ground level.

Oriented toward the surrounding roads, the apartment blocks employ a placement method similar to the one seen in old-fashioned Kyoto townhouses. The reason for using this arrangement, which differs from the kind of placement seen in most Japanese apartment settlements, is to establish bonds of community between the apartment buildings and the surrounding urban neighborhood. It is said that in Kanazawa, clearing roads of winter snows must be a communal project. Opening the apartments on the wooden houses on the opposite sides of the roads and on the rest of the surroundings by means of the townhouse placement makes joint endeavors of this kind easier.

Data
MOROÉ APARTMENTS/Kanazawa, Ishikawa Prefecture; planning: Building and Housing Division of the Ishikawa Prefectural Civil Engineering Bureau; architects: Gendai Keikaku Architectural and Planning Office; structural engineers: Shigeru Aoki and Associates, Hosei University; mechanical engineers: Goi Architectural Design Institute; site area: 12,455.17m²; building area: 3,896.00m²; total floor area: 9,329.29m²; general contractors: Kito Kensetsu Co., Ltd.; Hori Komuten Co., Ltd.; Toyokura-gumi Co., Ltd.; Takada Doken Co., Ltd.; and Hokkoku Kensetsu Co., Ltd.; completion date: March, 1980.

Photos: Masao Arai, Photography Dept., JA.

First floor plan; scale: 1/1,000.
SECTION AND SECOND FLOOR PLAN OF MOROE APARTMENTS

A-A Section; scale: 1/500.

Second-floor plan.
SECTION AND THIRD FLOOR PLAN OF MOROE APARTMENTS

B-B Section.

Third-floor plan.
1.3 PRINCIPLES GUIDING HOUSING DESIGN

In analyzing the demands of prospective residents, we can assume that these demands are closely related to the attributes of free-standing houses in suburban areas, to which is added proximity to work, school and urban facilities available to city dwellers.

We can identify those elements of suburban housing which residents want to find in their city dwelling as:

1. Sunny exposure...each house has southern exposure
2. Access...each house has its own access creating a sense of privacy and ownership
3. Floor Plan...each house has possible variations in plan, subject to family size and life style
4. Garden...each house has a garden facing south
5. Parking space...each house has its own parking space adjacent to the dwelling.

These five elements found lacking in Moroe Apartments are to be considered in the following design proposal.

To provide a realistic design application and test the previously proposed design principles, I have chosen the given site configuration and program of Moroe Apartments as the basis of my study. In addition to evaluating the existing solution and exploring alternative solutions, I will introduce additional criteria not part of the original plan.

The following are assumed premises:

1. the 1.2 hectare urban site is residentially zoned
2. buildings on the site are limited to 10m maximum height by building code
3. density is 300 people/ha and on an average of 4 people/family
4. the floor area is more than $86m^2$/unit
2. DESIGN STUDY FOR ALTERNATIVE SOLUTIONS

2.1 Block Plan (Neighborhood)
  2.11 Block Model
  2.12 Site Application

2.2 Access

2.3 House Plan
  2.31 Analysis of Space Organization
  2.32 House Plan for Each Access Type
  2.33 Additional Floor Plan Variations
  2.34 Facade Variations

2.4 Open Space
2.1 BLOCK PLAN (NEIGHBORHOOD)

Analysis of Moroe Apartments begins at the neighborhood level, which most closely relates to an urban application. Using the principles and premise outlined in Chapter 1, this study is divided into two parts:

1. development of block models as a general solution, to which is added good exposure, private access, increased living space, garden and adjacent parking
2. application of these block models to the case study site.

2.11 Block Model

1) Block Model 1
   • Elevation is three floors according to compliance with zoning code height limitations.
   • Housing units consist of a flat type (1st floor) and a maisonette type (2nd, 3rd floor). The floor area is approximately 100m$^2$ (15m x 6.3m for the lower units; 9m x 6.3m x 2 stories for the upper units). Each lower unit has a front yard facing south; each upper unit has the same sized garden located on the roof of the lower units.
   • Parking is provided in front of each unit.
   • Access for each unit is provided individually.
   • For increased privacy, each dwelling unit has its backyard facing the backyard of the opposite building.
   • A single block model consists of two housing units in the N-S orientation, and 10 units in the S-N orientation. In a large complex of multiple blocks, different configurations can be made by manipulating street dimensions.

2) Block Model 2
   Adhering to the same principles as Block Model 1, Block Model 2 shows another possible block layout. This model consists of two, four-unit blocks of Block Model 1 in the N-S
orientation connected by an alley instead of a street. The main issue in this layout is how to provide parking spaces for adjacent inner units; parking spaces enclosed by housing units are proposed as a solution. The open space created is not only for parking, but can be utilized as a play lot or communal space.
MODEL 1

Section 1

Section 2
2.12 Site Application

1) Site Model 1

Block Model 1 is applied to the actual case study site. Since the required density is satisfied by 90 units; communal space can be provided in the remaining area. In this site plan, 14 units can be installed in the E-W orientation with open space provided in the middle. This open space is effective for outdoor walkways, a communal facility or a public garden. Every housing unit satisfies the principles and premise of Block Model 1.

2) Site Model 2

Block Model 2 works well in this site except for some deformation of parking spaces at both the east and west side. (Block Model 2 has four more units than Block Model 1, so additional parking is required.) An alley in the middle of the site connects the east and west parking areas; spacial continuity of the N-S orientation is provided by internal open space and staggered parking.
Site Model 1
2.2 ACCESS

In a N-S orientation, there are three fundamental patterns of access which give users a sense of ownership: 1) south, 2) north and 3) side. Since each unit plan is influenced by the location of its entrance, the following three patterns were developed:

1) Access from the south............. Access Model 1, 2, 3, 4
2) Access from the north............. Access Model 5, 6, 7, 8
3) Access from either side............ Access Model 9

The characteristics of each model are illustrated in the 1st and 2nd Floor Plans and Cross Sections. (See Fig. 5-13).

Access Model 1

This type of access is shared by 4 housing units (2 lower units and 2 upper units). On the 1st floor, an open staircase is provided between the two entrance doors for the lower units; the two entrance doors for upper units are situated next to each other. The staircase wall should be high enough to prohibit visual access into the lower unit gardens.

Access Model 2

This type of access is provided for two housing units: one stair per lower and upper unit pair. The entrance for the lower unit and staircase for the upper unit are situated next to one another. In contrast to Access Model 1, each unit pair has its own access and staircase, which affords greater privacy.
Access Model 3

This access type is a compromise between Access Model 1 and 2. The segregation of upper unit staircases and lower unit entrances incorporates the best features of Access Model 1 and 2. By conserving staircase and access space, internal space of the dwelling unit is increased, and the same privacy afforded in Access Model 2 is preserved.

Access Model 4

The difference of this type from Access Models 1, 2, and 3 is apparent on the 2nd floor. A single staircase is provided for several units with a gallery-type corridor connecting them. This corridor creates the same relationship between access and open space as on the 1st floor. Also, access to the 2nd floor is gained from either end of the building which makes it quite flexible.
Access Model 5

The relationship between the entrances for lower units and staircase for the upper units is the same as in Access Model 1, except that the direction of access is from the north. Due to the absence of gardens on the 2nd floor on this side, the landing becomes dark despite the open stair.

Access Model 6

The relationship between entrance and staircase is almost identical to Access Model 2. However, in this case the stair could be enclosed and the entrance door for the upper unit could be located on the 1st floor. Each upper unit would have to have its own entry hall at the top of the stair.

Access Model 7

The relation between entrance and staircase most closely resembles Access Model 3. This access type shares the privacy and increased dwelling space of Access Models 5 and 6. However, it also has the problem of darkness on the landing.

Access Model 8

What distinguishes this type from the others is the arrangement of landing space on the second floor. A large open space is provided on the 2nd floor, and at the same time, the staircase is pushed further toward the street. This arrangement not only gives light, but also effectively articulates the north elevation.
Access Model 5

2nd Floor Plan

1st Floor Plan

Fig 9

Access Model 6

2nd Floor Plan

1st Floor Plan

Fig 10
Access Model 9

This type of access is for units which face open spaces like streets and parking spaces. The entrance for lower units could be the same as Models 1-4 from the south, and Models 5-8 from the north. Access for the upper units is provided from either side of the building. This kind of access type allows not only variation in access, but also adds interest to the townscape instead of providing monotonous walls. Privacy is well controlled in this access type.
2.3 House Plans

2.3.1 Analysis of Space Organization

The size of housing units in the block plan is based on the following sketch. This rough plan utilizes the analysis of location and interior dimensions described in this section.

Legend
L  Living Room
B1 Single Bedroom
B2 Double Bedroom
D  Dining Room
K  Kitchen
E  Main Entrance
Br Full Bath
Bt Half Bath
St  Storage

Upper Unit
3rd Floor Plan

2nd Floor Plan

Lower Unit
1st Floor Plan
Space and Function Analysis

Living Room (L) | Dining Room (D) | Single Bedroom (B₁) | Double Bedroom (B₂)
--- | --- | --- | ---
3.0 x 3.3 | 2.7 x 3.0 | 2.1 x 2.7 | 3.0 x 3.6

Kitchen (K₁) | Dining Kitchen (K₂) | Bathroom | Entrance (E)
--- | --- | --- | ---
1.8 x 3.0 | 3.0 x 4.2 | 0.9 x 1.5 | 1.5 x 2.1 | 1.5 x 2.4

Closet

0.3  Bookshelf
---
0.6  Cupboard
---
0.9  Closet
---
Futon
Zoning Analysis

A zone distribution is a system of zones and margins, the relative positions of which follow certain conventions.

An \( \alpha \) zone is an interior area, intended for private use, and is adjacent to an external wall. A \( \beta \) zone is an internal area, intended for private use, and is not adjacent to an external wall. A \( \gamma \) zone can be internal or external but is intended for public use. A \( \delta \) zone is an external area intended for private use. A margin is an area between two zones with the characteristics of both of these zones and taking its name from them.

\[ \begin{array}{c}
\text{Lower Unit} \\
\alpha 60 \\
\alpha 300 \\
\alpha B^2 90 \\
\beta^2 210 \\
\beta^1 B^2 120 \\
\beta^1 210 \\
\alpha B^1 90 \\
\alpha 300 \\
\alpha \gamma 90 \\
\end{array} \]

\[ \begin{array}{c}
\text{Upper Unit} \\
\alpha 60 \\
\alpha 210 \\
\alpha B 90 \\
\beta 90 \\
\alpha B 90 \\
\alpha 300 \\
\alpha \delta 60 \\
\end{array} \]

1st Floor 2nd Floor 3rd Floor
A sector is a part of a zone and its adjoining margins that can be planned freely.

A sector group is a combination of connected sectors.

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**Variations**

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<thead>
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**Dimensions**

- CL 630 CL
- 600 600
- 60 90
- 30 90
- 210 90
- 120 90
- 210 90
- 300 90
- 60 90
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- 90 90
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- 300 90
- 60 90

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Sector Analysis

A sector is a part of a zone and its adjoining margins that can be planned freely.

A sector group is a combination of connected sectors.

---

**Variations**

<table>
<thead>
<tr>
<th>Lower Unit</th>
<th>Upper Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Floor</td>
<td>2nd Floor</td>
</tr>
<tr>
<td>L/E</td>
<td>L/E</td>
</tr>
<tr>
<td>D/K</td>
<td>D/K</td>
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<tr>
<td>B₁/B₂</td>
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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>L/E</td>
</tr>
<tr>
<td>D/K</td>
</tr>
<tr>
<td>B₁/B₂</td>
</tr>
</tbody>
</table>

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**Dimensions**

- CL 630 CL
- 600 600
- 60 90
- 30 90
- 210 90
- 90 90
- 90 90
- 300 90
- 60 90
- 210 90
- 90 90
- 90 90
- 300 90
- 60 90

---

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Sector Analysis

A sector is a part of a zone and its adjoining margins that can be planned freely.

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2.32 Floor Plan for Each Access

In this section, basic floor plan variations and their sub-variations are studied according to one of these access types: 1) south, 2) north, and 3) side.

Basic Variation
A basic variation indicates the position, in a specific sector group, of a certain group of functions, which together form a dwelling program.

Sub-Variation
A sub-variation of a basic variation is a completed layout in which the positions of the functions are the same as in the basic variation.
The design premises for Basic Variation and Sub-Variation Floor Plans is as follows:

1) Location of entrance and staircase is fixed in the same access type.
2) The living room always faces south in the lower units, and is located on the southern side of the 2nd floor in the upper units.

Please note that the Basic Variations are indicated by symbols for each room type.
Basic Variations for Access Model 1 from the South

1st Floor

1)  B_2 | B_1
   | K_1
   ↓ | L  ↓ E

2)  B_2 | B_1
   | K_1
   ↓ | L  ↓ E

3)  → B_2
   | K_1
   ↓ | L  ↓ E

4)  B_2 | B_1
   | K_1
   ↓ | L  ↓ E

2nd Floor

1)  K_1 | B_1
   ↓ | L  ↓ E

2)  K_1 | B_1
   ↓ | L  ↓ E

3)  → K_1
   ↓ | L  ↓ E

3rd Floor

1)  B_1 | B_1
   ↓ | B_2

2)  B_1 | B_1
   ↓ | B_2

3)  → B_2
   ↓ | B_1

Lower Unit

Upper Unit
Sub-Variation for Access Model 1 from the South

1st Floor Plans for Lower Units

1) 2) 3)

Lower Units
Sub- Variations for Access Model 1 from the South

1st Floor Plans for Lower Units

Lower Units
Sub - Variations for Access Model 1 from the South

2nd and 3rd Floor Plans for Upper Units
Basic Variations for Access Model 8 from the North

1st Floor
1) \[ B_2 \quad E \]
   \[ L \quad L \quad K_1 \]
   \[ B_1 \quad K_1 \]

2) \[ B_2 \quad E \]
   \[ K_1 \]
   \[ L \quad B_1 \]

3) \[ B_2 \quad E \]
   \[ K_1 \]
   \[ L \]
   \[ B_1 \]

Lower Units

2nd Floor
1) \[ B_2 \quad E \]
   \[ L \quad L \quad K_1 \]
   \[ B_1 \quad K_1 \]

4) \[ K_1 \]
   \[ E \]
   \[ L \]
   \[ B_2 \quad B_1 \]

3rd Floor
1) \[ B_1 \]

4) \[ K_1 \]
   \[ E \]
   \[ L \]
   \[ B_2 \quad B_1 \]

2) \[ B_1 \]

Upper Units
Sub- Variations for Access Model 8 from the North

1st Floor Plans for Lower Units
Sub-Variations for Access Model 8 from the North

2nd and 3rd Plans for Upper Units
Basic Variations for Access Model 9 from Either Side

1st Floor
1) \[ B_2 \rightarrow B_1 \]
   \[ K_1 \]
   \[ L \rightarrow E \]

2) \[ B_2 \rightarrow B_1 \]
   \[ B_1 \]
   \[ K_1 \]
   \[ L \rightarrow E \]

3) \[ B_2 \rightarrow B_1 \]
   \[ B_1 \]
   \[ K_1 \]
   \[ L \rightarrow E \]

4) \[ B_2 \rightarrow B_1 \]
   \[ B_3 \]
   \[ L \rightarrow K_1 \]
   \[ E \]

5) \[ B_2 \rightarrow B_1 \]
   \[ K_1 \]
   \[ L \rightarrow E \]

2nd Floor
1) \[ K_1 \rightarrow B_1 \]
   \[ E \]
   \[ L \rightarrow \]
   \[ B_2 \rightarrow B_1 \]

2) \[ K_2 \]
   \[ E \]
   \[ L \rightarrow \]
   \[ B_2 \]

3) \[ B_1 \rightarrow K_2 \]
   \[ E \]
   \[ L \rightarrow \]
   \[ B_2 \]

3rd Floor
1) \[ B_1 \rightarrow B \]
   \[ B_2 \rightarrow B_1 \]

2) \[ B_1 \rightarrow B_1 \]
   \[ B_2 \]

3) \[ B_1 \rightarrow \]
   \[ B_2 \]
Sub- Variations for Access Model 9 from Either Side

1st Floor Plans for Lower Units
Sub-Variations for Access Model 9 from Either Side

1st Floor Plans for Lower Units

4) 5)
Sub-Variations for Access Model 9 from Either Side

2nd and 3rd Floor Plans for Upper Units
Based on the analysis of floor plans in section 2.32, the following drawings show the support structure (illustrated by heavy lines) and anticipated wall lines (illustrated by dotted lines). Both internal and external staircases are a part of the support structure.

Fig. 17, 18 show the assembled support structure.
Support Structure for Access Model 8 from the North

1st Floor
Lower Unit

2nd Floor
Upper Unit

3rd Floor

entrance

Fig. 15
Support Structure for Access Model 9 from Either Side

Fig. 16
Support Structure for Access Model 1 and 9 from the South and Either Side

Fig. 17

1st Floor

2nd Floor

3rd Floor
Support Structure for Access Model 8 and 9 from the North and Either Side

Fig. 18

3rd Floor

1st Floor

2nd Floor
2.33 Additional Floor Plan Variations

So far, the study of floor plans has been contained within the predetermined party walls which has limited the number of variations. However, by providing openings in the party wall, it is possible to develop many more housing unit variations with different floor areas and configurations.

The following drawings show several variations ranging from a 4-bedroom to a studio unit in both the lower and upper units. Openings in the party wall are limited to three or less, and closed if not needed. This makes it possible to create multi-level units.
Additional Floor Plan Variations for Access Model 1 and 9 from the South and Either Side

4 Bedroom Type

1st Floor

2nd Floor

3rd Floor
Additional Floor Plan Variations for Access Model 1 and 9 from the South and Either Side

3 Bedroom Type

3rd Floor

2nd Floor

1st Floor
Additional Floor Plan Variations for Access Model 1 and 9 from the South and Either Side

2 Bedroom Type

2nd Floor

3rd Floor

2nd Floor

1st Floor
Additional Floor Plan Variations for Access Model 1 and 9 from the South and Either Side
1 Bedroom Type and Studio Type
Additional Floor Plan Variations for Access Model 8 and 9 from the North and Either Side
4 Bedroom Type
Additional Floor Plan Variations for Access Model 8 and 9 from the North and Either Side

3 Bedroom Type
Additional Floor Plan Variations for Access Model 8 and 9 from the North and Either Side

2 Bedroom Type
Additional Floor Plan Variations for Access Model 8 and 9 from the North and Either Side

1 Bedroom Type and Studio Type

1st Floor

2nd Floor

3rd Floor
2.34 Facade Variations

There are two ways to consider the facade: 1) to make it a fixed part of the support structure, or 2) to leave the decision to users as a part of the infill units. Variations exist for both 1) and 2) as seen in Fig. 19.

---

**Facade Variations**

1) Support Structure Level
   - Primary Facade Element

2) Infill Unit Level
   - Secondary Facade Element

Variations within Support Structure

---

- Example
  - South Elevation of Lower Unit
  - Space Use: Living, Dining, Kitchen

- Two possibilities of location for facade

---

Fig. 19
2.4 Open Space

The study of open space is divided into private space and public space. Private space deals with access variations to the private garden. Public space incorporates street, sidewalk, parking and alleyways.

Additional Access Variations

Access Model 1  1st Floor

Variation 1)

Variation 3)

Variation 4)

Variation 5)
Additional Access Variations

Access Model 1  2nd Floor

Variation 1)  2)

Variation 3)
Additional Access Variations

Access Model 8  1st Floor

Access

Garden

Dwelling Unit

Variation 1)

Access Model 8  2nd Floor

Access

Dwelling Unit

Variation 1)

Access Model 9

Dwelling Unit

Variation 1)

Open Staircase

Closed Staircase
Proposed Street Configurations for 12, 9 and 6m Streets

12m
1)

2)

9m
1)
Minimum Dimension for 4 cars

2)

6m
1)
Preferred Minimum for 2 cars

2)
Parking Variation 1

S T R E E T

P A R K I N G

Garden

Dwelling Unit

6.00 Preferred Minimum

4.80 Minimum

GARDEN

Garden

6.30
Minimum Dimension

For Pedestrian Circulation 1.80 m
For Fire Lane 3.60 m

Alley

Dwelling Unit Garden Alley Garden Dwelling Unit

3.00 6.00
3. COMPARISON OF PROPOSED DESIGN SOLUTIONS WITH THE MOROE APARTMENT COMPLEX

3.1 Comparison with Moroe Apartments

3.2 The Decision Making Process
3. COMPARISON OF PROPOSED DESIGN SOLUTIONS WITH THE MOROE APARTMENT COMPLEX

In this chapter, the process and product of this design proposal are described in comparison with the case study. Next, the decision making process is discussed in relation to each stage of construction.

3.1 Comparison with Moroe Apartments

3.11 Proposed block plan
A) All units are exposed to the sun.
B) Each dwelling unit is equivalent in terms of amenities.
C) This layout provides each facade with access articulation; there are no blank walls facing adjacent housing blocks.

3.12 Proposed Access
A) The qualitative difference between the lower and upper units is minimized.
B) Arrangement of the gardens and access provides a feeling of ownership to users.
C) The proposed access variations can be one of the factors providing interest to the townscape.

3.13 Floor Plan
A) Arrangement of the support structure and infill unit allows tremendous variation in space organization.
B) Minimum openings in the party walls make various configurations possible.
C) Facade variations provide design accents to the elevation.
3.14 Open Space

A) Every garden faces south.
B) Each parking space is adjacent to its respective unit.
C) A common park is enclosed by the housing units and is controlled by the housing community.

In addition to the above description, an elaborated plan of Site Models 1 and 2 (Fig. 20 - 24 shows these variations in more detail.
Site Plan (Site Model 1)
Partial Floor Plan of Site Model 1

Fig. 22

1st Floor Plan

Communal Space

Garden

Backyard

Parking

Street

5 10 20 M

Fig. 22
Partial Floor Plan of Site Model 1

2nd Floor Plan

Fig. 23
Partial Floor Plan of Site Model 1

3rd Floor Plan

Fig. 24
3.2 The Decision Making Process

Up to this point, this proposal has focused solely on the development of design variations. However, the decision making process is also a critical factor in developing a housing plan. The final product could vary greatly depending on the different policies governing decision making.

Following are the components of a design decision:

Components

1) Support Structure
2) Entrance Type
3) Location of an Internal Staircase
4) Location of Wall, Columns
5) Location of Duct
6) Size of Dwelling (subject to party wall)
7) Primary Facade Element
8) Location of Infill Unit (Partitioning, Kitchen & Bath)
9) Secondary Facade Element
10) Garden/Fence
Next, the stage at which decisions are made greatly influences the final product.

The following are the stages of decision making:

A) design development (pre-construction)
B) after completion of support structure (1-5)
C) after decision concerning party wall (1-6)
D) when user known but before occupancy
E) during occupancy.

The following diagrams show the relationship between the components of the design decision and the stages in which decisions can be/are made. Fig. 25 shows that decisions can technically be made throughout the entire construction process. Fig. 26 shows that decisions are usually made only during the design development stage, which automatically excludes tenant participation in major decisions.

Fig. 25 illustrates that at Stage D, tenants could technically be involved in decisions concerning unit layout, access and facade variations, and use of open space. From the tenant's point of view, the ideal is to participate in decision making to the extent technically possible as in Fig. 25.

As seen in Fig. 26, the extent of user participation in decisions for Japanese housing projects such as Moroe Apartments is usually limited to input regarding furniture placement and garden maintenance.

Because of standardization of space elements through industrialization and mass production, the tendency on the part of the Developer/Architect may be to allow these uniform components to dictate a uniform design solution. However, standardization can also permit tremendous variation while still working within the framework of the contemporary construction process.
**Fig. 25**

Design Issues and Respective Stage at which User Could Technically Become Involved in the Decision Making Process

<table>
<thead>
<tr>
<th>Elements</th>
<th>Stages</th>
</tr>
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<tbody>
<tr>
<td>1)</td>
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</tr>
<tr>
<td>3)</td>
<td>4)</td>
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<td>5)</td>
<td>6)</td>
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<td>7)</td>
<td>8)</td>
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<td>10)</td>
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**Fig. 26**

Typical Decision Making Pattern for Housing in Japan

<table>
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</table>

* Stage at which tenants are currently involved in decision-making

Stages at which decisions can be made

Stages at which no decisions can be made
CONCLUSION

In this thesis, through use of a case study, the designer's comprehension for user needs is analyzed, and a proposal for housing design responding to user requirements is studied. User requirements were manifested through reaction against a dwelling space which forced users to live a uniform life style. Also, basic but essential requirements for a dwelling environment are often forgotten by designers who are historically unaccustomed to planning multi-tenant housing. These are the main problems in Japanese housing today.

Therefore, this study applies a methodical design process, using variable requirements as its theme, to show that many alternatives can be provided at the level of the neighborhood as well as in the individual dwelling unit. It is also intended to show what kind of choice can be provided at different stages of the process development. This makes possible a more flexible policy of decision-making, taking into consideration important, more individual, user requirements that otherwise may be neglected.

This thesis is based on the concepts of "support" and "urban tissue" as developed by SAR. It does not discuss technical issues, especially concerning infill units, which I intend to study in the future. These concepts need not be applied to low-rise housing only; I hope to apply them to other types as well.
BIBLIOGRAPHY

Works in English


Works in English (continued)


Works in Japanese


