INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

UMI®

Bell & Howell Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
800-521-0600

The Relationship between Resident Satisfaction and Apartment Forms: A case Study in the Seoul Metropolitan Area, Korea

Sekyung Oh

A dissertation submitted in partial fulfillment of the requirements for the degree of

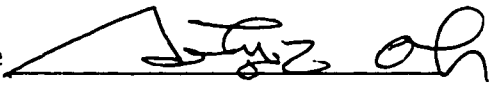
Doctor of Philosophy

University of Washington

1999

Program Authorized to Offer Degree: Urban Design and Planning

In presenting this thesis in partial fulfillment of the requirements for the Doctoral degree at the University of Washington, I agree that the Library shall make its copies freely available for inspection. I further agree that extensive copying of the dissertation is allowable only for scholarly purposes, consistent with "fair use" as prescribed in the U.S. Copyright Law. Requests for copying or reproduction of this dissertation may be referred to University Microfilms, 1490 Eisenhower Place P.O. Box 975, Ann Arbor, MI 48106, to whom the author has granted "the right to reproduce and sell (a) copies of the manuscript in microform and/or (b) printed copies of the manuscript made from microform."

Signature 

Date May 13 1999

University of Washington
Graduate School

This is to certify that I have examined this copy of a doctoral dissertation by

Sekyung Oh

and have found that it is complete and satisfactory in all respects, and that any and all revisions required by the final examining committee have been made.

Chair of Supervisory Committee:

Anne Vernez Moudon

Reading Committee:

Geoffrey R. Loftus

Chang-Hee Christine Bae

Date: 5/12/99

University of Washington

Abstract

The Relationship between Resident Satisfaction and Apartment Forms: A Case Study of the Seoul Metropolitan Area, Korea

Sekyung Oh

Chairperson of the Supervisory Committee:
Professor Anne Vernez Moudon
Department of Urban Design and Planning

The major objective of this research is to study the relationship between apartment forms and resident satisfaction in the Seoul metropolitan area. To achieve this objective, the study has followed three steps. The first is to investigate typo-morphological characteristics of apartment forms in the Seoul metropolitan area; the second, to survey resident satisfaction with different apartment forms; the third step, to discover the important factors affecting resident satisfaction with apartment forms by using statistical analyses.

This study found that that most personal and physical variables studied are not significantly related to the level of satisfaction with apartment forms. Among those variables, dwelling unit type, building siting, and income are significantly related to satisfaction. However, these objective variables are somewhat weaker predictors of satisfaction compared to other significant subjective evaluation variables. Dwelling unit type appears to be related only to satisfaction with the medium unit.

As regards satisfaction with the dwelling unit, the evaluation of *Anbang*, bathroom and utility room size was found to have a very important influence on satisfaction in the small unit; the evaluation of living room and dining space size together with dwelling unit type in a medium unit; the evaluation of the living room location, dining space size, and utility room size in the large unit.

The evaluation of visual privacy, building siting, and auditory privacy have proved important variables in accounting for satisfaction with the apartment building, while the evaluation of open space, parking lot and playground size were major predictors of satisfaction with the space around or between buildings.

TABLE OF CONTENTS

LIST OF TABLE

LIST OF FIGURES

LIST OF ABBREVIATIONS

KNHC. Korea National Housing Corporation
FAR. Floor Area Ratio

ACKNOWLEDGMENTS

I wish to express deep appreciation to the chairp of my supervisory committee, Professor Anne Vernez Moudon. Without her intellectual guidance and help, this dissertation would not have been possible. I also express sincere thanks to the other committee members: Professor Goffrey R. Loftus, Professor Chan-Hee Christine Bae, Professor Gary E. Pivo, and Professor Judith H. Heerwagen who always gave me their encouragement and kind support.

I am also grateful to Professor Sungsu Rheem who gave me statistical advice in the early stages of this dissertation. Special thanks should also be given to Chang-Hyun Lew, Seonghee Yang, and other students, at Sung Kyun Kwan University who helped me to survey the residents for gathering information. I also thank Terry Duffey for her proof-reading assistance.

My wife, Sookyoung Oh, also deserves my special thanks. With her strong support, I was able to concentrate on developing my dissertation. In addition, I thank my sons, Dongseok Oh and Wonseok Oh, who always make me happy. Finally, I give my deep love and thanks to my father, mother, and mother-in-law.

DEDICATION

The author wishes to dedicate this dissertation to my parents.

Chapter One

Introduction: The Study

I-1. Research Objective

Since 1970s apartment buildings have been built massively in the Seoul metropolitan area. The residential development of modern apartment housing has encouraged by the goal of mass housing construction in the National Economic 5-Year Plan since 1962 in order to solve housing shortage under the condition of limited supply of urban land which could be developed. For example, about 48 percent of total housing supply in Seoul, the capital city of Korea, were apartments from 1986 to 1990, while only 25 percent were detached single-family dwellings. The massive construction of apartment complexes seems to be only a solution to deal with housing shortage. Wide spread of apartments has greatly changed the form of the Seoul metropolitan area, especially, the residential form. In addition, modern apartment housing unit had changed traditional Korean life-style.

Since the 1970s, there have been a number of significant changes in forming apartment residential areas

in terms of dwelling unit design, apartment building design, building siting, inner road patterning, and so on.

The objective of this research is to investigate the relationship between apartment form and the satisfaction of residents in the Seoul metropolitan area. My basic research questions are as follows:

1) What specific patterns of apartment form have been made since 1960s in the Seoul metropolitan area?
2) How satisfied are residents with different apartment forms?
3) What factors contribute to make residents satisfied with these apartment forms?

To answer the first question, firstly, this dissertation presents basic elements of apartment form (especially, typo-morphological characteristics to form apartment complex). Secondly, it analyzes the apartment form into typical types according to typo-morphological characteristics of dwelling unit, apartment building, grouping of apartment buildings and space around or within buildings.

To answer the second and third questions, it reviews literatures in satisfaction studies with regard to

methodology that includes selection of variables, measurement, and data analysis. From the understanding of pro and cons of existing literature, this dissertation investigates residents' satisfaction with relation to different apartment forms and tries to find out important factors to affect residents' satisfaction. In addition, it examines the relative degree of importance among these factors.

I-2. Research Significance

The significance of this dissertation is, firstly, that it provides the systematic understanding of apartment form in the Seoul metropolitan area. A typo-morphological study on apartment form, relaying in part on Moudon's study (1992[b])[1] and Kim's study (1992)[2], attempts a systematic and comprehensive analysis of the typical apartment design practice from the 1970s to the present. The apartment form consists of dwelling units, apartment buildings and space around or within buildings as basic elements. By using these basic elements, seven apartment complexes are analyzed in terms of their built form (e.g., styles, building siting and site plan) as well as the relationship between spatial

[1] Moudon (1992[b]) traces typical residential design practice from 1920 to the present by using typological characteristics—streets, lots, and houses.

components (such as road, parking lots, playgrounds and neighborhood parks) and apartment buildings.

Secondly, this dissertation expands existing studies of the residential satisfaction. This examines specific physical variables with relation to the design aspects of apartment form. Most studies of residents' satisfaction in Korea and the United States have examined wide range of variables such as personal, social, physical and psychological aspects, but have not concentrated on the detailed physical variables that deal with design characteristics of the residential environment. For example, in resident satisfaction, most researches have investigated several variables such as types of housings, size of housing, location of housings, room size, density, interior structure and so on, but there have been no studies dealing with variables of design aspects such as the location and size of every room (e.g., bedrooms, kitchen, dining room, bathroom etc.). In addition, it deals with the design aspects of neighborhood built form such as building height, building siting, road pattern, and so on.

Thirdly, the significance of this research is on the practical level. Findings can be used not only as a

---

[2] By using the same methodological approach of Moudon's study (1992[b]), Kim studies the morphological characteristics of American suburban residential area and the impact of planning regulations on them.

guideline for future apartment residential design by examining what specific physical aspects of apartment form are important to the residents. But also findings will be used to evaluate current or proposed apartment residential development. This dissertation can contribute to expand information on the basis of which apartment form design can be made more responsive to the resident' need and wants.

I-3. Literatures in Residential Satisfaction

The study of residential satisfaction had been developed in order to evaluate the quality of housing since the 1960s. Since then, researchers have increasingly examined the relationship between the residents' satisfaction and the physical and social aspects of the residential environments.

In the literature review, there are two major directions in the study of residential satisfaction: theoretical and practical. In the theoretical aspects, the satisfaction studies have been interested in developing the model of residential satisfaction, which is intended to find

out the process of residential satisfaction.[3] Most studies have tried to reveal major factors to affect the residents' satisfaction and their relative importance among factors.

Marans and Rodgers(1975) developed a conceptual model of satisfaction. Their model consists of subjective experiences which are linked to objective environmental characteristics. Subjective experience is the assessment of perceived environmental characteristics through the process of the perception of environmental characteristics, which could be affected by personal characteristics. Therefore, satisfaction with residential environments is related with personal characteristics, objective environmental characteristics, and the perceptions and assessments of objective characteristics.

Francescato and others (1977) used the model of the residential satisfaction as a function of three different categories of variables: objective characteristics of the residents (e.g. age, gender, income, previous housing experience, etc.), objective characteristics of the housing environments (e.g. housing type, housing size, etc.), and the residents' perception or beliefs about housing environments (e.g. physical environments, management, and

[3] Regarding overview of residential satisfaction models, see Amerigo, M. and J. I. Aragones (1997); Weidermann, S. and J. R. Anderson (1985)

other residents). Their model intends to identify design, managerial, social, and psychological factors that influence the degree of residents' satisfaction.

Galster and Hesser(1981) developed a theory of residential satisfaction by using a path analysis. The residential satisfaction model was described by the presumed causal relation of objective independent variables by passing through subjective intervening variables. Objective independent variables divided into three categories; 1) household characteristics- age, the presence of child, race, family income, education attainment, job status, length of residence, etc., 2) neighborhood characteristics- mean value of owner occupied homes, proportion of residents who have not moved in five years, mean household income, proportion of units which are dilapidated, the presence of nonresidential land uses, then number of house per acre, and 3) dwelling characteristics-index measuring the quality of interior and exterior of the unit, index measuring the availability of basic plumbing and heating facilities, the number of bathroom, the number of bedroom, front footage of lot, the ratio of persons per room. Subjective intervening variables are the degree of the residents' interaction with neighbors, index measuring the residents' lack of anomie, the perception of the existence of run-down properties in

neighborhood, index of satisfaction with local public service (such as police, fire, sanitation), neighborhood noise, crime rate, and index measuring perceptions the neighborhood as friendly.

Cutter(1982) viewed residential satisfaction as a function of the importance and evaluation of specific community attributes, the satisfaction with housing unit, and finally a perceived social influence measure (e.g. perceived evaluation of friends', neighbors' ,and relatives' ratings of community as a place to live). In this model, it is interesting to note that the weight of each variable can be used by asking residents to assess how important each of variables is in their decision to purchase a home in the community.

Weidemann and Anderson (1985) suggested an expanded version of the residential satisfaction model which includes social and physical components of housing environment as well as levels of satisfaction scale (such as housing satisfaction, neighborhood satisfaction, and community satisfaction).

In the relation of practical issues, a satisfaction studies focus on certain types of residential environments such as planned communities (Francescato and others, 1979), large housing real estates (Winter and others, 1993), public

housing (Kaitilla, 1993; Wisenfeld, 1992), rural communities (Wilkin, 1990), suburban communities (Cutter, 1982), urban neighborhood (Savasdisara, 1988), and so on. These studies are intended to find practical information that can be useful to the design and management decision.

The studies on a residential satisfaction come from the disciplines of environmental psychology, social psychology, urban planning, and urban design. They use various research methods such as experiment, field observation, field survey and a variety of variables.

This chapter deals with important variables and research methods which are used in studies of the residential satisfaction. In detail, it, firstly, describes various independent variables that affect the residential satisfaction. Secondly, it shows various research methods for the satisfaction studies by reviewing the advantages and disadvantages of the methods described in the literature. The research method includes the measurement method of the satisfaction and data gathering method. Thirdly, it describes various analytical techniques on order to reveal the relationship between independent variables and residents' satisfaction as a dependent variable.

1. Factors that affect the residential satisfaction

This section presents a number of different variables that affect the residents' satisfaction. Residential satisfaction research has focused on how people are satisfied with the residential environment. Various variables can be arranged in two dimensions, shown in table 2-1.[4] One dimension refers to people versus residential environment. People represents the characteristics of person or households as an informant, and residential environment can be divided into physical or social aspects of environment. Another dimension is objective versus subjective dimension, depending on whether the variable is objective or measured by the subjective evaluation.

Table 1-1: Category of variables in residential satisfaction

		Residential environment	
	Personal aspects	Physical aspects	Social aspects
Objective	Social, economic, and demographic characteristics	Objective physical characteristics	Objective social characteristics
Subjective	Psychological, behavioral characteristics or subjective evaluation of people	Subjective evaluation of physical environment	Subjective evaluation of social environment

[4] The idea of classification comes from the study of Amerigo and Aragones (1997). They used two dimensions for the classification: 1) physical versus social, 2) subjective versus objective. However, this study expands their work by providing detailed dimension - personal, physical, and social.

1). Person-objective aspects

Person-objective aspect includes objective characteristics of the resident, who is surveyed, such as demographic factors, socio-economic background, and life style or any other characteristics that are potentially important to affect the residential satisfaction.

House ownership is one of most important variables in this category. It is generally believed that owner-occupiers do feel sense of "self-gratification" and hence become psychologically proud and satisfied with their houses- the product of their sweat and psychic energy. Those individuals who owned their residence are significantly more satisfied than those who rented (Rent and Rent,1978).

Several studies (Kain,1970; Marans and Rodgers, 1975; Michelson,1976) shows that life cycle stage significantly is related to the residential satisfaction. The level of residential satisfaction tends to increase with the later stages of the life cycle.

Comparison to previous place or neighborhood also are important factors in the satisfaction study. For example, people who moved from rural or suburban may perceive it less dense than those who moved from much bigger city. Previous housing type (single-family housing or multi-family housing) will affect the satisfaction differently.

Other characteristics include age, gender, educational background, household income, occupation, household size and so on. Bonnes and others (1991) show that age is associated with residents' satisfaction. From literature review, household income in most cases is not related with the residents' satisfaction and elderly persons provide highly positive evaluation of their housing or community.

2) Person-subjective aspects

Person-subjective aspect includes subjective characteristics of the resident such as behavioral and psychological factors.

Perception of crowding is one of most important variable in this category. Crowding is a psychological variable that is affected by cultural and social difference. Edward T. Hall (1966) argued that different cultures socialize their members to expect certain densities and interpersonal distances as "normal". Thus, Latin Americans may feel normal with a certain level of crowding that North Americans find intolerable. In general, studies have shown that individuals who are crowded together display greater

negative interpersonal affect.[5] The feeling of crowding will cause to dissatisfy with the environment.

"Locus of control" is a behavioral variable that may be relevant to the satisfaction experience. Locus of control (Rotter 1966) refers to people's generalized expectancies of whether they can influence their environment (internal locus) or whether they are influenced by their environment (external control). It can be hypothesized that people who perceive that consequences of their action are under their own control (internal locus of control) will satisfy much more with their environment than those who are influenced by their environment (external locus of control). Two studies (Bruin and cook, 1997; LeBrasseur et al., 1988) show that personal psychological characteristics are powerful predictors of housing satisfaction.

3) Physical-objective aspects

Many researches have revealed that the physical characteristics of the residential environment are significantly related with resident satisfaction. The physical-objective aspect may include the characteristics of

[5] Regarding this crowding study, see Milgram (1970); Rapoport (1975); Altman (1975). They argued that the perception of crowding results from the feeling of lost control over interpersonal interaction and undesirable or excessive contact with others.

housing unit, neighborhood, the condition of density, and location that can be measured objectively.

Various physical characteristics of housing unit are found to be associated with residential satisfaction. Surely one of the most apparent factors related to satisfaction is housing type (e.g. single-family house, duplex, row town house, and apartment). Rent and Rent (1978) found that in United States single family dwelling brings more satisfaction than duplex or town-row house. Single-family housings are usually associated with more room, more privacy, and more yard space. Other characteristics include housing size (Speare, 1974; Campell, et al., 1976; Yi, 1981), room size (Rent and Rent, 1978; Kaitilla, 1993), interior structure or housing quality (Michelson et al., 1973; Galster, 1981), newness of housing (Marans and Rodgers, 1975), land value or house value (Cutter, 1982; Weidermann, 1982) and so on.

Several studies have demonstrated that the level of residential satisfaction is closely related to various neighborhood factors such as presence of run-down properties (Galster, 1981; Lansing et al., 1970), quality of neighborhood maintenance (Lansing et al., 1970; Deutschman, 1972; Marans and Rodgers, 1975), educational facilities (Cutter, 1982) and so on. In addition, age of neighborhood

has a positive relationship with overall satisfaction (Rothblatt and Garr, 1986).

Density is another important factor to affect residential satisfaction. Generally, in the United States, resident satisfaction with their environment is inversely related to the density of the environment (Michelson, 1976). However, it is interesting to note that density had positive relationship with the overall satisfaction of housing environment (Rothblatt and Garr, 1983). The high level of satisfaction is associated with a planned community and the provision of various community facilities. From this point, the positive relationship is largely due to the site characteristics in the planned community such as park, playgrounds, cultural and entertainment activities, and security.

Density can be defined very differently according to different measurements: number of people per room, number of people per housing unit, number of people per acre, number of housing units per acre, ground cover ratio, and so on. Generally, number of persons per room is largely used in the satisfaction studies. In addition, Yi (1985) used density within the dwelling unit that was derived from dividing the size of each dwelling unit by the number of occupants within that unit.

Research has also found that the distance from the central city may negatively influence the satisfaction with residential environment (Michelson at al.,1973; De Jong, 1977; Yi, 1985; Amerio, 1990). In addition, convenience to various facilities such as a shopping center, medical facilities, and public transportation affects the residential satisfaction (Michelson et al.,1973; De Jong, 1977).

4) Physical-subjective aspects

Physical-subjective aspects refer to subjective perceptions and evaluations of the residential physical environment. These aspects could be major factors to affect satisfaction because the residents' perception and evaluation are not necessarily equivalent to the objective characteristic of the environment as it actually is. These aspects usually are measured by asking residents to assess specific characteristics of their residential environment with rating scale.

Davis and Fine-Davis (1981) examined various physical-subjective variables such as satisfaction with various aspects of the dwelling and perception of environmental factors in order to find predictors of overall satisfaction with housing and neighborhood. Among them, satisfaction with

kitchen, satisfaction with heating, satisfaction with bathroom and satisfaction with storage etc. are predictors of overall satisfaction with the dwelling unit. Satisfaction with public transportation is one of predictors of overall satisfaction with neighborhood. Glaster and Hesser (1981) also found that the perception of the existence of rundown properties and index of satisfaction with local public service (i.g. police, fire, and sanitation) were related with the residential satisfaction.

In addition, Savasdisara (1988) examined 15 subjective residential satisfaction variables in order to identify the physical and socio-environmental components of Japanese urban communities. Among them, relative satisfaction with noise generated by traffic and satisfaction with amount of sunlight inside dwelling unit are most important components in explaining general satisfaction with the current living condition. Satisfaction with roads and roadside walkway is the second and the third most powerful predictor is satisfaction with parking facilities.

5) Social-objective aspect

Social-objective aspect includes length of residence, racial profile black, presence of relatives in neighborhood,

and number of neighbors who have close relationship and so on.

Satisfaction with residential area is frequently said to be conditioned by the resident' length of residence. It was hypothesized that residents who planned a longer term of residence would report greater positive feelings toward their environment. Savasdisara (1988) found that the longer people in the neighborhood the more satisfied they are with the living condition. However, some researches show that there is no relationship between length of residence and neighborhood satisfaction (Rent and Rent, 1978).

6) Social-subjective aspect

Social-subjective aspect refers to perception and evaluation of features of the residential social environment. This aspect is measured by asking the residents to rate the level of satisfaction with safety/security, friendship, relation with neighbors, attachments of residential area, homogeneity, and privacy from neighbors or neighborhood.

The degree of integration or involvement of an individual in society is closely related with the residential satisfaction. Several studies show that amount of participation is associated directly with an individual's

degree of satisfaction- the greater the participation, the greater the satisfaction. Rent and Rent (1978) shows that housing satisfaction is found to be strongly related to the residents' satisfaction with their neighbors; residents are more satisfied with their housing if they are also satisfied with their neighbors.

Safety and security from crime and vandalism are also strongly related to the residential satisfaction (Galster and Hesser, 1981; Fried , 1982; Savasdisara, 1988; Cook, 1988).

2. Research methods

I discussed various factors that affect residential satisfaction. Now I will discuss how to measure the residential satisfaction.

A variety of research methods can be used for the residential satisfaction studies depending on the study purpose, what is being measured, and to what extent of detail it is being measured.

1) Data collection methods

In literature review, researchers have undertaken mostly to study residential satisfaction by correlational study, and they have used one or some combinations of three

methods of data collection: 1) sample survey, 2) observation, and 3) secondary data analysis.

Sample survey and secondary data analysis are more appropriate for the study of large population. In addition, these methods can be replicated over time and geographically, so help other researchers to generalize by comparing findings from other satisfaction studies. Sample surveys can be divided into 1) direct contact with informants 2) indirect contact with informants. Direct contact with informants can be employed by using structured questionnaire or in-depth, semi-structured interview. Telephone survey or mail survey can be used for indirect contact with informants. In literature review, most researchers used interview survey with a structured questionnaire. A small portion of researches used telephone survey or none of the researches reviewed used mail survey. There are some difficulties to use mail survey. Generally, mail survey with questionnaire results in low response rate. In addition, if respondents do not think seriously about the research questions, they maybe retain incomplete questionnaire, or their answer may be unreliable.

Surveys are the most frequently used tools for data collection in the residential satisfaction studies.

Quantitative survey instruments use standardized questions that are scored numerically.

In addition to interviews and surveys, researchers frequently use observation methods by using the site observation and behavioral observation. For site observation, they usually use maps or measurements to document observations of the physical arrangement of a site. Site observation includes indication of user modification, physical deterioration, use patterns and so on. Behavioral observation focuses on types and frequency of various on-site activities of residents. These observations may be made by visiting the site or through special photographic techniques such as video images.

2) Measurement of the residential satisfaction

Measurement of residential satisfaction may differ depending on the instruction given by questionnaire used in surveys. Generally, two different types of measurements have been used for determining the residential satisfaction; 1) ask directly the level of satisfaction and 2) ask indirectly the level of satisfaction.

The direct question about the satisfaction is 'how are you satisfied with housing or neighborhood?' The indirect question is to ask some questions that seem to be related to

a general sense of satisfaction. For example, Francescato and others (1979) used the direct question as well as the indirect questions as follows: "how long do you want to live in this development?; "if you move again, would you like to live in another place like this?; "Would you recommend this place to one of your friends if they are looking for a place to live? Weidermann and others (1982) used above questions (developed by Francescato and others, 1979) for the measurement of the concept of residents' satisfaction. They determines the index of residents' satisfaction with their residential environment by finding the average score for four highly correlated questions, which was measured on a five-point scale. In addition, Amerigo and Aragoens (1990) compared the direct way and indirect way on residential satisfaction. They found that the direct scale was a better predictor than the indirect way.[6]

Five-point rating scale (e.g. very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, very dissatisfied) is generally used in the measurement of the level of residents' satisfaction in both questionnaire and interview survey. However, to avoid checking the middle

[6] They compared the results of regression analysis of the direct and indirect scales. In their study, the direct scale predicts 51.65 % residential satisfaction (that means, R-square is 51.65%), while the indirect scale predict 22.73 %.

of rating scale, four-point scale or seven-point scale can be used in the survey. For example, Rent and Rent (1978) used four-point rating scale for examining the satisfaction with housing and neighborhood (e.g. very much, average amount, only a little, not at all). Newman (1977) used a seven-point satisfaction scale ranging from "completely satisfied" (the first point) to "completely dissatisfied" (the seventh point).

3) Analysis of data

The major objective of data analysis is to reveal the relationship between various variables as independent variables and residential satisfaction as dependent variable. This objective is reached by using two major kinds of analysis: the descriptive process and the analytical process. Firstly, the descriptive process intends to report simply how the residents are satisfied with the residential environment by using the frequency distribution table of percentage or mean value.

For example, the differences in levels of residents' satisfaction can be presented by showing the percentages of satisfied and dissatisfied residents. Another way of examining these differences is to look at the mean score of satisfaction obtained in each category. This frequency table

can be used to compare the differences in levels of residents' satisfaction according to variables. The significance of frequency distribution is tested usually by chi-square. The value of the chi-square provides useful information of relationship between two variables when they are categorical data. However, the chi-square statistic tells little information about the strength of relationship between two variables. In addition, the value of the chi-square depends on the sample size,[7] so it is not able to compare chi-square values from several studies with different sample size. The differences among mean values can be tested by t-test or analysis of variance. A t-test tells whether two sample means differ or not and Analysis of variance can do multiple comparisons of several sample means. However, these kinds of analysis only tell the difference among sample means, not a distribution pattern of sample data.

Secondly, the analytical process is intended to reveal which of variables are important independent ones to affect significantly residential satisfaction. In literature review, three kinds of statistical analysis has been used mostly in analytical process: 1) correlation analysis 2)

[7] If the value of each category is multiplied by 10, the value of chi-square also increases 10 times

multiple regression analysis and 3) factor analysis.

Correlation analysis, which uses mostly the Pearson correlation coefficient, intends to examine the linear relationship between dependent variable and independent variable. The value of correlation coefficient ranges from 1 to -1.[8] Multiple regression analysis is to study the relationship between a single dependent variable and several independent variables. And it also examines the relative importance of two or more independent variables with respect to their contribution to dependent variable (e.g. residents' satisfaction).[9] In correlation analysis and multiple regression analysis, the basic assumption is the linear relationship between dependent and independent variable(s). Therefore, if there exists a non-linear relationship, these analyses are not appropriate to measure the relationship between variables. Factor analysis intends to identify the principle components which consist of a set of interrelated variables. Factor analysis will be useful to examine the relationship among a large number of variables.

Other analytical technique used in literatures is log-linear analysis (yi, 1984) that is to examine the

---

[8] The value of the coefficient ranges from -1.0 for a perfect negative linear relationship, through zero where is no linear relationship, +1.0 for a perfect positive linear relationship.

[9] The relative importance is determined by the value of standardized regression coefficients.

relationship among a set of variables which are categorical.

Figure 1-1 shows various types of techniques for data analysis. Most researchers used several techniques to find out which variables are more highly related to the resident satisfaction. Their statistical techniques are determined by their satisfaction model and data characteristics.

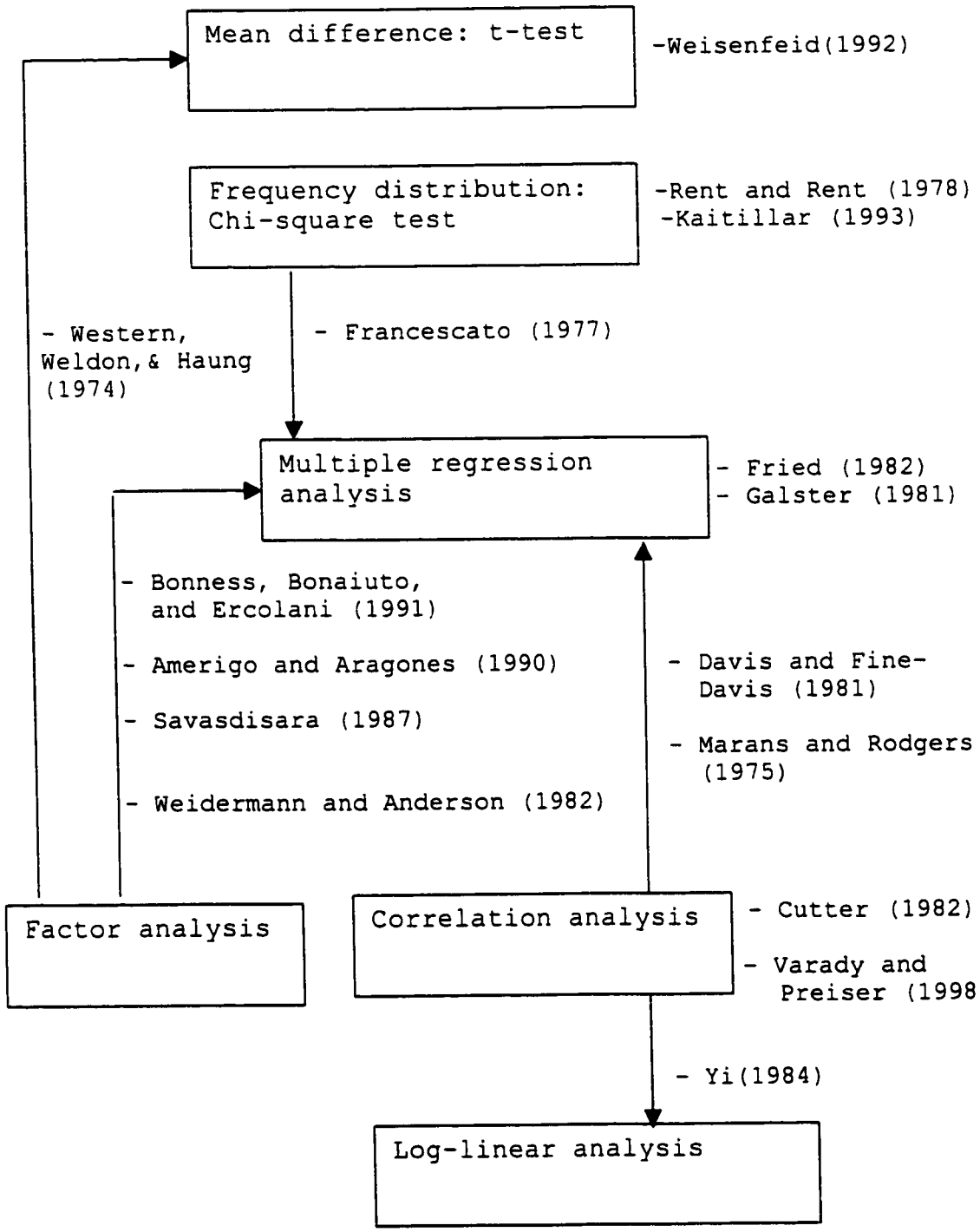


Figure 1-1: Types of statistical techniques for data analysis

Chapter Two

A Typology of Apartment Forms

Introduction

There has been increased interest in typo-morphological studies of urban design and architecture since the 1980s.[1] Typo-morphological studies attempt to analyze present urban forms and building types and their changes over time in order to explain the city building process.[2] These studies employ the built elements as a tool for describing and analyzing urban form. For example, Conzen (1960) used the basic built elements -streets, plots, and buildings, and typical typology (he called it "plan unit") is derived from the combination of basic built elements.[3] Moudon (1992 [b]) employs house form, lot sizes, and street layouts as the essential elements of urban and suburban residential form. She studied the relationship among land subdivisions, houses, street networks and their combined pattern of use in order analyze the change in urban residential form over time.

From the view of Moudon's typo-morphological study, I will present in this chapter an analysis of apartment forms

---

[1]Regarding the typo-morphological research tradition, see Moudon (1992); Kim (1992); Vance (1990); Conzen (1977)

[2] Moudon, Anne Venez. (1992[a]) "A Catholic Approach to Organizing What Urban Designers Should Know." Journal of Planning Literature 6, p342

in the Seoul metropolitan area since the 1970s. To begin I will provide a detailed description of modern apartment emergence and development in Korea. Later I will describe the basic built elements of the apartment form. In the conclusion of this chapter, I will outline the changes that have taken place in typical types of apartment form.

II-1. Emergence of Modern Apartment Housing in Korea

In Korea, the modern apartment complex has emerged only since the early 1960s,[4] due in large part to housing shortages and limited supply of land that can be developed in the urban area. Compared with traditional residential development, apartment developments are characterized by much higher residential density, provision of public open space, and a greater interconnected pattern of road and parking lot.

In the 1960s, Korea faced a very difficult situation, both economically and socially, because the Korean War (1950-53) had destroyed most of the major industrial facilities and housing stock. To achieve greater economic development, the Korean government started a series of five-year economic plans in 1962. By means of this economic development planning, Korea

---

[3] Conzen, M.R.G., Alnwick, Northumberland: A study in Town-Plan Anaysis, (1960), P.4

[4] The first modern apartment built at Mapo, Seoul in 1962-64. Mapo apartment complex consists of 642 dwelling units.

has experienced rapid industrialization and successful economic growth since 1962. Both industrialization and economic growth have brought a significant degree of urbanization and modernization to Korean society. Owing to the processes of industrialization and urbanization, Korea has faced an urban housing shortage crisis brought on by massive migration from rural areas to urban centers. In addition, a decrease in household size coupled with an increase in the number of households has exacerbated the problem of housing shortages. For example, the average household size has deceased from 5.5 in 1970 to 3.3 in 1995, and the number of households in 1995 has risen to about 1.3 million, shown in table 2-1.

Table 2-1: Population in Korea by year

	1995	1990	1980	1970
Total population	44,608,726	42,869,000	38,124,000	32,241,000
Number of households	12,991,304	11,354,540	7,969,201	5,856,901
Household size	3.3	3.7	4.8	5.5

Source: 1995 Population and Housing Statistics Information. Korea National Housing Corporation

To deal with the housing shortage, the National Economic Five-Year Plan and major housing legislation set a goal of mass housing construction. High-density apartment housing was introduced to achieve this goal.

Table 2-2 shows the number of housing units constructed over ten-year periods in Korea. Since 1960, the number of modern apartments being built has increased dramatically. During 1960s, only 20,475 new apartments were built, but 323,000 units were built during 1970s and about 1.3 million apartments were built during 1980s. From 1986 to 1990, about 45 percent of total new housing units were apartments, while about 35 percent were single-family dwellings. In the case of Seoul, 48 percent of the new housing supply from 1986 to 1990 has been apartments, shown in Table 2-3.

From the First to the Sixth Five-Year Economic Plan (1962-91), about 2.1 million housing units were built by the public sector that includes the Korea National Housing Corporation and local government (shown in Table 2-4). The share for the public sector is about 33 percent of the total housing supplied between 1962 and 1991. This trend shows that the public sector share of the housing supply has increased from 12 percent during 1962-66 to 44 percent between 1977-81, and then decreased somewhat to 37 percent between 1987-91.

Most new apartment complexes, supplied by both public and private sectors, have been constructed by large-scale land

Table 2-2: Number of new housing units built by type and year in Korea

Korea

Unit: Number of Housings

	Before 1950	1950--1959	1960--1969	1970--1979	1980--1985	1986--1990	Total
Detached dwellings[5]	934359	461496	863634	1220517	664360	582992	4727358
Apartments[6]	0	492	20475	323517	545094	738539	1628117
Row house[7]	701	324	4760	98145	221454	162122	487506
Multi-family house[8]	0	0	0	0	10466	104883	115349
Others[9]	9352	7982	23706	56133	53681	51627	202481
Total	944412	470294	912575	1698312	1495055	1640163	7160811

Unit: Percentage

	Before 1950	1950--1959	1960--1969	1970--1979	1980--1985	1986--1990	Total
Detached dwellings	98.94	98.13	94.64	71.87	44.44	35.54	66.02
Apartments	0.00	0.10	2.24	19.05	36.46	45.03	22.74
Row house	0.07	0.07	0.52	5.78	14.81	9.88	6.81
Multi-family house	0.00	0.00	0.00	0.00	0.70	6.39	1.61
Others	0.99	1.70	2.60	3.31	3.59	3.15	2.83
Total	100	100	100	100	100	100	100.00

Source: 30-year-history of the Korea National Housing Cooperation, pp.222-223.

[5] A separate and independent place for human habitation by one household
[6] A dwelling unit by one household in more than five storied building
[7] A dwelling unit by one household in less than 4 storied building, but more than 660 sq. meter of floor area
[8] A dwelling unit by one household in less than 4 storied building and less than 660 sq. meter of floor area
[9] Dwelling units in building that not are intended for human habitation. Dwelling space in commercial building is one of example.

Table 2-3 :Number of new housing units built by type and Year in the case of Seoul

Seoul

Unit: Number of Housings

	Before 1950	1950--1959	1960--1969	1970--1979	1980--1985	1986--1990	Total
Detached dwellings	43682	37959	147935	239494	91123	99359	659552
Apartments	0	492	13078	156262	142199	190470	502501
Row house	195	84	1098	42139	86377	51263	181156
Multi-family house	0	0	0	0	5353	43409	48762
Others	1574	1464	5459	11239	9321	9953	39010
Total	45451	39999	167570	449134	334373	394454	1430981

Unit: Percentage

	Before 1950	1950--1959	1960--1969	1970--1979	1980--1985	1986--1990	Total
Detached dwellings	96.11	94.90	88.28	53.32	27.25	25.19	46.09
Apartments	0.00	1.23	7.80	34.79	42.53	48.29	35.12
Row house	0.43	0.21	0.66	9.38	25.83	13.00	12.66
Multi-family house	0.00	0.00	0.00	0.00	1.60	11.00	3.41
Others	3.46	3.66	3.26	2.50	2.79	2.52	2.73
Total	100	100	100	100	100	100	100.00

Source: KNHC (1992). 30-year-history of the Korea National Housing, Cooperation, pp.222-223.

Table 2-4: Number of housing supply by sector from 1951 to 1991

Unit: Number of housings

	1962--1966	1967--1971	1972--1976	1977--1981	1982--1986	1987--1991	Total
Public sector	39915	69613	228766	495378	396431	877101	2107204
Local government	34756	61874	174355	341347	209753	602140	1424225
Korea National Housing Corporation	5159	7739	54411	154031	186678	274961	682979
Private sector	286020	470725	531825	620696	758640	1509390	4177296
Total number of new housing units built	325935	540338	760591	1116074	1155071	2386491	6284500

Unit: Percentage

	1962--1966	1967--1971	1972--1976	1977--1981	1982--1986	1987--1991	Total
Public sector	12.25	12.88	30.08	44.39	34.32	36.75	33.53
Local government	10.66	11.45	22.92	30.58	18.16	25.23	22.66
Korea National Housing Corporation	1.58	1.43	7.15	13.80	16.16	11.52	10.87
Private sector	87.75	87.12	69.92	55.61	65.68	63.25	66.47
Total number of new housing units built	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: KNHC (1992). 30-year-history of the Korea National Housing Cooperation, pp.350-351

development[10] with high residential density (about 150-250 persons per acre). The large-scale modern apartment complexes typically sprang up in the suburban areas of major cities, as well as in new town developments close to major cities. At the same time medium or large-scale developments arose in urban areas with the demolition and replacement of substandard urban dwellings or of traditional single-family dwellings.

II-2. Elements of Apartment Forms

Generally, residential form consists of various physical elements and their combinations. Different residential forms may give people different views of landscape and, hence, a different feeling, even a different degree of satisfaction. In the United States, the basic elements of the residential form are house, street and lot (Moudon, 1992[b]), and the combination of these elements makes a residential landscape distinctive among its neighbors, which may affect visual perception and satisfaction about the residential area.

In Korea, basic elements of apartment form will necessarily differ from those of the residential form of single-family housing area. Apartment form consists of several basic physical elements such as dwelling unit, apartment

[10] Large scale development means that each apartment complex consists of more than 1,000 units.

building, grouping of apartment buildings, and the space around or between buildings related to road pattern, parking lot, open spaces, and playground, while the single-family residential form consists of house, lot and street.

These basic elements of apartment form can be classified by the following various sub-elements, shown in Table 2-5.

Table 2-5: Physical elements of apartment forms in the Seoul metropolitan area

Basic elements	Sub-elements	Examples
Housing unit	Size	small/medium/large
	dimension	sq. meter, ratio of width to depth
	layout of rooms	size and location of each room
Apartment building	height	medium/ high
	access type	corridor/ core/ walk-up
Grouping of apartment buildings	building siting	parallel/ court
Space around or between buildings	road patterning	grid/ loop/ *cul-de-sac*
	parking arrangement	street parking/ *cul-de-sac* parking
	Open space and playground	integrated/ separated

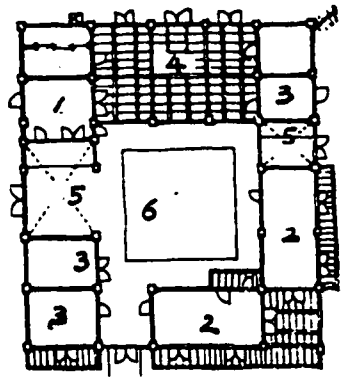
1. Dwelling unit

The modern apartment usually consists of bedrooms (from one to more than five), living room, kitchen and dining space, utility room and balcony. Each room is usually laid out for the most efficient use of space because of limited space, which is quite different from the traditional Korean housing. The traditional Korean housing usually consists of *Anbang*[11], *Sarangbang*[12], other bedrooms, kitchen, *Deachung*[13], courtyard as shown in figure 2-1. It is very often square-shaped with a small courtyard in its center, and bedrooms, kitchen and *Deachung* located around the courtyard. This design concept has also been applied to urban single-family housing, as shown figure 2-2.

The design of traditional courtyard-centered housing is very closely related to the traditional family structure and the relationships among family members. Foremost, courtyard housing represents the strong hierarchy within the extended

---

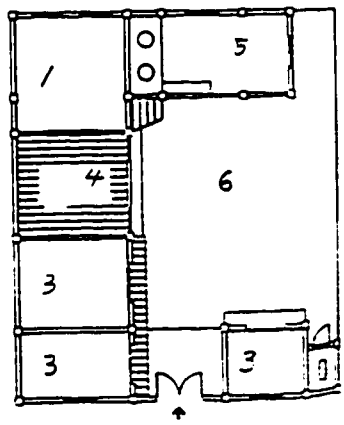
[11] The traditional meaning of *Anbang* was the room for spouse of head of household. But nowadays, it has almost same function of master bedroom in West.
[12] This room is only for the head of household in order to study, sleep, or receiving male guests.
[13] A big room with a wooden floor.



1. Anbang
2. Sarangbang
3. Other bedroom(s)
4. Deachung
5. Kitchen
6. Courtyard

Source: Jang, Seongjun (1978), "A Study of the Houses In Toyedong, a Traditional Village near Andong." Journal of the Architectural Institute of Korea 22, p6.

Figure 2-1: Example of traditional courtyard house



1. Anbang
2. Sarangbang
3. Other bedroom(s)
4. Deachung
5. Kitchen
6. Courtyard

Souce: Choi, Jaepil. (1992) "The Traditional Charactertistics Reflected in the Plan of Modern Apartment House in Korea." In . Korean National Housing Corporation, Proceedings of International Symposium on Housing, p.192

Figure 2-2: Example of urban Single-family house

family[14] and the segregation of men and women. Each bedroom is assigned distinctly to either the male or the female domain. For example, *Sarangbang* is only for the head of the household in order to study, sleep, or receive male guests. *Anbang* (the wife's bedroom) and kitchen are women's domain. However, in the case of the *Anbang*, it has multiple functions that include dining and entertaining for the whole family members (excluding the head of the household) as well as receiving female guests in the daytime, and it also is the sleeping space for husband and wife at night.

Traditional courtyard-centered housing also represents the status of the woman. In traditional Korean society, women were discouraged from exposure to outsiders. *Anbang* and kitchen, which were usually the women's domain, are located rather deep from main entrance within house, where outsiders would not be encountered.

Considering the fact that modern apartments are very popular, this might be support a newly emerging pattern of family structure and kin relationships. Encouraged by the process of industrialization and urbanization, the relationship

---

[14] Gans (1982) divided family types into three categories --nuclear family, extended family and expanded family - in order to study working-class community life in the Wear End, inner city Boston neighborhood. Nuclear family consists of husband, wife and their child(ren). Extended family consists of nuclear family and related individuals from several generations. And expanded family is represents as a family who dose not share dwelling unit but has close relatives such as unmarried brothers, sisters, or cousins.

between man and woman has changed from a hierarchical and segregated relationship to a joint relationship. In view of the design of the modern apartment dwelling unit, as the *Anbang* has changed toward the space for both husband and wife, this room becomes to have the traditional function of both *Anbang* and *Sarangbeng*. Although elements of modern apartments differ from traditional courtyard-entered housing, the original design of apartment was affected by the design concept of traditional housing. For example, the *Anbang* in an apartment has the biggest space when compared to other rooms, and therefore, it represents the hierarchy led by the head of the household. The *Anbang* is also located far away from the entrance.

The living room was newly introduced to Korean society from the West. It became the center of the modern dwelling, especially an the apartment unit. In most cases, the living room contains a television and a sofa for family entertainment, family communication, and entertaining neighbors or guests. It replaces some of the function of the traditional *Anbang* and *Sarangbeng*. In an apartment, most rooms are connected to the living room, and all openings are into it. Most family activities except sleeping occur in the living room.

In traditional housing, the kitchen is the exclusive domain of the women, so this room would be located deep within the house. In modern apartments, the kitchen is no longer the

woman's space but is now open to every member of the family. The kitchen is visually open by the connection with the dining space and, sometimes, with the living room.

The dining space was also a new concept in the design of the modern house. In traditional housing, there is no dining space. *Sarangbeng* functioned as a dining space for the head of the household, while the *Anbang* usually served for the dining of other family menbers. In an apartment, the location of the dining space is close to the kitchen. In many cases, some portion of the kitchen is designated the dining space.

A utility room usually serves as laundry. Most washing machines are located in utility rooms, but the room can also be converted to storage. Access to the utility room is most often from the kitchen.

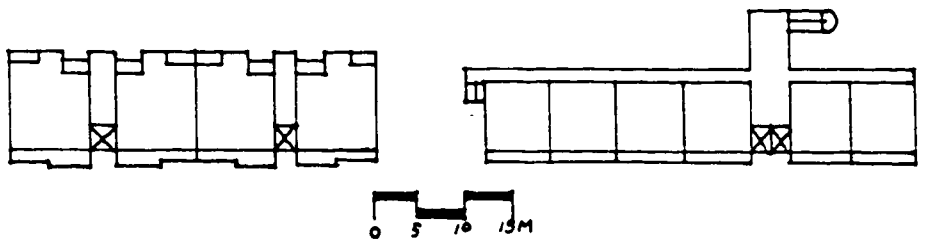
The Balcony is the only outdoor space in apartments. This space functions as storage and family garden for planting flowers in containers.

2. Apartment Buildings

An apartment building is the combination of the dwelling units by simple horizontal and vertical repetition. Therefore, its appearance seems to be monotonous. However, apartment buildings may differ according to its height, length, unit-access type.

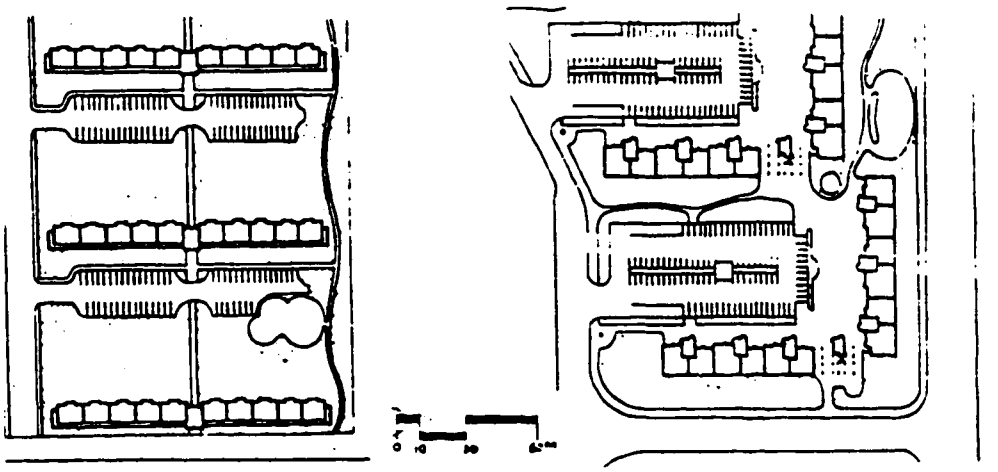
All apartment buildings are constructed as medium-rise (5-story) or high-rise (12- to 30-story). Five-story apartment buildings are walk-ups, while 12-story or above buildings are served by elevators. The length of an apartment building are determined by the number of units on each floor. Typically, an apartment building consists of four large-size or six medium-size dwelling units on each floor, ranging from 60M to 70M.

The types of unit-access can be classifies into core and corridor, as shown in figure 2-3, In core-type apartment buildings, the elevators serve two dwelling units on each floor. In corridor-type apartment buildings, in most cases, two elevators, which are located in the middle or corner of the building, serve several units on each floor. Therefore, residents may express different views of resident satisfaction. In the case of corridor-type access, a resident can see the inside of the other units through windows as he/she walks on the corridor. In the case of core-type access, the sense of community is somewhat weaker, when compared to corridor-type access, because only two dwelling units face each other and share the same entrance/exit hallway in most cases. The corridor-type has less privacy (especially visual privacy from outside) than core-type, but encourages somewhat social interaction between neighbors.



Core type Corridor type

Figure 2-3: Unit-access types



Parailel type Court type

Figure 2-4: Grouping of apartment buildings

3. Grouping of Apartment Buildings

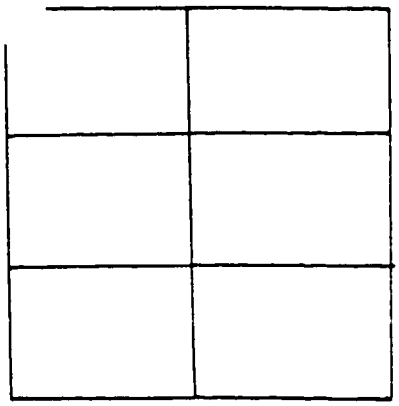
For this dissertation, the grouping of apartment buildings is defined as the layout pattern of several neighboring buildings, which can be called building siting. The siting of buildings can be classified into the parallel type and the court type (see figure 2-4). The parallel type of siting occurs when several buildings are laid out "parallel fashion". This building siting is intended to make all buildings south-oriented in order to provide a longer duration of sunlight during winter. The court type of siting occurs when three buildings are laid out "court fashion". In other words, buildings are laid out around a large open space. Generally, court type siting is intended to accommodate more by plotting another building or extending a building to the side. This kind of court type siting may produce the problem of visual and aural privacy for units in the corner area of the apartment building because they are closely located each other.

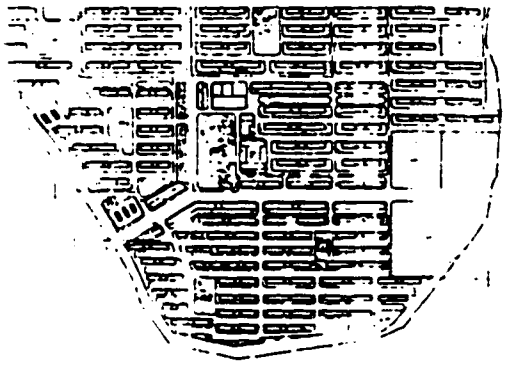
4. Space around or between Apartment Buildings

The space around or between apartment buildings encompasses roads, pedestrian walkways, neighborhood parks, playgrounds and parking lots.

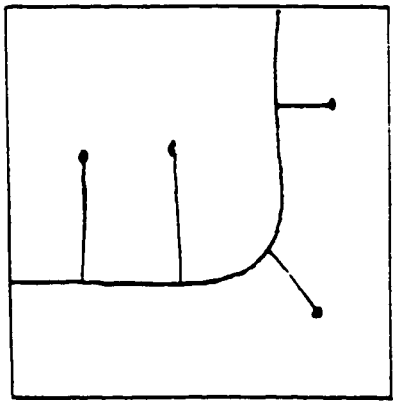
Three different types of road patterns are found in the Seoul metropolitan area: grid, loop, and *cul-de-sac*, as shown

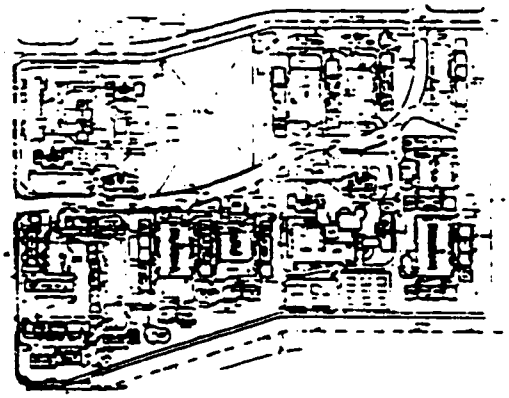
in figure 2-5. These road patterns are closely related to the parking arrangements and the open space layout. Parking arrangement can be divided into street parking and *cul-de-sac* parking. As shown figure 2-5, *cul-de-sac* parking branches off the main road, and its shape is narrow and deep. With regard to playground and neighborhood park, there are two types of layouts: integrated and separated. "Integrated playground and park" implies that some portion of the site is assigned for playground and park, while "Separated" means that several playgrounds or parks are distributed vis-a-vis a group of apartment buildings.



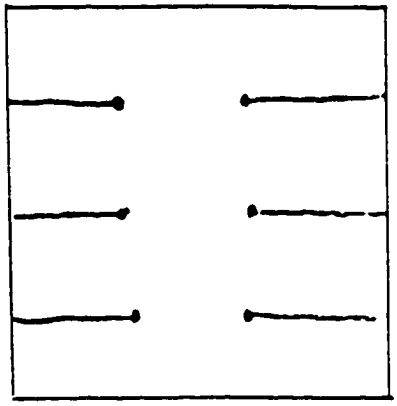


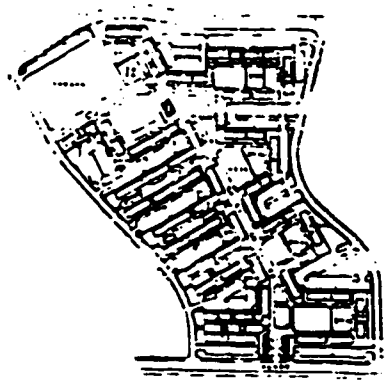
Grid road pattern and on-street parking





Loop road pattern and cul-de-sac parking





Cul-de-sac road and cul-de-sac parking

Figure 2-5: types of road Pattern and Parking arrangement

II-3. Typical Types of Apartment Forms

This section will present the typical types of basic elements such as dwelling unit, apartment building, grouping of apartment buildings and space around and between buildings. In addition, it describes changes in these typical types over time.

1. Types of Dwelling Units

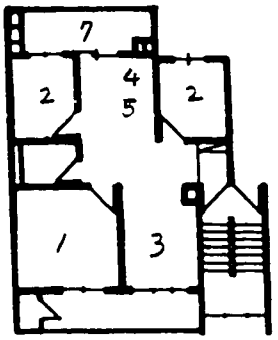
Types of dwelling unit for this dissertation can be divided by dwelling unit size and room layout. Dwelling unit size is categorized as either a small size unit, a medium size unit or a large size unit. A small size unit is defined as a unit of about 60 sq. meters (about 600 sq. feet). In most cases, two-bedroom units fall in this range, but occasionally this range can include three-bedroom units as well. A medium size unit is defined as one of about 85 sq. meters which typically implies a three-bedroom unit. A large unit is defined as one of about 125 sq. meters that implies a more-than-three-bedroom unit, usually a four- or five-bedroom housing unit. This cut-off point is essentially arbitrary, but the aim is to identify the distinctive design features of a housing unit plan.

1) The small size unit

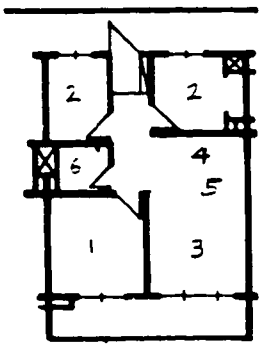
In an analysis of the small size units, there are usually three distinct types of room layout that depend on the location of the main entrance and the number of bedrooms: 1) side-entrance and three-bedroom type, 2) rear-entrance and two-bedroom type, and 3) rear-entrance and three-bedroom type, shown in figure 2-6. In the corridor-type, most units have their main entrance from the corridor that is located in the back of the housing unit. In the core-type apartment, the main entrance is located at the side of the housing unit.

2) The medium size unit

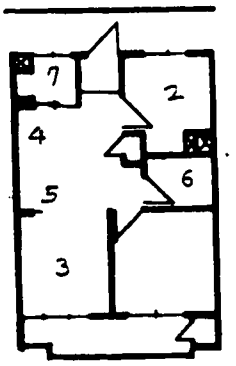
Four types of room layout are investigated in an analysis of the medium-size unit: 1) B+L type, 2) B+L+B type, 3) B+B+L type, and 4) B+L+B and rear entrance type, shown in figure 2-7. These types are defined by the location of living room and main entrance. B+L type means one bedroom and a living room in the front, while B+L+B type means that a living room is located between the two bedrooms in the front. These types of room layout depend most often on the location of the staircase which provides access to the dwelling unit. The former type has the staircase in the front of the apartment building, while the latter has one in the back. The B+B+L type is an early



Side-entrance and
three-bedroom type



Rear-entrance and
three-bedroom type

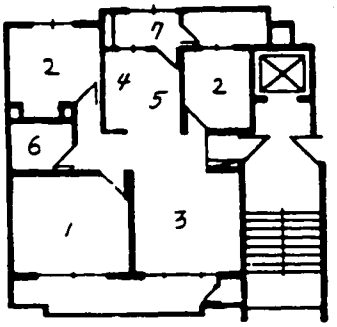


Rear entrance and
Two-bedroom type

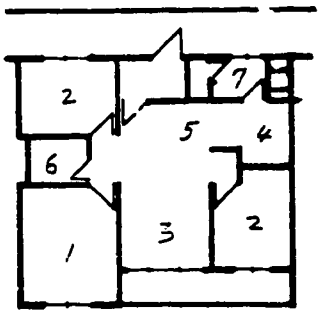
1 Anbang
2 Other room(s)
3 Living room
4 Kitchen
5 Dining space
6 Bathroom
7 Utility room

0 5M

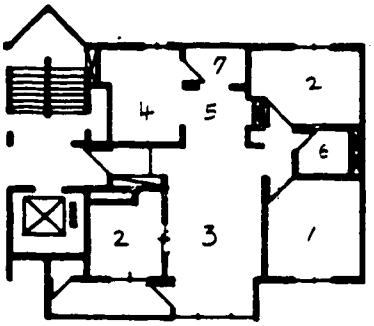
Figure 2-6: Types of room layout in the small-size units



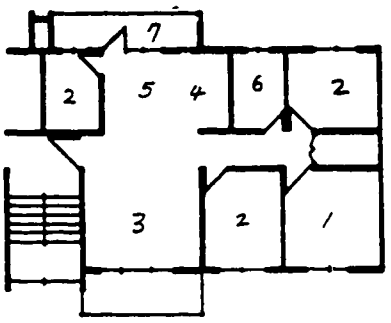
B+L type



B+L+B and
Rear entrance type



B+L+B type



B+B+L type

Figure 2-7: Types of room layout in the medium-size units

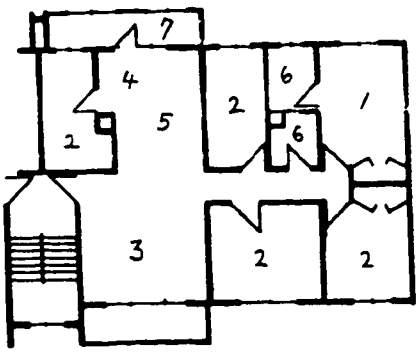
model of room layout that was affected by the western-style apartment. The type of B+L+B and rear entrance is designed for the corridor type apartment building.

The B+L+B type usually has a smaller living room, a smaller *Anbang*, but a bigger kitchen and dining space than the B+L type. It exhibits the trade-off between the size of kitchen and the size of the living room, between the size of the *Anbang* and the size of the other bedrooms.

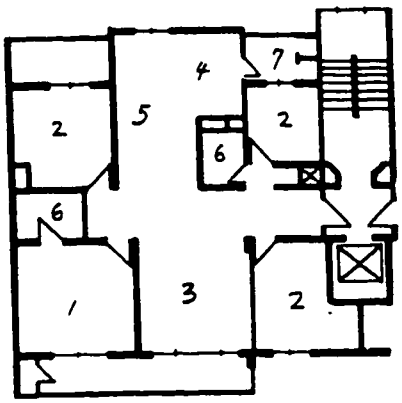
3) The large size unit

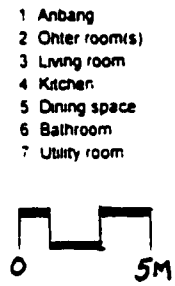
Most large size dwelling units have been built by private developers rather than by public developers. These units are for high-income people, and usually have four or five bedrooms. Until the mid-1980s, most large-size units had one small bedroom near the kitchen for a housemaid. Therefore, this bedroom could be accessed only through the kitchen. Nowadays, the housemaid's bedroom has disappeared and the space is absorbed into the kitchen due to increased wages for housemaid and the reduction in household chores by using the electric appliances.

There are generally two types of room layout in the large-size units: 1) western-style room layout and 2) Korean-



Western-style type





Korean-style type

Figure 2-8: Types of room layout in the large-size units

style room layout, shown in figure 2-8. The typical room layout in the mid-1970s included a separation between the private space and the common space that would be affected by the design of western-style apartments. That is, the western-style unit consists of two major divisions that were intended to separate bedrooms from a living room by putting most bedrooms on one side of the unit and the living room, kitchen and dining space on the other side.

However, this western-style type had changed to the living room, kitchen and dining space in the center section and the bedrooms occupied the corner section of the dwelling unit. This layout seems to be derived from the concept of the traditional courtyard-centered housing layout. The traditional courtyard housing is square-shaped with a small courtyard in its center, with bedrooms and kitchen in located around the courtyard.

In a Korean-style apartment layout, the living room is located in the center of the house, and all other rooms such as bedrooms, kitchen and dining space are located around it. This Korean-style type is intended to separate the space for one generation (ex. father and mother) from one for other generation (ex. children).

2. Apartment Building

Apartment building is the combination of the dwelling units by simple horizontal and vertical repetition. Types of apartment buildings for this dissertation can be divided by their height and unit-access type.

1) Building height

Types of building height can be classified into medium-rise and high-rise. The medium-rise implies the five-story apartment building and the high rise specifies the 12-story apartment building or above. Until the mid-1970s, most apartment buildings were five stories largely due to limitations in construction techniques. Since the elevator has been incorporated in the apartment building and construction techniques were improved in the late 1970s, most apartment buildings are 12-stories or higher. In addition, 25-story buildings were introduced during the development of Seoul Olympic Village in 1987 in order to increase the number of dwelling units, and 30-story buildings are currently popular in present. Therefore, these kinds of developments result in a much denser residential environment by maintaining more than 100 units per acre.

2) Unit-access type

The unit-access can be classified into core type and corridor type. In the core type of apartment buildings, a core without an elevator (mostly, in medium-rise building) or with an elevator (in high-rise buildings) serves two dwelling unit on each floor. In the corridor type of apartment building, a corridor serves several units (between 4 to 16 units) per floor. This type usually has one or two elevators that are located in the middle or the corner of the building.

These two different types affect the building and unit design, and even the interaction with neighbors and neighborhood privacy. The corridor type typically is used for an apartment building with small size units, even for the apartment building of medium size units built before the mid 1970s. All buildings with large size units are core types. After the mid-1970s, the unit-access type changed from the corridor to the core in buildings with medium size units. In addition, since the late 1980s the core type of unit-access had emerged in buildings with small size units. This situation may reflect residents' preference for a core type building because the corridor type may afford less visual privacy and security than the core type. But the corridor type may also encourage social interaction with neighbors because many units use the same corridor on each floor.

3. Grouping of apartment buildings

A grouping of apartment buildings can be classified into the parallel type and the court type. As described in earlier section, in Korea, most people prefer south-oriented housing because it provides a longer exposure to sunlight during winter. The parallel type of siting is intended to allow all dwelling units to face south. This was the most common siting type of apartment building until the mid-1970s.

The court type of building siting may encourage different perception due to the variation in building height. There are two court types of building siting: 1) court type with same height buildings and 2) court type with different height buildings (e.g., a combination of 5-story buildings and a 12-story building). The former became a common siting type from the late-1970s to the present. The latter was developed to provide a visual variety in apartment complexes in the early 1980s and has been used in some apartment sites until the present.

Typically, the court type was meant to accommodate more units on an apartment site by plotting another building or extending the building at the side, and to offer a bigger open space between buildings since the mid-1970s. But, this space has currently been designed for parking lots due to the

increasing number of automobiles. Court type siting may produce a problem of visual and aural privacy among units in the corner area of the apartment building.

4. Space around or between apartment buildings

Space around or between apartment buildings includes road patterns, pedestrian walkways, neighborhood parks, playground and parking lots.

As described in the previous section, three types of road patterns are found in the Seoul metropolitan area: grid, loop, and *cul-de-sac*. These road patterns affect parking arrangement and open space layout.

A grid road pattern forms rectangular blocks and each block contains one apartment building. All roads around blocks are connected to each other, and have street types of parking lots along a line parallel to the building. In the Seoul metropolitan area, this type of road pattern was commonly used in the early stage of apartment development, until the mid-1970s. In this case, developers provide an open space and a playground in one section of blocks. Therefore, this kind of open space and playground usually is somewhat large size.

The loop type of road pattern was introduced after the mid-1907s for the reduction of construction cost by reducing the total length of the road, and for the partial separation

between automobiles and a pedestrian pathway. The loop road with attached parking lots began to prevail as another type of road pattern since the mid-1970s.

The *cul-de-sac* road system was first developed as a distinguishable type of road pattern in the Mokdong apartment district in the mid-1980s. It was intended to separate totally automobiles from pedestrians. All automobiles access to an apartment building came directly from a major road around the apartment area.

Chapter Three

Dissertation Method of Resident Satisfaction with Apartment Forms

Introduction

Chapter two provided a categorization of apartment forms into typical types according to the typo-morphological characteristics for dwelling unit, apartment building, grouping of apartment buildings and space around and between buildings.

This chapter will present a method employed by this study to measure resident satisfaction with apartment forms. In detail, first, I will describe how apartment complexes were selected for the analysis of apartment form and residents' satisfaction. Following this, I will present a model of satisfaction that identifies dependent variables and independent variables. Third, I will outline the kinds of data collected and how they were collected. Finally, I will present how data were analyzed in order to uncover the relationship between resident satisfaction and apartment forms.

III-1. Selection of Apartment Complexes

Because this study investigates the relationship between resident satisfaction and apartment forms, the apartment complexes have to contain necessarily the typical types of apartment forms. Moreover, it is impossible to get information on all apartment complexes in Seoul. For those reasons, a formal method of site selection such as random sampling was not used for this study. Instead, apartment complexes were chosen to meet several criteria for selection.

In selecting apartment complexes, the first criterion was easy access to information about apartment forms. Contacting the developer or using published documents (or reports) were the only way to obtain such information as overall site design, building type, dwelling unit floor plan, number of dwelling units and so on.

The second criterion was to include various apartment forms. There have been significant changes in apartment forms from the early 1970s to the present in terms of dwelling unit design, building design, building siting, site plan and so on. Apartment complexes were chosen to include a range of these changes. Therefore, the selected complexes show various typical types of apartment forms.

A third criterion was to achieve homogeneity among samples of residents. The apartment complexes were chosen to have more or less similar socioeconomic characteristics, especially income level, linked to dwelling unit size to enable comparison about satisfaction with apartment forms. In other wards, I planned to control, in some degree, the socioeconomic variables in order to compare the levels of satisfaction with apartment forms.

In addition, the location of the apartment complex was considered in the selection process. Most apartment complexes were located about 10 KM to 15 KM from the central business district of Seoul. Of these, one apartment complex was located farther away (about 25Km from the center of Seoul) because it was developed as a part of a new town development project around Seoul. However, this apartment complex was located very close to the subway, so the time needed to access the center of city is comparable to that of other complexes.

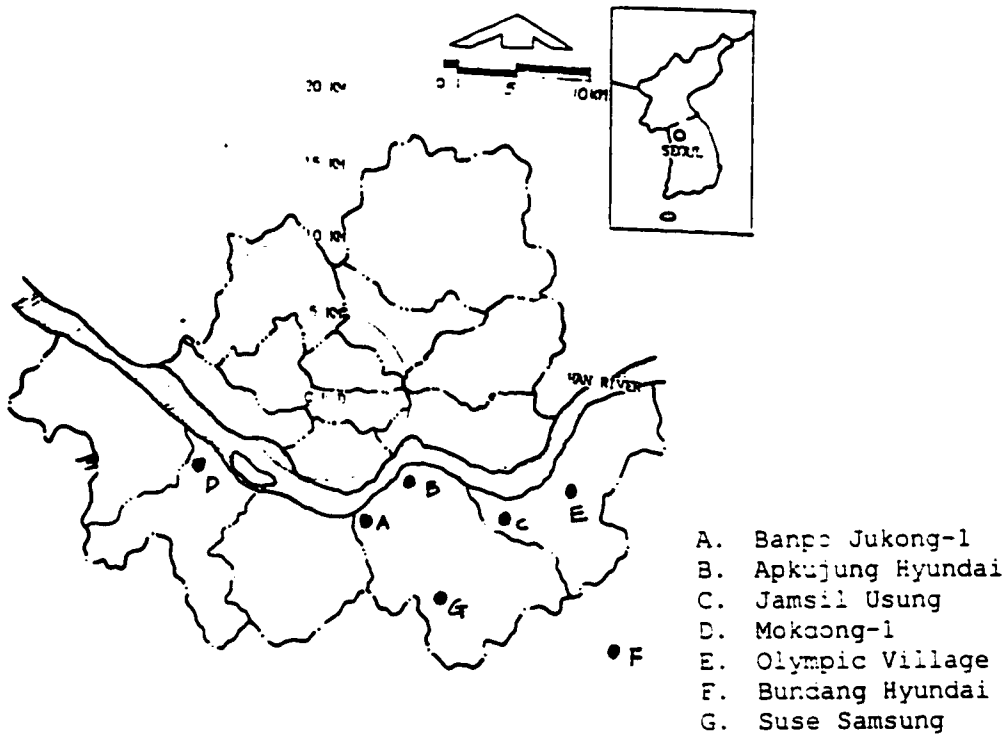
Using these criteria, Seven apartment complexes were selected for this study. Figure 3-1 shows the approximate location of those complexes and Table 3-1 displays the general characteristics of each apartment complex.

The development year for these apartment complexes

Table 3-1: General characteristics of apartment complexes

	Banpo Jukong-1	Apkujung Hyundai	Jamsil Usung	Mokdong-1	Olympic village	Bundang Hyundai	Suse Samsung
Date of construction completed	1974	1978	1982	1985	1988	1992	1994
Developer	Public	Private	Private	Public	Public	Private	Private
Area*	137 acres	92 acres	30 acres	41 acres	136 acres	31 acres	8.4 acres
Number of dwelling unit	3,786	3,529	1,842	1,882	5,540	1,659	930
Net density	27 units per acre	38 units per acre	62 units per acre	46 units per acre	41 units per acre	54 units per acre	111 units per acre

* It includes commercial area and school area between apartment complex.



A. Banpo Jukong-1
B. Apkujung Hyundai
C. Jamsil Usung
D. Mokdong-1
E. Olympic Village
F. Bundang Hyundai
G. Suse Samsung

Figure 3-1: Location of apartment complexes studied

ranges from the early 1970s to the early 1990s. Banpo Jukong-1, Apkujung Hyundai, and Jamsil Usung were developed in the 1970s, Mokdong-1 and Olympic Village in the 1980s, and Bundang Hyundai and Suse Samsung in the 1990s.

Of the seven apartment complexes, three were developed by the public sector: Banpo Jukong-1 by the Korean National Housing Corporation, and Mokdong-1 and Seoul Olympic Village by the Seoul municipal government. The others were developed by private companies.

III-2. A Model of resident satisfaction with apartment forms

Weisenfeld (1992) defines resident satisfaction is a state of equilibrium between the use and the built design, between the needs and aspiration of the people and the actual housing situation.[1] From his point of view, residents evaluate their apartments by considering not only their actual condition, but also projecting their housing needs and aspirations for the future. Therefore, resident satisfaction is affected by both housing characteristics and personal characteristics.

---

[1] Weisenfeld (1992), p 214

In the literature review, I found that researchers used various statistical techniques to examine models of satisfaction using the following sets of variables: 1) variables of residents' demographic features, 2) variables of the residents' physical environment, and 3) variables in residents' perception or evaluation of housing and neighborhood condition, management, neighborhood social interaction, and so on.

By using same framework, I will develop a model of resident satisfaction with apartment forms, as shown in figure 3-2.

1. Overall resident satisfaction as a dependent variable

Three different specifications of overall resident satisfaction are herein examined: a) overall satisfaction with the dwelling unit, b) overall satisfaction with the apartment building, and c) overall satisfaction with the space around or between buildings. These overall satisfaction specifications are measured separately by using a satisfaction score. Residents were asked to state their level of overall satisfaction by assigning a score from 0 to 100. For example, to measure overall satisfaction with the dwelling unit, the question was phrased, " Using a

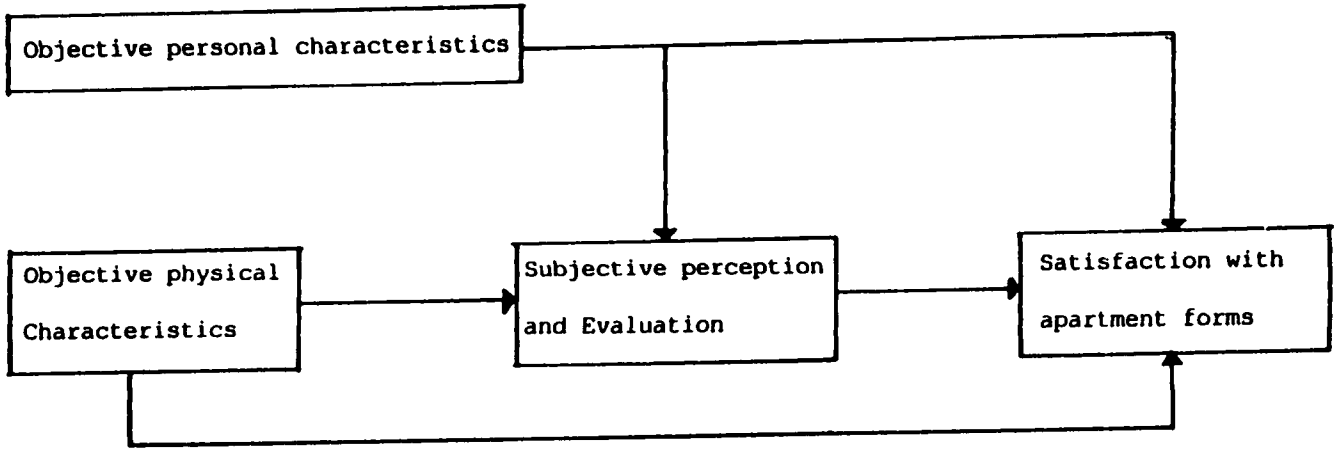


Figure 3-2: Conceptual framework of resident satisfaction with apartment forms

scale from 0 (lowest) to 100 (highest), what score of satisfaction would you give to the dwelling unit in which you reside? If you are satisfied, please score above 50 points, if dissatisfied, write down a score below 50 points". The same question formats were used to measure overall satisfaction with each of the apartment building and the space around or between buildings.

Assessing their responses, I classified the residents who gave a score of above 50 points as the satisfied group while those who responded below 50 points are regarded as the unsatisfied group. Specifically, those scoring above 75 points are regarded as the very satisfied group and those scoring below 25 points are regarded as the very dissatisfied group. If the residents gave a score 50 points, those are regarded as the satisfied group because residents generally have a tendency to think positively their living environment.[2]

[2] Residents have a tendency to give inflated answers. Campbell et al.(1976) have pointed out the general tendency of people to rate their satisfaction positively more frequently than to rate negatively, but showed that this kind of bias is probably not very large.

2. Components of resident satisfaction used as independent variables

Previous researches in resident satisfaction have often dealt with the limited scope of resident evaluations about the physical characteristics of residential environment. This research, however, intends to include comprehensive information on the subjective evaluation about a number of components that make up apartment form in Korea. Three categories of variables are examined: 1) objective personal characteristics, 2) objective physical characteristics, and 3) subjective evaluations of the physical components of apartment form, shown in Table 3-2.

Listed on table 3-2, twelve objective personal and physical variables were tested to discover the relationship to three different specifications of overall satisfaction (i.e., dwelling unit, apartment building, and the space around or between buildings). In evaluating the physical components within a dwelling unit, two dimensions of each component were evaluated, size and location aspects. Therefore, fourteen subjective variables (i.e., seven subjective variables for the size of each room plus seven

Table 3-2: Categories of independent variables

Objective personal characteristics	1. Household income 2. Age 3. Ownership 4. Household size 5. Duration of residence 6. Number of socially close neighbors
Objective physical characteristics	1. Types of dwelling unit 2. Apartment building height 3. Density within dwelling unit 4. Floor where resident lives 5. Building siting 6. Unit access type
Subjective evaluation of physical components of apartment forms	
Dwelling unit -Size aspect -Location aspect	1. *Anbang* 2. Other room(s) 3. Living room 4. Kitchen 5. Dining space 6. Bathroom 7. Utility room
Apartment building	1. Building height 2. Building length 3. Access type to dwelling unit 4. Siting with neighboring buildings 6. Auditory privacy 7. Visual privacy
Space around or between buildings	1. Inner road pattern 2. Parking lot size 3. Parking arrangement 4. Playground size 5. Playground location 6. Size of green/open space 7. Location of green/open space

subjective variables for the location of each room within the dwelling unit) were investigated for the overall satisfaction with a dwelling unit. For example, the physical component, living room, was assessed by each respondent as regard first size, then location considering room layout of the dwelling unit.

Seven subjectively assessed variables are examined to gauge overall satisfaction with apartment building, and seven subjectively assessed variables for overall satisfaction with the space around or between buildings.

Subjective evaluation of each physical component of apartment form was measured by using a five-point rating scale (very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, and very dissatisfied).

III-3. Data collection

Resident satisfaction for this study is garnered through a structured questionnaire survey and an interview survey. The questionnaire and interview survey was administered to a random sample of housewives who live in the selected apartment complexes. In Korea, most housewives spend their time at home caring for children care and performing housework. Because housewives generally use the

spaces in both within housing and within the neighborhood more intensively than their spouses, and because they are available for the survey only during the daytime, they are chosen as respondents (or informants) for this study of resident satisfaction.

The survey questionnaire of seven pages consisted of three parts with structured questions (see appendix A). The first part of the questionnaire dealt with the subjective evaluation of components within the dwelling unit. Residents were asked to rate their evaluation on the basis of their present experience by using a five-point scale (from very satisfied to very dissatisfied). The residents were asked to rate how they were satisfied with the size of each room including *Anbang*, other bedrooms, living room, kitchen, dining area, bathroom and utility room considering the overall size of the dwelling unit. They also were asked how satisfied they were with the location of each room considering the room layout of the dwelling unit. And then, they were asked to give a satisfaction score for the entire dwelling unit, considering all of the above evaluations. In addition, residents were asked to state their needs and wants. To uncover residents' needs and wants, they were asked to state which aspects of their dwelling unit should

be modified, added (or removed), or enlarged to improve their housing satisfaction. Then, they are asked to indicate what concessions in room size they were willing to make. For example, they were asked to select two rooms in priority (e.g., first priority and second priority) which they would like enlarged even though this enlargement would reduce the size of other rooms; they were also asked the inverse question to prioritize (i.e., two rooms that they would like to reduce). Finally, they were asked to list modifications (or transformations) already done to their dwelling unit.

The second part of the questionnaire dealt with a subjective evaluation of components of the apartment building and the space between or around apartment buildings. The residents were asked to rate how they were satisfied with the height of the building, the length of the building, unit-access types, siting with adjacent buildings, auditory privacy from the outside, and visual privacy from the outside. And then, they were asked to give a satisfaction score for the entire apartment building, considering all of the above evaluations. In addition, residents were asked to state the number of neighbors with whom they have close relationships within the apartment

building, to state their floor where they live and the floor level on which they would prefer to live.

With regard to satisfaction with the space around or within buildings, residents were asked to rate how they were satisfied with inner road patterning, parking lot size, parking arrangement, playground size and its location, and open or green space size and its location. And then, they were asked to give a satisfaction score for the entire space around or between buildings, considering all of the above evaluations. In addition, residents were asked to describe their perception about entire apartment complex with relation to buildings and the space around or between buildings. Three kinds of perceptions were measured by using 5 point rating scale: monotonous versus varied, closed versus open, and spacious versus dense.

The third part of the questionnaire elicited information about the social, economic, and demographic characteristics of each resident. The objective characteristics of residents include age, household income, household size, duration of residence, ownership, and previous housing type.

The purpose of the interview survey was, first, to investigate how the residents use the space and each room

at home. Second, it was designed to reveal resident satisfaction with a dwelling unit in terms of their activities such as cooking, eating, sleeping, family communication, etc.. Furthermore, photographs were taken to record the condition of each apartment complex. These photos are very helpful in understanding the physical characteristics of an apartment form. Moreover, the spatial relations between apartment buildings, parking lot, road, and open space can be presented visually.

The questionnaire and interview survey in this study were administered from July 12 to July 26, 1995. Eight college students (two graduate students and six undergraduates) were hired to administer the survey. Of these students, seven were female and one was male. A woman surveyor was preferred in the belief that she might be more easily gain access to the resident.

The distribution method of questionnaires and the response rate represented a major concern for this study. One method of distribution, at first I thought of using the monthly neighbors' meeting. In Korea, neighbors' meetings usually consist of 25 to 30 households gathering at one house of the group members on the 25th of every month. However, the interval chosen to administer the survey fell

during the vacation season in Korea, so many residents would not be attending the neighbors' meeting on July because they would be out of town. In addition, the pretest showed a low response rate if I used the monthly neighbors meetings for the distribution of questionnaires and their collection. Therefore, I decided to change the distribution method from a survey using the monthly neighbors meeting to a survey administered by direct approach to the residents in their homes.

Residents were contacted directly by a surveyor knocking on their door, and then, explaining briefly the purpose of the study and asking them to fill out the questionnaire. The residents were also told their participation was voluntary, and that all responses from them would be kept confidential and used for this study only. In most cases, a surveyor waited while the residents completed the questionnaires, but in some cases, the questionnaire was picked up at a later time either on the same day or on the next day. It usually took 30 to 35 minutes to fill out the questionnaire. If the resident had a question about the survey, or did not understand the meaning of some items in the questionnaire, the surveyor explained it. In addition, if the residents turned out to take an interest in the

study, they were asked to participate in the interview survey. In most cases, interviews took about 45 minutes to one hour. After completing the questionnaire and/or the interview, the residents were thanked and given a ball-point pen for the questionnaire and a kitchen glove for their cooperation in the interview.

A total of 512 questionnaires and 133 interviews were collected. However, only 463 questionnaires and 128 interviews were used for data analysis because some of the questionnaires and interviews were incomplete. Table-3 shows the distribution of samples by each apartment complex and dwelling unit size.

III-4. Data analysis

The major objective of data analysis in this study was to reveal the relationship between various physical characteristics of an apartment's residential environment and resident satisfaction. Two major kinds of analysis including a descriptive process and an analytical process, were employed for this study. First, in the descriptive process, frequency distribution table of percentage and mean value were used in order to show how the residents are satisfied with the apartment residential environment. This

frequency table can be used to compare differences in level of resident

Table 3-3: Sample size for questionnaire and interview

	Number of questionnaires	Number of interviews
Banpo Jukong-1		
Small unit	25	7
Medium unit	28	5
Large unit	29	7
Apkujung Hyundai		
Medium unit	39	8
Large unit	28	8
Jamsil Usung		
Small unit	28	8
Medium unit	30	8
Large unit	28	7
Mokdong-1		
Small unit	25	6
Medium unit	25	6
Olympic Village		
Medium unit	25	7
Large unit	31	6
Bundang Hyundai		
Small unit	25	8
Medium unit	28	8
Large unit	29	8
Suse Samsung		
Small unit	20	11
Medium unit	20	8
Total	463	128

satisfaction among different apartment form designs in terms of each variable (i.e., including dependent and independent variables). It provides one way of examining the difference in levels of resident satisfaction by showing the percentage of both satisfied and dissatisfied residents.

Another way of examining these differences is to look at the mean of satisfaction level obtained in each variable. The differences between mean scores were examined by analysis of variance, specifically Duncan's multiple range test. The main purpose of this descriptive process was to evaluate a number of the apartment forms by gauging resident satisfaction.

Now the purpose of the analytical process is to reveal the important independent variables that significantly affect satisfaction with each of the housing unit, the apartment building, and the space around or between buildings. This process uses two major kinds of statistical analysis included in a SAS package,[3] correlation analysis and multiple regression analysis.

---

[3] For using SAS program, every item of the questionnaires is coded by using DOS editor. See appendix B for these coded data.

As a first analytic step, the Pearson correlation coefficients were computed to make a preliminary examination of the relationship between dependent and independent variables. The purpose of this step was to discover the variables that are significantly associated with resident satisfaction with apartment form.

A second analytic step was directed at determining the degree to which independent variables affect significantly resident satisfaction. The variables that were selected in the first step are used in a stepwise multiple linear regression analysis. Regression analysis can identify the most important explanatory variables and determine the relative importance among these variables. The relative importance of each explanatory variable is expressed by a standardized regression coefficient. The regression coefficient is an estimate of how much change in the dependent variable is produced by one unit of change in the independent variable. Therefore, the variable that its absolute number of the regression coefficient is bigger than others is more important relatively among other variables.

Chapter Four

Analyzing the Form of Apartment Complexes: Case Studies

Introduction

This chapter presents an analysis of apartment forms by examining seven apartment complexes in the Seoul metropolitan area. The form and pattern of seven apartment complexes are analyzed using the basis elements of apartment form; dwelling unit, apartment building, grouping of apartment buildings, and space around or between buildings that was described in chapter two. In addition, the level of satisfaction with apartment forms is described for each complex. It is interesting to see if there exist differences in levels of satisfaction among various apartment forms. These differences are then analyzed in terms of percentages of satisfied and dissatisfied residents. Moreover, this chapter compares the level of satisfaction between the different apartment complexes.

To analyze apartment form, the seven apartment complexes selected here have been mapped at the same scale to comparing them to each other. However, each mapped area covers 360M by 240M (about 21.4 acres), so these mapped areas show only a representative section of entire site in most cases. These mapped areas are useful in understanding the general pattern and form of each complex including density, building siting,

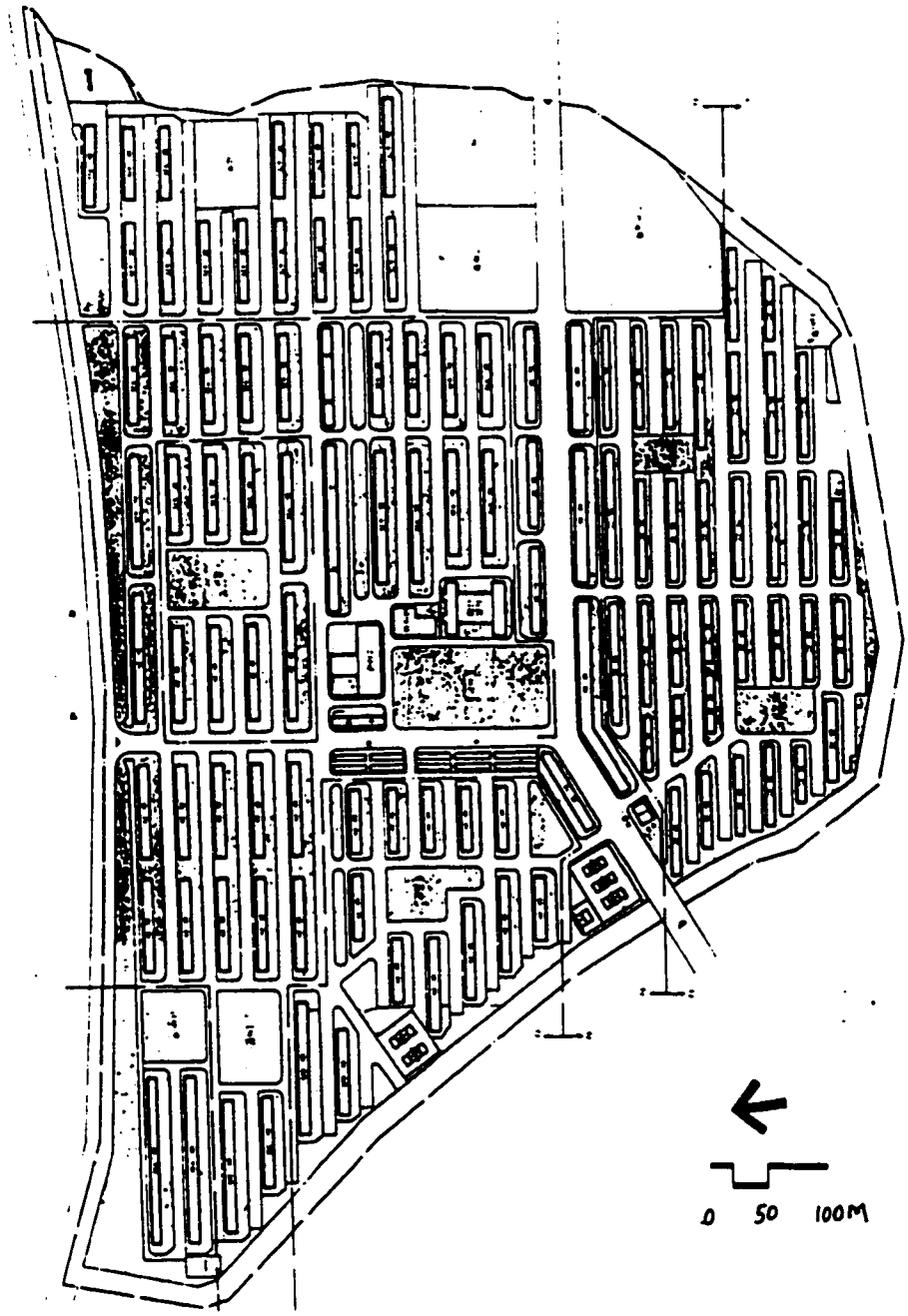
open space, and circulation system, and in comparing several apartment complexes by investigating units per acre, floor area ratio, building coverage, percentage of public space, and percentage of road and parking lot.

IV-1. Banpo Jukong-1 Apartment Complex

The Banpo Jukong-1 apartment complex is located approximately 10 km (about 6.3 miles) south of the central business district of Seoul. The site is newly developed on the south area of the Han River that was the edge of the developed part of the city. It was constructed by the Korea National Housing Corporation from 1972 to 1974 as a community of about 3,786 dwelling units, shown in figure 4-1. The site area which includes both the commercial and educational uses covers about 137 acres, so the overall residential density approximates about 27 dwelling units per acre.

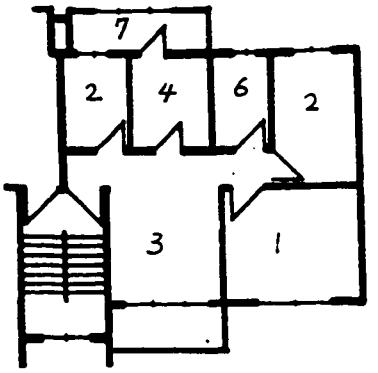
1. Dwelling unit form

Three types of dwelling units are chosen for the analysis of dwelling unit form, shown in figure 4-2.



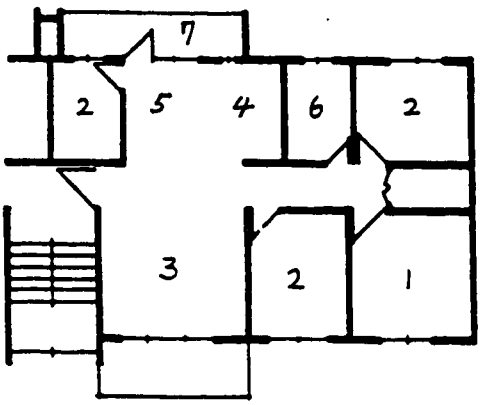
Source: KNHC (1980), Collection of site Planning: 1987-1980, p.23

Figure 4-1: Banpo Jukong-1 apartmemt complex



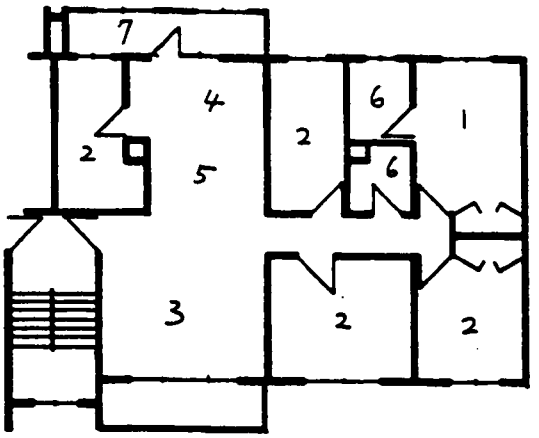
Small-size unit

	Size (sq.m)	Percentage
1. Anbang	13.24	20.3
2. Ohter room(s)	15.32	23.4
3. Living room	12.21	18.7
4. Kitchen	6.72	10.3
5. Dining space	NA	NA
6. Bathroom	5.03	7.7
7. Utility room	5.16	7.9
8. Passage way	7.68	11.8
Total	65.36	100.0



Medium-size unit

	Size (sq.m)	Percentage
1. Anbang	13.7	14.5
2. Ohter room(s)	27.81	29.4
3. Living room	16.47	17.4
4. Kitchen	13.92	14.7
5. Dining space	K+D	K+D
6. Bathroom	5.8	6.1
7. Utility room	6.76	7.2
8. Passage way	10.02	10.6
Total	94.48	100.0



Large-size unit

	Size (sq.m)	Percentage
1. Anbang	14.86	11.6
2. Ohter room(s)	46.92	36.6
3. Living room	17.57	13.7
4. Kitchen	10.08	7.9
5. Dining space	7.78	6.1
6. Bathroom	9	7.0
7. Utility room	8.19	6.4
8. Passage way	13.65	10.7
Total	128.05	100.0

Figure 4-2: Types of dwelling unit in Banpo Jukong-1 apartment complex.

The small-size unit is the side-entrance type and consists of three bedrooms, a living room, kitchen, utility room, and front balcony. Net area[1] of the small unit is 65.36 sq. meters with 7.2 meters in depth. In the layout of rooms, an *Anbang* and a living room are located at the front of the unit, while a kitchen, bathroom, and two bedrooms are located in the back. Table 4-1 shows that 64 percent of respondents living in a small-size unit indicate feeling of overall satisfaction with the unit. The mean satisfaction score is 59.6.

Table 4-2 shows the residents' subjective evaluation of each physical component such as *Anbang*, other bedrooms, living room, kitchen, bathroom, and utility room. The evaluation of each component was investigated for two dimensions: size aspect and location aspect. In table 4-2, I show that satisfaction with the location of each room is most often much higher than satisfaction with the size of each room. In particular, residents are much more dissatisfied with the size of other room, the kitchen, and the dining space. The reasons may include that the bedroom near the entrance is too small compared to the other two bedrooms, and that the dining space was not considered in this unit.

---

[1] The net unit area excludes service area (such as balcony area) and common use areas (such as corridor area or staircase area)

Table 4-1: Percentage of response of overall satisfaction with dwelling unit by unit size in Banpo-1 apartment complex

		Dwelling unit satisfaction			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=82)	31	46	22	1
Small unit	(N=25)	20	44	32	4
Medium unit	(N=28)	29	50	21	0
Large unit	(N=29)	41	45	14	0

Table 4-2: Percentage of response of subjective evaluation by components of dwelling unit and unit size in Banpo-1 apartment complex

	Small unit		Medium unit		Large unit	
Size aspects	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied
Anbang	40	28	18	36	45	24
Other bedroom	12	48	18	36	43	21
Living room	48	13	75	7	86	4
Kitchen	13	54	46	19	34	24
Dining space	0	70	41	11	52	11
Bathroom	44	12	43	4	52	19
Utility room	26	43	22	30	44	30
Location aspects	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied
Anbang	72	4	79	7	48	14
Other bedroom	48	16	46	18	39	18
Living room	68	5	71	4	79	0
Kitchen	52	17	21	36	48	24
Dining space	40	27	20	24	48	12
Bathroom	52	12	50	14	61	14
Utility room	45	25	37	7	56	8

The medium-size unit has four bedrooms. One small bedroom is for a housemaid, so access to this room leads from the kitchen. This unit design may be affected by the western-style apartment because it was designed emphasizing the separation between private space and common space.

The net area of the medium unit is 94.48 sq. meters with 7.8 meters in depth. In the layout of rooms, this unit is B+B+L type. An *Anbang*, one bedroom, and a living room are located at the front of the unit, while a kitchen, bathroom, and two bedrooms are located in the back. In table 4-1, I show that about 80 percent of the respondents living in the medium size unit indicates feelings of overall satisfaction with this unit. The mean satisfaction score is 67.5.

In subjective evaluation of physical components, the residents were much more satisfied with the location of the bedrooms than with the size of the bedrooms, while they are much more satisfied with the size of the kitchen and dining space than with their location. In regard to the living room, more than 70 percent of the respondents are satisfied with its size and location.

The large-size unit in Banpo Jukong-1 apartment complex has five bedrooms. Of these, four bedrooms including *Anbang* are clustered close to one another and intentionally separated from

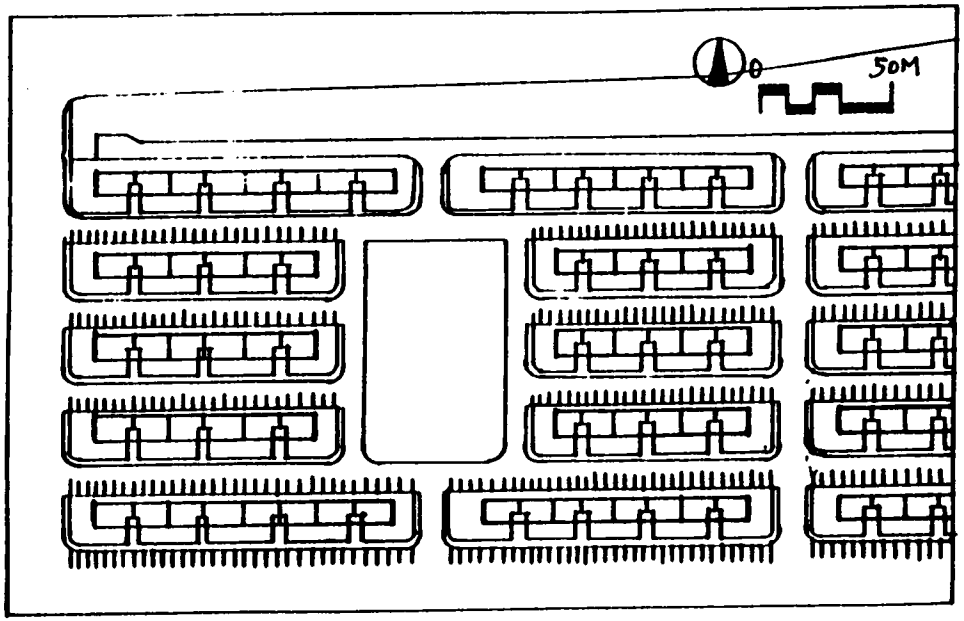
the living room and the kitchen. Therefore, the room layout in the large unit is a western-style type. Net area of the large unit is 128.05 sq. meters with 9.3 meters in depth.

About 86 percent of the respondents living in the large unit are satisfied with the unit. The mean satisfaction score is 71. As regard to the subjective evaluation of physical components, the respondents are generally satisfied with every component, but they are somewhat less satisfied with the size of the kitchen and the location of other room(s).

2. Apartment building form

The grouping pattern of apartment buildings is a repetitive parallel, shown in figure 4-3. Most apartment buildings are five-story walk-up and oriented toward south (see figure 4-4). Each building consists of dwelling units ranging in number from 30 to 40, while the length of each building ranges from 75 to 112 meters. On the basis of figure 4-3, the building coverage is approximately 13.5 percent and Floor Area Ratio (Hereafter, FAR) is about 76 percent. The rectilinear grid made up of blocks of different sizes that consist of one or two apartment buildings.

Table 4-3 shows that most residents are satisfied with their apartment building. About 79 percent of the respondents indicate the feeling of satisfaction.



	Banpo Jukong-1
Date of construction completed	1974
Developer	Public
Residential area	17 acre
Number of dwelling unit	415
Net density	24.6 units per acre
Building coverage	13.5 %
Floor Area Ratio	76 %
Building height	5-story
Percentage of playground and park	6.6 %
Percentage of road and parking area*	42 %

*exclude underground parking area

Figure 4-3: Site layout plan of Banpo Jukong-1 apartment complex

Figure 4-4: A view of Banpo Jukong-1 complex

Figure 4-5: On-street parking in Banpo Jukong-1 complex

Most buildings have same facade treatment, are tightly arranged against one another, and are of the same height (i.e., same story building). Naturally, they are quite monotonous in scale and style. The entire complex seems to lack a sense of a clearly differentiated neighborhood. However, the residents show that they are quite satisfied with the building height, building length, and unit-access type, as shown in table 4-4. The residents express somewhat less satisfaction with auditory and visual privacy.

Table 4-3: Percentage of response of overall satisfaction with apartment building by unit size in Banpo-1 apartment complex

		Apartment building satisfaction			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=82)	36	43	21	0
Small unit	(N=25)	28	60	12	0
Medium unit	(N=28)	32	36	32	0
Large unit	(N=29)	48	35	17	0

Table 4-4: Percentage of response of subjective evaluation by components of apartment building in Banpo-1 apartment complex

	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	very Dissatisfied
Building height	50.0	31.7	13.4	3.7	1.2
Building length	37.8	41.5	19.5	0	1.2
Access type to the unit	33.3	43.6	16.7	2.6	3.8
Building siting	22.2	45.7	21.0	11.1	0
Auditory privacy	11.1	25.9	40.7	16.0	6.2
Visual privacy	6.2	21.0	46.9	18.5	7.4

3. The form of other spatial components: road pattern, parking arrangements and public open spaces

The road patterns within the Banpo-1 apartment complex constitutes a grid with on-street parking, shown in figure 4-5. This pattern exhibits the typical type of apartment traffic circulation system during the 1960s and the 1970s. As shown figure 4-2, road and parking area covers 42 percent of the mapped area.

Public open space includes parks (figure 4-6), playgrounds (figure 4-7), and walkways. In Banpo-1 site, only 6.6 percent of the mapped area are devoted to public open space.

As described in table 4-5, about 87 percent of the respondents are satisfied with the space within or between apartment buildings. Regards to spatial components, table 4-6 indicates about more than 60 percent of the respondents are satisfied with the road pattern, parking, and open space while about 38 percent are dissatisfied with the playground location.

Figure 4-6: A view of neighborhood park in Banpo Jukong-1 complex

Figure 4-7: A view of playground in Banpo Jukong-1 complex

Table 4-5: Percentage of response of overall satisfaction with the space around or between buildings by unit size in Banpo-1 apartment complex

	Satisfaction with the space around or within buildings				
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=82)	50	37	13	0
Small unit	(N=25)	40	40	20	0
Medium unit	(N=28)	36	46	18	0
Large unit	(N=29)	72	24	4	0

Table 4-6: Percentage of response of subjective evaluation by spatial components in Banpo-1 apartment complex

	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	very Dissatisfied
Inner road pattern	17.3	45.7	28.4	8.6	0
Size of parking lot	26.8	42.7	25.6	4.9	0
Parking arrangement	19.8	44.4	28.4	6.2	1.2
Playground size	15.8	22.4	42.1	17.1	2.6
Playground location	13.2	21.1	27.6	34.2	3.9
Size of open space	25.9	39.5	25.9	6.2	2.5
Location of open space	23.5	34.6	25.9	12.3	3.7

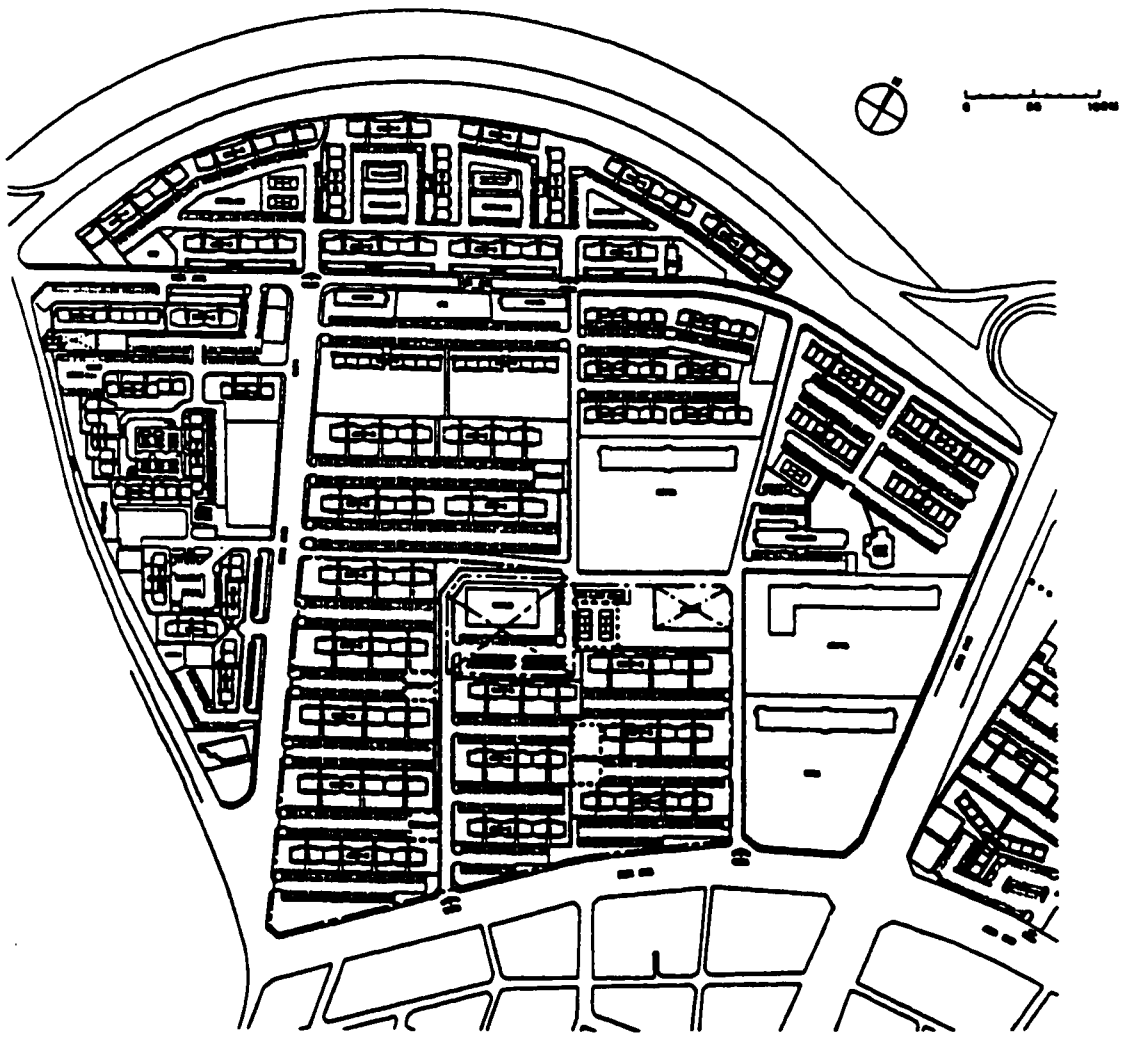
IV-2. Apkujung Hyundai Apartment Complex

The Apkujung Hyundai apartment complex is located about 8 Km south of the central business district of Seoul. Its construction was completed in 1978 as a new bedroom community of 3,229 dwelling units on about 92 acres, shown in figure 4-8. Overall housing density reaches as high as 38 units per acre. This complex was the largest apartment residential development that was constructed by the private developer (Hyundai construction company) until that time.

1. Dwelling unit form

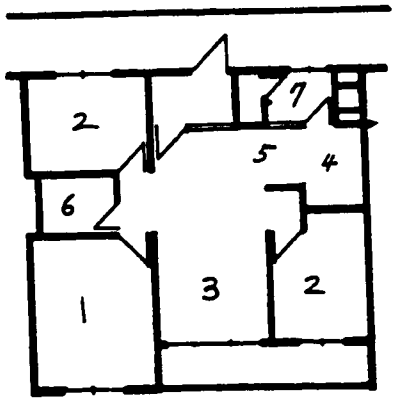
Two types of dwelling unit are selected for the analysis, shown in figure 4-9. The medium-size unit has a rear-entrance from the corridor, so this unit is B+L+L/corridor type. Net area of this unit is 82.78 sq. meters with 9.1 meters in depth. It consists of two bedrooms and a living room in the front, with a bedroom, kitchen, dining space, and utility room in the back. This type of layout was most common for the design of the medium-size unit until the late 1970s.

About 64 percent of the respondents express overall satisfaction with the unit, as shown in table 4-7. The mean satisfaction score is 57 that is the lowest score among medium units. According to analysis of residents' evaluation of



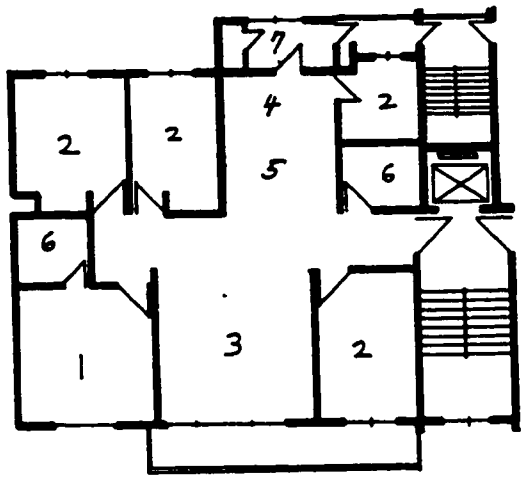
Source: Yim et al. (1994). A Study on Plannig Srandard and Density of Large-Scale Residential Developemnt. Seoul, Korea Research Institute for Human Settlement. p 54.

Figure 4-8:Apkujung Hyundai apartment complex



Medium-size unit

	Size (sq.m)	Percentage
1. Anbang	16.65	20.1
2. Ohter room(s)	20.26	24.5
3. Living room	10.37	12.5
4. Kitchen	11.98	14.5
5. Dining space	K+D	K+D
6. Bathroom	4.87	5.9
7. Utility room	5.73	6.9
8. Passage way	12.92	15.6
Total	82.78	100.0



Large-size unit

	Size (sq.m)	Percentage
1. Anbang	17.25	13.5
2. Ohter room(s)	45.09	35.3
3. Living room	19.68	15.4
4. Kitchen	14.7	11.5
5. Dining space	K+D	K+D
6. Bathroom	9.9	7.7
7. Utility room	5.6	4.4
8. Passage way	15.6	12.2
Total	127.82	100.0

Figure 4-9: Types of dwelling units in Apkujung Hyundai apartment complex

physical components (see table 4-8), the residents in this type of unit are much more satisfied with the size and location of the *Anbang* than with other rooms. However, more than 67 percent are dissatisfied with the size and location of the kitchen, while about 51 percent are dissatisfied with the size of a living room.

In the large-size unit, net area runs up to 127.82 sq. meters with 10.1 meters in depth. Its room layout indicates that it was designed during the transition in unit design from the western style to Korean style. Three bedrooms are clustered together, but one bedroom is located separately from these. The living room moved somewhat toward the center of the unit by being located between clustered bedrooms and separated one. In this study, this type of unit was regarded as the western-style.

About 71 percent of the respondents are satisfied with this large unit, and the average satisfaction score is 64.32. In the subjective evaluation of physical components, almost 90 percent are satisfied with the size of the other rooms, about 70 percent are satisfied with the location of the living room, the location of the *Anbang*, and the size of living room. However, about 40 percent indicate dissatisfaction with the size of the kitchen, dining space, and *Anbang*.

Table 4-7: Percentage of response of overall satisfaction with dwelling unit by unit size in Apkujung Hyundai apartment complex

		Housing unit satisfaction			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=67)	18	49	31	2
Medium unit	(N=39)	13	51	33	3
Large unit	(N=28)	25	46	29	0

Table 4-8: Percentage of response of subjective evaluation by components of dwelling unit and unit size in Apkujung Hyundai apartment complex

	Medium size unit		Large size unit	
Size aspects	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied
Anbang	49	15	43	39
Other bedroom	18	38	89	4
Living room	13	51	68	7
Kitchen	5	67	25	43
Dining space	3	61	22	37
Bathroom	32	11	68	0
Utility room	22	35	27	35
Location aspects	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied
Anbang	63	8	71	7
Other bedroom	29	21	57	25
Living room	39	21	74	7
Kitchen	10	67	30	37
Dining space	9	53	41	33
Bathroom	39	13	64	7
Utility room	31	26	46	27

2. Apartment building form

The building siting is a repetitive parallel with high-rise buildings, as shown in figure 4-10. Most apartment buildings are 15 stories and oriented toward the south, and have the same facade treatment (see figure 4-11). Therefore, they are quite monotonous in scale and style. Each building consists of between 90 and 120 dwelling units. On the basis of the mapped area, the building coverage is about 10.5 percent and FAR is about 170 percent. The fragmented large grid made up of large blocks of different sizes that consist of five or six apartment buildings.

About 76 percent are satisfied with the apartment building in Apkujung Hyundai complex (table 4-9). The average satisfaction score is 63.46.

In the evaluation of physical components, about 50 percent are satisfied with the building height and building length. In building siting, 54 percent are satisfied while 22 percent are dissatisfied. On the other hand, more than one third are dissatisfied with the visual and auditory privacy.

Table 4-9: Percentage of response of overall satisfaction with apartment building by unit size in Apkujung Hyundai apartment complex

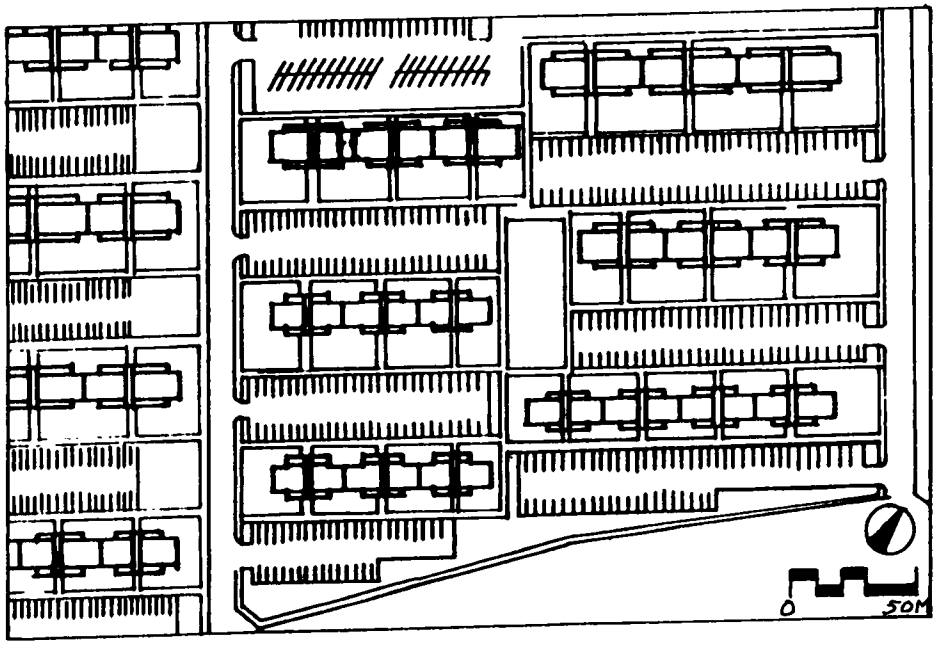
		Apartment building satisfaction			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=67)	22	54	24	0
Medium unit	(N=39)	18	59	23	0
Large unit	(N=28)	29	46	25	0

Table 4-10: Percentage of response of subjective evaluation by components of apartment building and in Apkujung Hyundai apartment complex

	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	very Dissatisfied
Building height	10.4	44.8	37.3	6.0	1.5
Building length	10.4	43.3	41.8	3.0	1.5
Access type to the unit	16.7	25.8	30.0	27.3	0
Building siting	10.4	43.3	23.9	22.4	0
Auditory privacy	3.0	34.3	29.9	26.9	6.0
Visual privacy	6.0	23.9	34.3	34.3	1.5

3. The form of the spatial components: road pattern, parking arrangement and public open space

The road pattern of this complex shows a fragmented large grid. Most of the parking lots branch off from a road way and are located between apartment buildings (see figure 4-12). A parking lot usually does not connected with anther parking lot. The road and parking area covers about 30 percent of the site, as shown figure 4-10, and only 3 percent of the site is devoted to parks (see figure 4-13) and playgrounds (see figure 4-14) in the mapped area.



	Apkujung Hyundai
Date of construction completed	1978
Developer	Private
Residential area	19 acre
Number of dwelling unit	742
Net density	39 units per acre
Building coverage	10.5 %
Floor Area Ratio	170 %
Building height	15-story
Percentage of playground and park	3.1 %
Percentage of road and parking area*	30 %

*exclude underground parking area

Figure 4-10: Site layout plan of Apkujung Hyundai apartment complex

Figure 4-11: A view of Apkujung Hyundai apartment complex

Figure 4-12: Parking arrangement in Apkujung Hyundai apartment complex

Figure 4-13: A view of neighborhood park in Apkujung Hyundai apartment complex

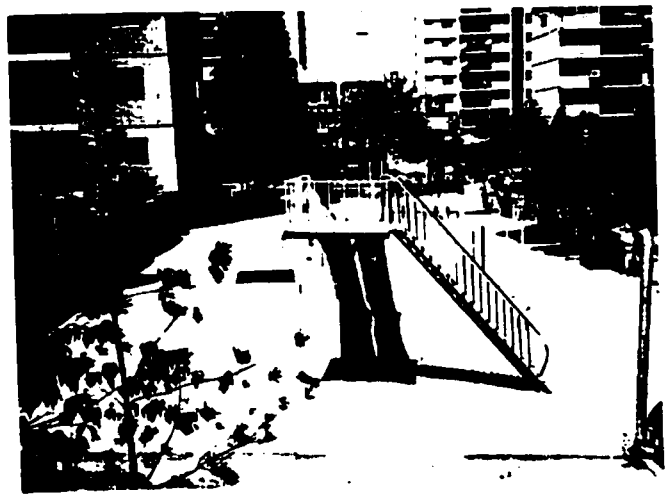


Figure 4-14: A view of playground in Apkujung Hyundai apartment complex

In table 4-11, sixty seven percent of the respondents are satisfied with the space within or between buildings, and their average score of satisfaction is 62.3.

In detail, the residents express much dissatisfaction with the size of parking lots, and about 37 percent are dissatisfied with the playground size (see table 4-12). As regards the road pattern, about 48 percent are satisfied while only 11 percent are dissatisfied.

Table 4-11: Percentage of response of overall satisfaction with space around or between buildings by unit size in Apkujung Hyundai apartment complex

		Satisfaction with space			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=67)	22	45	33	0
Medium unit	(N=39)	20	49	31	0
Large unit	(N=28)	25	39	36	0

Table 4-12: Percentage of response of subjective evaluation by spatial components in Apkujung Hyundai apartment complex

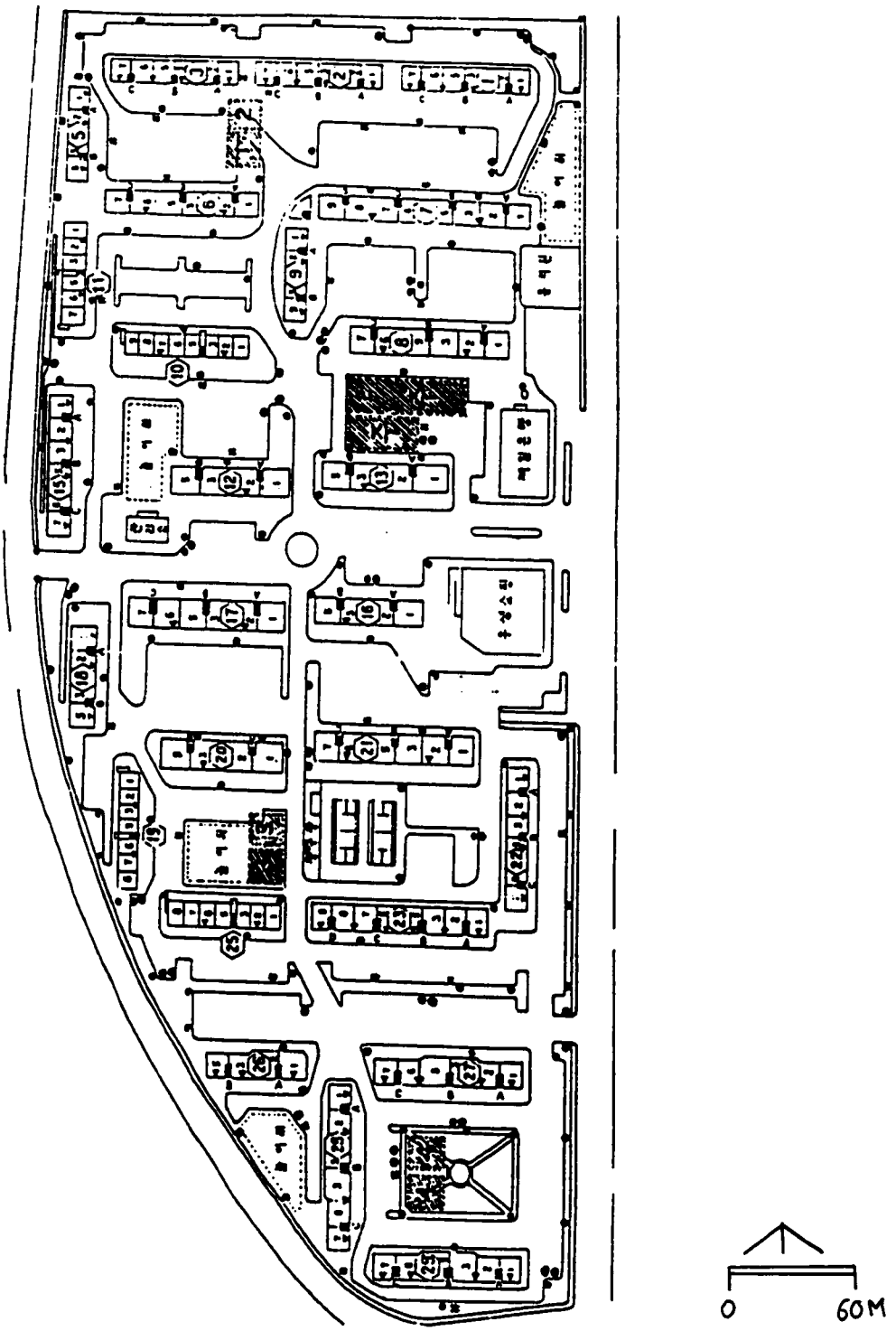
	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	very Dissatisfied
Inner road pattern	9.0	38.8	40.3	11.9	0
Size of parking lot	1.5	14.9	28.4	46.3	9.0
Parking arrangement	1.5	22.4	46.3	23.9	6.0
Playground size	3.1	26.2	33.8	32.3	4.6
Playground location	7.6	34.8	31.8	22.7	3.0
Size of open space	6.1	28.8	34.8	27.3	3.0
Location of open space	7.8	26.6	39.1	23.4	3.1

IV-3. Jamsil Usung Apartment Complex

Jamsil Usung apartment complex is located about 11 km south-east of the central business district of Seoul. Its construction was completed in 1982 as a community of 1,842 dwelling units, as shown figure 4-15. The site area covers about 30 acres, so overall housing density could be about 62 units per acre. This project was built during an apartment construction rush in the vast new residential area, called Kangnam, south of the Han River.

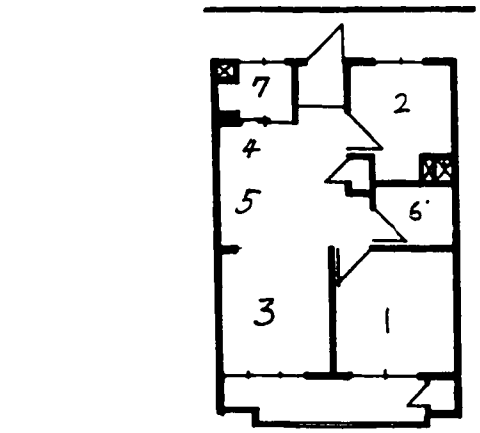
1. Dwelling unit form

Three types of dwelling unit are shown in figure 4-16. In the small-size unit, net area is about 63 sq. meters with 8.8 meters in depth. It is the two bedrooms and rear entrance type that can be accessed through the corridor. Its room layout is the most common type in the design of a small unit until now. This type consists of two sections in the unit design: one section includes a living room, a kitchen & dining, and utility room, other section includes two bedrooms and a bathroom between those rooms. As shown table 4-13, 67 percent of the respondents are satisfied with the dwelling unit. In regard to the subjective evaluation of the physical components (table 4-14), about 57 percent of the respondents are satisfied with the location of *Anbang*, while 21 percent are dissatisfied with the



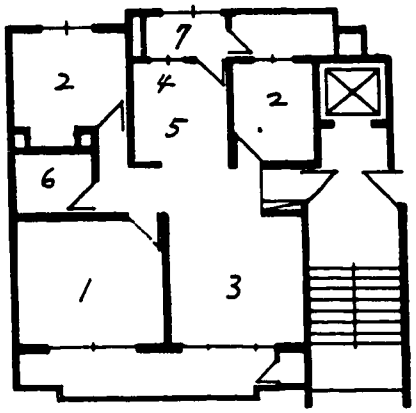
Source: Management office of Jamsil Usung complex

Figure 4-15: Jamsil Usung apartment complex



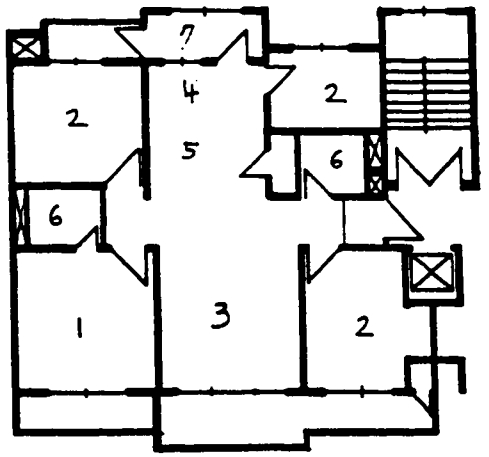
Small-size unit

	Size (sq.m)	Percentage
1. Anbang	13.7	21.8
2. Ohter room(s)	9.9	15.7
3. Living room	12.58	20.0
4. Kitchen	8.88	14.1
5. Dining space	K+D	K+D
6. Bathroom	5	7.9
7. Utility room	4.07	6.5
8. Passage way	8.85	14.1
Total	62.98	100.0



Medium-size unit

	Size (sq.m)	Percentage
1. Anbang	16.72	19.9
2. Ohter room(s)	20.85	24.9
3. Living room	17.55	20.9
4. Kitchen	9.73	11.6
5 Dining space	K+D	K+D
6 Bathroom	4.83	5.8
7 Utility room	4.04	4.8
8 Passage way	10.11	12.1
Total	83.83	100.0



Large-size unit

	Size (sq.m)	Percentage
1 Anbang	17.21	15.2
2. Ohter room(s)	37.46	33.0
3. Living room	17.64	15.5
4. Kitchen	13.67	12.0
5. Dining space	K+D	K+D
6. Bathroom	9.33	8.2
7. Utility room	5.39	4.8
8. Passage way	12.75	11.2
Total	113.45	100.0

Figure 4-16: Types of dwelling units in Jamsil Usung apartment complex

Table 4-13: Percentage of response of overall satisfaction with dwelling unit by unit size in Jamsil Usung apartment complex

		Housing unit satisfaction			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=86)	27	48	24	1
Small unit	(N=27)	26	41	33	0
Medium unit	(N=30)	30	50	20	0
Large unit	(N=29)	24	52	21	3

Chi-square=3.86, d.f.=6, p=0.69

Table 4-14: Percentage of response of subjective evaluation by components of dwelling unit and unit size in Jamsil Usung apartment complex

	Small size unit		Medium size unit		Large size unit	
Size aspects	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied
Anbang	29	21	67	13	46	11
Other bedroom	21	18	14	45	33	22
Living room	43	11	52	14	68	11
Kitchen	21	36	14	39	22	59
Dining space	12	20	6	50	30	33
Bathroom	36	14	14	24	52	30
	39	14	30	23	36	39
Location aspects	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied
Anbang	57	7	80	7	82	4
Other bedroom	41	15	45	7	44	22
Living room	54	7	60	3	82	0
Kitchen	31	35	37	27	27	50
Dining space	20	32	22	22	33	26
Bathroom	43	7	21	25	68	4
Utility room	48	7	52	7	57	7

size of *Anbang*. Fifty four percent are satisfied with the location of the living room, while 43 percent are also satisfied with its size. However, there is a high percentage of dissatisfaction with the size and location of the kitchen.

In the medium-size unit, net area is about 84 sq. meters with 9.4 meters in depth. Its layout presents one bedroom and a living room in the front, both of the same size (i.e., B+L type). The kitchen is located between two bedrooms in the back. *Anbang* and another bedroom face each other. Eighty percent of those residing in the medium unit express satisfaction with the unit, and their average satisfaction score is about 66.

Moreover, the residents are highly satisfied with the size and location of the *Anbang*, and more than 50 percent are satisfied with the size and location of the living room. However, 50 percent of the respondents are dissatisfied with the size of the dining space. Forty five percent are dissatisfied with the size of other rooms, and 39 percent dissatisfied with the size of the kitchen.

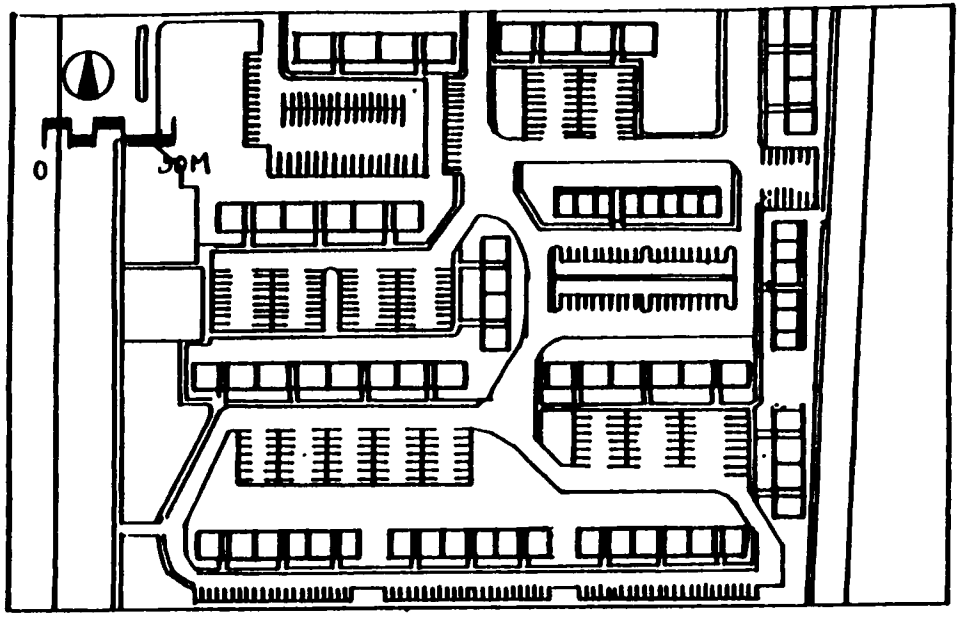
The large-size unit is Korean-style type where every room is laid out around the living room. This type of layout was most common until recently. In the middle section, a living room and a kitchen & dining area are located, but are separated by a passageway. And four bedrooms are located on each corner of the unit.

Seventy six percent living in the large unit show satisfaction with the unit, and their average score satisfaction is about 64. As to the subjective evaluation of the physical components, 82 percent are satisfied with the location of *Anbang* and living room, and 68 percent are satisfied with the size of the living room. But more than 50 percent are dissatisfied with the size and location of the kitchen.

2. Apartment building form

The building siting is a mostly repetitive parallel with high-rise buildings, but some are laid out "court" fashion by plotting another building to the side, as shown figure 4-17. Most apartment buildings here are 12-stories high and oriented toward the south, although some of them face the east (see figure 4-18). Each building consists of between 36 and 96 dwelling units depending on the size of the dwelling unit. The length of each building ranges from 41 meters to 94 meters. The building coverage is about 13 percent and FAR is about 177 percent on the basis of the analysis of the mapped area, as shown in figure 4-17.

About 73 percent of the respondents express satisfaction with their apartment building, and their average satisfaction score is 63 (table 4-15). As regards the evaluation of the



	Jamsil Usung
Date of construction completed	1982
Developer	Private
Residential area	15 acre
Number of dwelling unit	864
Net density	58 units per acre
Building coverage	12.6 %
Floor Area Ratio	177 %
Building height	12-story
Percentage of playground and park	5 %
Percentage of road and parking area*	32 %

*exclude underground parking area

Figure 4-17: Site layout plan of Jamsil Usung apartment complex

physical components (table 4-16), the residents are somewhat less satisfied with building siting, auditory privacy and visual privacy than with other components. In particular, about 38 percent of them are dissatisfied with visual and auditory privacy.

Table 4-15: Percentage of response of overall satisfaction with apartment building by unit size in Jamsil Usung apartment complex

		Apartment building satisfaction			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=86)	28	45	23	4
Small size	(N=27)	22	52	26	0
Medium size	(N=30)	37	50	13	0
Large size	(N=29)	24	35	31	10

Table 4-16: Percentage of response of subjective evaluation by components of apartment building in Jamsil Usung apartment complex

	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	very Dissatisfied
Building height	8.2	52.9	31.8	4.7	2.4
Building length	4.7	48.8	40.7	5.8	0
Access type to the unit	3.6	45.8	36.1	12.0	2.4
Building siting	3.5	31.8	36.5	21.2	7.1
Auditory privacy	3.5	23.3	33.7	33.7	5.8
Visual privacy	2.4	23.5	36.5	27.1	10.6

3. The form of other spatial components: road pattern, parking and public open space

The road pattern of this complex is hard to define, road and parking lots are more complexly interconnected. Most parking lots are connected by the inner roads (see figure 4-19). Playgrounds and parks are isolated and fragmented (see figure 4-20 and 4-21). On the basis of the analysis of the mapped area, about 32 percent of the area is used for roads and parking lots, and 5 percent for playgrounds and parks.

As shown in table 4-17, 71 percent of the respondents are satisfied with the space around or within buildings, and the average satisfaction score is 66 that is slightly higher than overall building satisfaction. The satisfaction with the space around or within buildings is not related to unit size in this complex. As regards the evaluation of the physical components (table 4-18), 37 percent are dissatisfied with parking lot size, while 20 percent are satisfied. In addition, they show some dissatisfaction with the size and location of open space.

Table 4-17: Percentage of response of overall satisfaction with space around or between building by unit size in Jamsil Usung apartment complex

	Satisfaction with the space around or within buildings				
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=86)	35	36	29	0
Small unit	(N=27)	41	41	18	0
Medium unit	(N=30)	40	37	23	0
Large unit	(N=29)	24	31	45	0

Table 4-18: Percentage of response of subjective evaluation by spatial components in Jamsil Usung apartment complex

	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	very Dissatisfied
Inner road pattern	3.6	45.2	35.7	11.9	3.6
Size of parking lot	2.3	18.6	41.9	33.7	3.5
Parking arrangement	2.4	21.2	61.2	14.1	1.2
Playground size	3.6	33.3	46.4	16.7	0
Playground location	3.5	35.3	47.1	11.8	2.4
Size of open space	9.3	22.1	30.2	32.6	5.8
Location of open space	7.1	18.8	42.4	27.1	4.7

Figure 4-18: A view of Jamsil Usung apartment complex

Figure 4-19: Parking arrangement in Jamsil Usung apartment complex

Figure 4-20: A view of neighborhood park in Jamsil Usung apartment complex

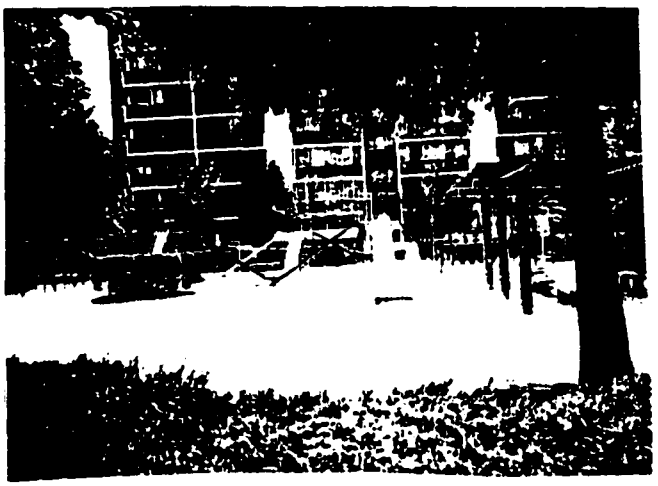


Figure 4-21: A view of playground in Jamsil Usung apartment complex

IV-4. Mokdong-1 Apartment Complex

Mokdong-1 apartment complex is located about 10 km south-west of downtown Seoul. This complex was constructed in 1985 as a community of 1,882 dwelling units on 41 acres, as shown in figure 4-22. Overall housing density is about 46 dwelling units per acre. This project was part of a massive residential development of 25,000 dwelling unit with a projected population of 12,000 on about 1,063 acres, and consisting of 14 apartment complexes. Moreover, this settlement was built by a comprehensive process in which Seoul city government controlled the entire housing process in the design and construction.

1. Dwelling unit form

There are various types of dwelling units in order to accommodate various household types. In this research, two types of dwelling units are selected for the analysis of dwelling unit from.

As shown figure 4-23, the small-size unit is the two bedrooms and rear-entrance type and its net area is about 62 sq. meters with 9.9 meters in depth. This unit has an enclosed kitchen, with a living room and dining space jointed together.

From table 4-19, 44 percent of the respondents are satisfied with the dwelling unit, and the mean satisfaction score is 56. As regards the physical components in the dwelling

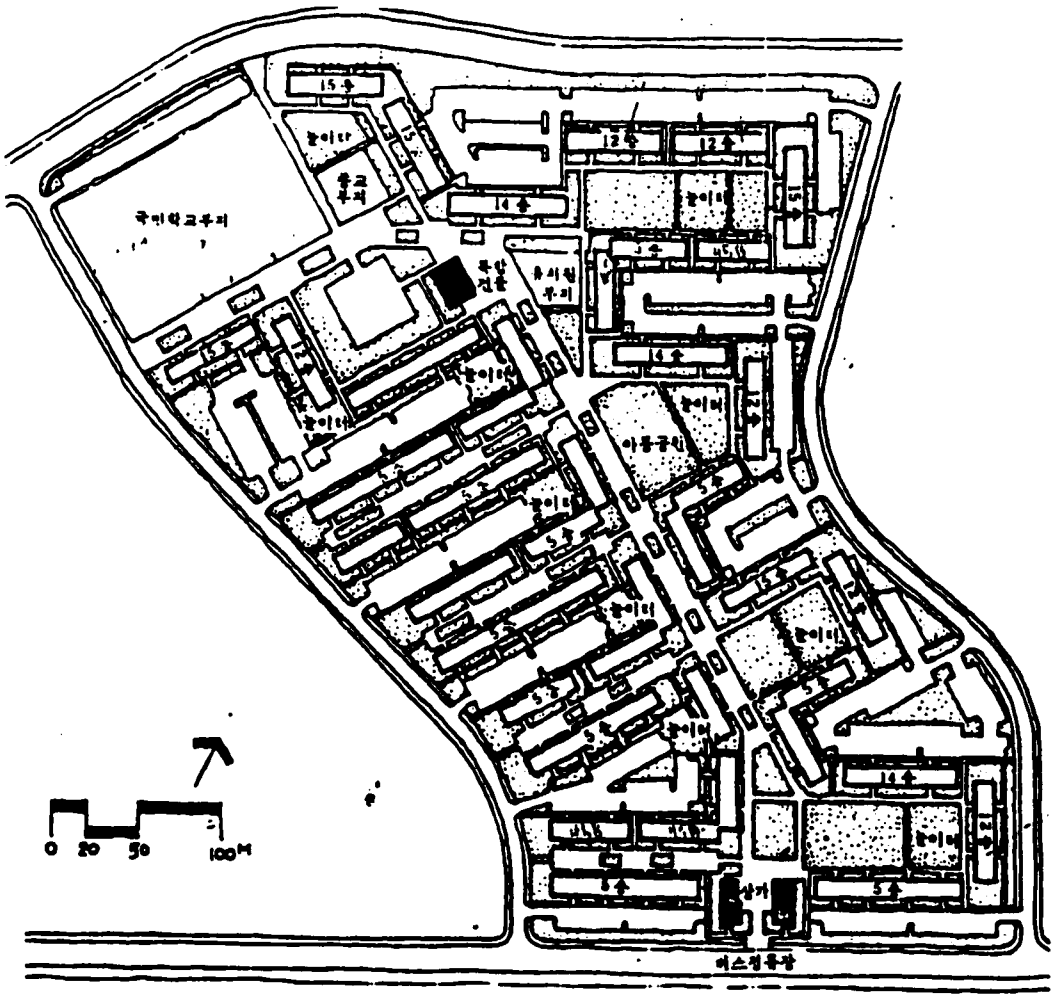
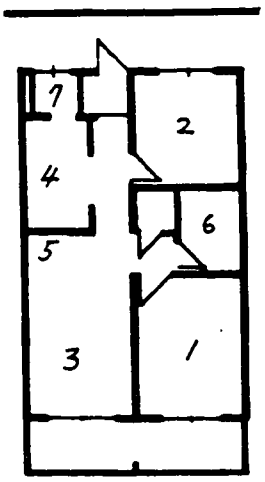
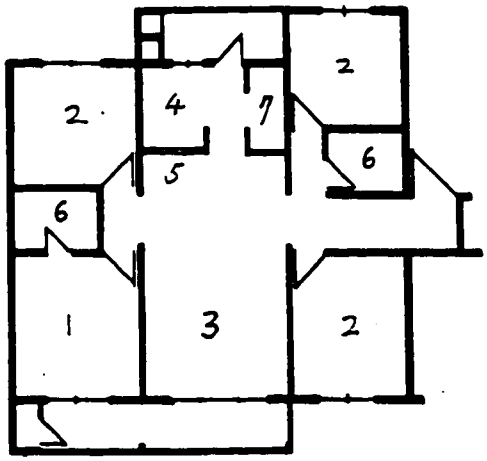


Figure 4-22: Mokdong-1 apartment complex



Small-size unit

	Size (sq.m)	Percentage
1. Anbang	13.86	22.3
2. Ohter room(s)	10.89	17.5
3. Living room	16.62	26.7
4. Kitchen	6.93	11.1
5. Dining space	L+D	L+D
6. Bathroom	4.16	6.7
7. Utility room	1.56	2.5
8. Passage way	8.16	13.1
Total	62.2	100.0



Large-size unit

	Size (sq.m)	Percentage
1. Anbang	16.38	13.5
2. Ohter room(s)	42.12	34.7
3. Living room	20.25	16.7
4. Kitchen	8.91	7.3
5. Dining space	5.4	4.4
6. Bathroom	8.4	6.9
7. Utility room	3.05	2.5
8. Passage way	16.95	14.0
Total	121.46	100.0

Figure 4-23: Types of dwelling units in Mokdong-1 apartment complex

unit (table 4-20), the residents are much more dissatisfied with the size of each room than with its location. In particular, 75 percent of the respondents are dissatisfied with the size of the utility room, 54 percent are dissatisfied with the size of the kitchen, and 44 percent are dissatisfied with the size of the living room.

The large-size unit is Korean-style type in room layout. The living room lies in the center of the unit, and all of the other rooms are located around it. Net area is about 121 sq. meters with 9.6 meters in depth.

About 72 percent of the respondents indicate overall satisfaction with the dwelling unit, and their average satisfaction score is 66. As regards the physical components, they show much greater dissatisfaction with the size and location of the dining space, while 65 percent are dissatisfied with the kitchen size.

Table 4-19: Percentage of response of overall satisfaction with dwelling unit by unit size in Mokdong-1 apartment complex

		Housing unit satisfaction			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=50)	20	38	38	4
Small unit	(N=25)	20	24	52	4
Large unit	(N=25)	20	52	24	4

Table 4-20: Percentage of response of subjective evaluation by components of dwelling unit and unit size in Mokdong-1 apartment complex

	Small size unit		Large size unit	
Size factors	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied
Anbang	28	32	44	28
Other bedroom	20	24	48	4
Living room	16	44	63	13
Kitchen	21	54	13	65
Dining space	9	41	9	68
Bathroom	25	29	28	28
Utility room	4	75	32	20
Location factor	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied
Anbang	56	16	64	8
Other bedroom	40	20	48	0
Living room	48	12	80	0
Kitchen	33	21	50	21
Dining space	27	23	32	55
Bathroom	24	24	40	16
Utility room	32	32	44	12

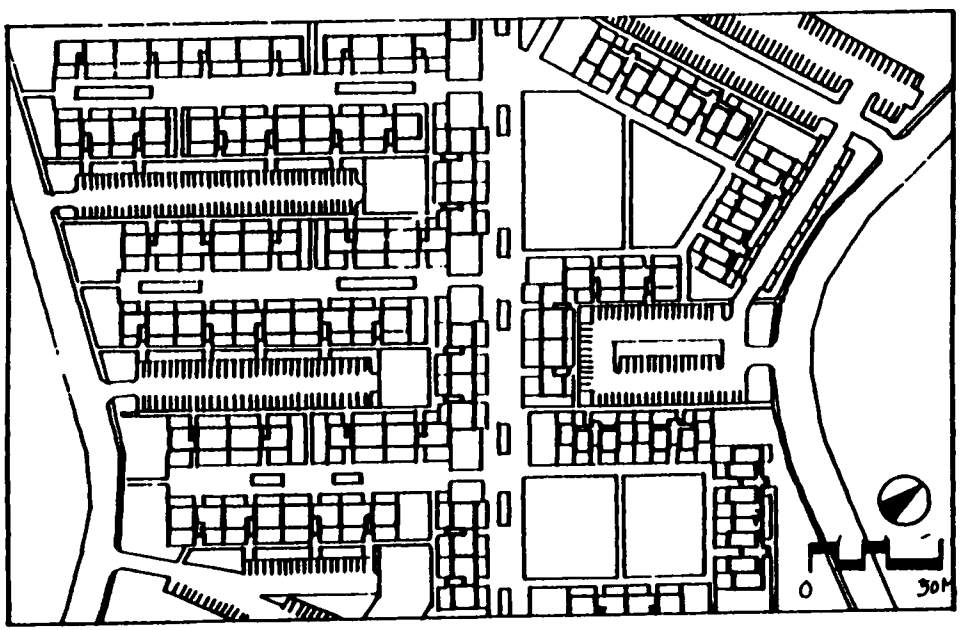
2. Apartment building form

The building siting is mostly laid out "court" fashion with middle-rise (5-story) and high-rise buildings (12-story). Each building consists of between 36 and 96 dwelling units depending on the size of the dwelling unit, and the length ranges from 48 to 95 meters. On the basis of figure 4-24, the building coverage is about 15 percent and Floor Area Ratio is about 112 percent.

Table 4-21 shows that 70 percent of the respondents are satisfied with the apartment building, and the mean satisfaction score reaches about 66. In terms of the physical components (table 4-22), more than 60 percent of the respondents are satisfied with the building height, building length, and building siting, while about 27 percent are satisfied with auditory and visual privacy.

Table 4-21: Percentage of response of overall satisfaction with apartment building by unit size in Mokdong-1 apartment complex

		Apartment building satisfaction			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=50)	34	36	30	0
Small unit	(N=25)	44	28	28	0
Large unit	(N=25)	24	44	32	0



	Mokdong-1
Date of construction completed	1985
Developer	Public
Residential area	18 acre
Number of dwelling unit	844
Net density	48 units per acre
Building coverage	15.4 %
Floor Area Ratio	112 %
Building height	5-story and 12-story
Percentage of playground and park	11.2 %
Percentage of road and parking area*	20 %

*exclude underground parking area

Figure 4-24: Site layout plan of Mokdong-1 apartment complex

Table 4-22: Percentage of response of subjective evaluation by components of apartment building in Mokdong-1 apartment complex

	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	very Dissatisfied
Building height	10	58	24	8	0
Building length	8	50	32	8	2
Access type to the unit	12	50	28	8	2
Building siting	8	40	36	12	4
Auditory privacy	2	24	48	18	8
Visual privacy	0	28	38	30	1

3. The form of other spatial components: road pattern, parking and public open spaces

Road pattern in this site is clearly a *cul-de-sac* form separating pedestrian from automobile traffic. A linear pedestrian path runs through the complex (see figure 4-25). Parking lots are accessed only from main road and are not interconnected (figure 26). The main walkway is connected to several playgrounds (figure 27) and neighborhood parks (figure 28). Trees are planted in the middle of the walkway.

Public open spaces are well organized along the main walkway. Their size is usually are small, and variable in this site. On the basis of the mapped area, about 2 acres (or 11.2 percent) are devoted to neighborhood parks and playgrounds. This is a higher percentage than any other complex selected.

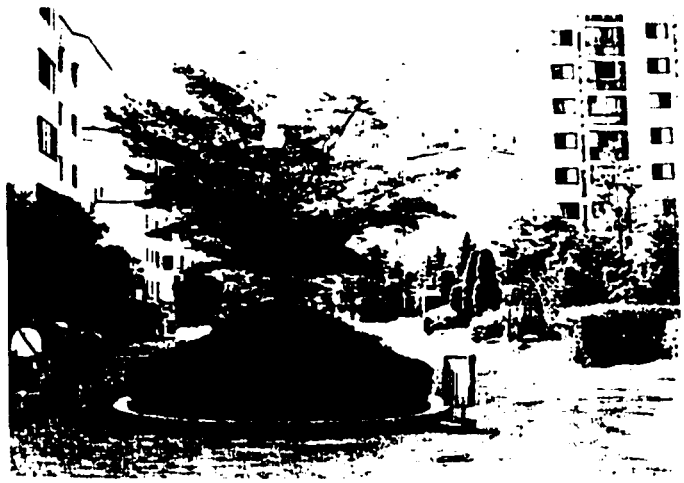


Figure 4-25: A view of main walkway in Mokdong-1 apartment complex

Figure 4-26: Parking arrangement in Mokdong-1 apartment complex

Figure 4-27: A view of neighborhood park in Mokdong-1 apartment complex

Figure 4-28: A view of playground in Mokdong-1 apartment complex

As shown in table 4-23, eighty six percent of the respondents express satisfaction with the space around or within buildings and their satisfaction score ranges up to 75 which is the highest recorded score, compared with any other complex.

In table 4-24, the respondents are highly satisfied with the physical components of the space around or within buildings: In particular, 80 percent are satisfied with road pattern, size of open space, and location of open space. However, 42 percent are dissatisfied with the size of parking lots.

Table 4-23: Percentage of response of overall satisfaction with space around or between buildings by unit size in Mokdong-1 apartment complex

		Satisfaction with the space around or within buildings			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=50)	60	26	14	0
Small unit	(N=25)	80	12	8	0
Large unit	(N=25)	40	40	20	0

Table 4-24: Percentage of response of subjective evaluation by spatial components in Mokdong-1 apartment complex

	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	very Dissatisfied
Inner road pattern	10	70	18	2	0
Size of parking lot	6	24	28	38	4
Parking arrangement	6	28	40	22	4
Playground size	8	50	32	10	0
Playground location	8.2	51.0	26.5	14.3	0
Size of open space	30	50	10	8	2
Location of open space	26	52	8	12	2

IV-5. Seoul Olympic Village Apartment Complex

Seoul Olympic Village apartment complex is located about 15 km south-east of downtown Seoul. This complex was constructed in 1988 to accommodate Seoul Olympic athletes and journalists (shown in figure 4-29). This complex consists of about 5,540 dwelling units on 136 acres. Overall housing density is about 41 units per acre. These units were used for the Seoul Olympics and then sold to the public.

1. Dwelling unit form

Two types of dwelling units are chosen for the analysis, shown in figure 4-30. The medium-size unit is B-L-B type. Net area of this unit is 83.41 sq. meters with 8.7 meters in depth. It consists of two bedrooms and a living room in the front and a bedroom, kitchen, dining space, and utility room in the back. An interesting feature in the design is the expansion of the living room by reducing the balcony area. In addition, it is designed to separate a kitchen and dining space.

From table 4-25, more than 50 percent of the respondents show overall dissatisfaction with the medium unit and their mean satisfaction score is 54. In their subjective evaluation of the physical components (table 4-26), more than 50 percent are dissatisfied with the size of *Anbang*, other bedrooms, and bathroom.

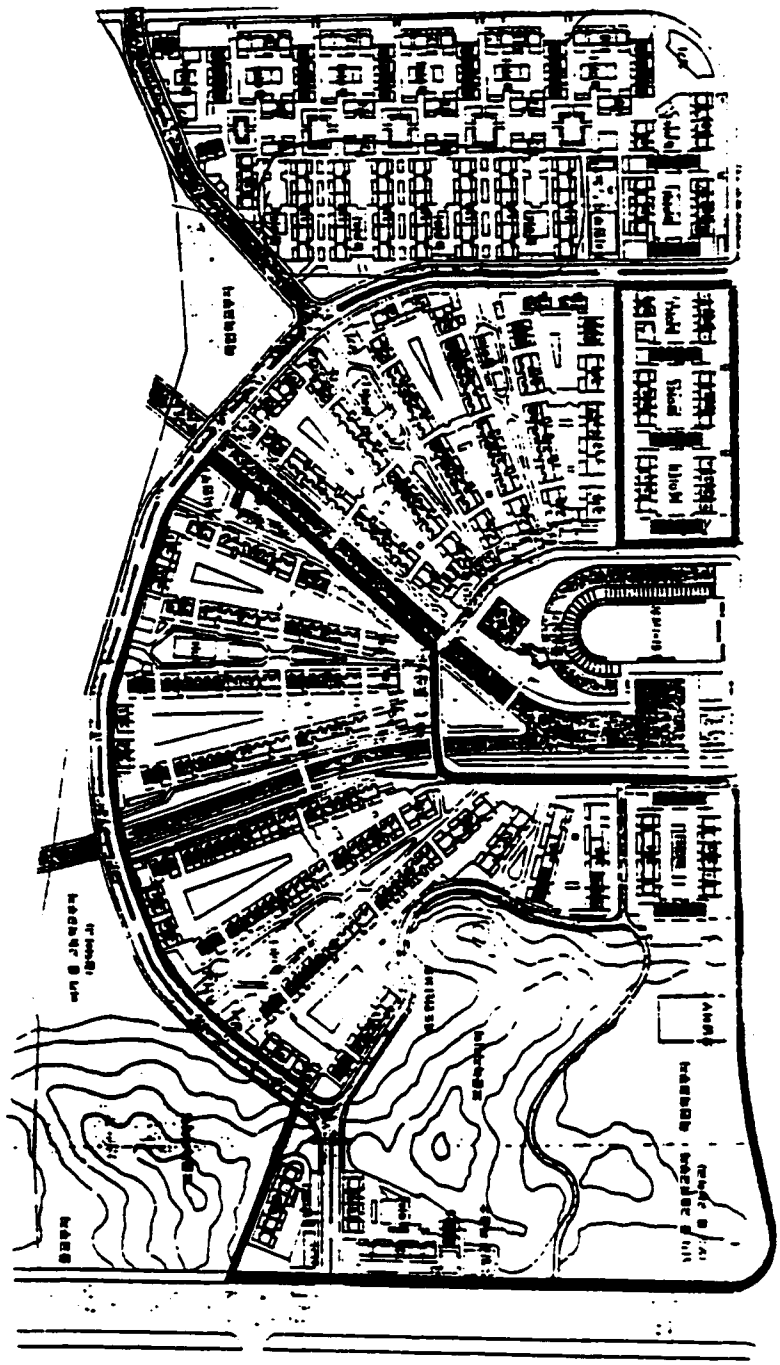
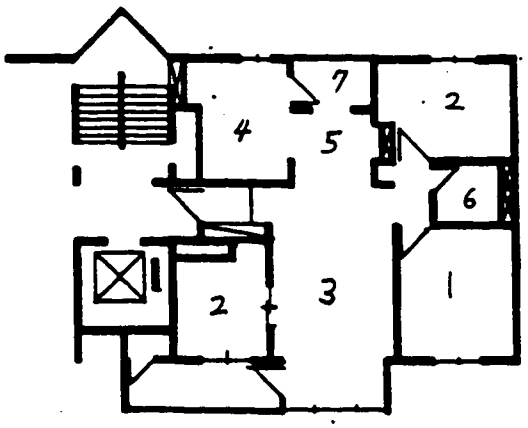
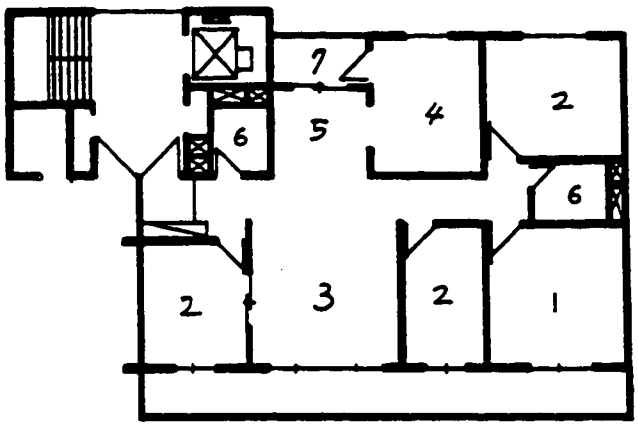


Figure 4-29: Seoul Olympic village apartment complex



Medium-size unit

	Size (sq.m)	Percentage
1. Anbang	14.07	16.9
2. Ohter room(s)	19.53	23.4
3. Living room	19.44	23.3
4. Kitchen	5.76	6.9
5. Dining space	5.53	6.6
6. Bathroom	4.86	5.8
7. Utility room	4.5	5.4
8. Passage way	9.72	11.7
Total	83.41	100.0



Large-size unit

	Size (sq.m)	Percentage
1. Anbang	17.68	14.6
2. Ohter room(s)	37.51	30.9
3. Living room	18.9	15.6
4. Kitchen	8.11	6.7
5. Dining space	8.11	6.7
6. Bathroom	8.1	6.7
7. Utility room	4.95	4.1
8. Passage way	18.09	14.9
Total	121.46	100.0

Figure 4-30: Types of dwelling units in Seoul Olympic village apartment complex

Table 4-25: Percentage of response of overall satisfaction with dwelling unit by unit size in Seoul Olympic Village apartment complex

		Housing unit satisfaction			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=56)	18	46	32	4
Medium unit	(N=25)	8	40	48	4
Large unit	(N=31)	26	52	19	3

Table 4-26: Percentage of response of subjective evaluation by components of dwelling unit and unit size in Seoul Olympic Village apartment complex

	Medium size unit		Large size unit	
Size factors	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied
Anbang	12	56	45	26
Other bedroom	13	54	23	26
Living room	28	32	29	29
Kitchen	30	26	16	52
Dining space	38	25	36	29
Bathroom	16	52	40	20
Utility room	40	32	35	19
Location factor	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied
Anbang	60	8	68	16
Other bedroom	44	8	32	21
Living room	63	8	48	13
Kitchen	54	13	54	18
Dining space	39	22	50	20
Bathroom	26	39	45	16
Utility room	50	14	52	10

In the large-size unit, net area is about 121.45 sq. meters with 9.6 meters in depth. Its room layout appears almost identical to the large unit design in Hyundai Apkujung apartment complex. Three bedrooms are clustered closely, but one bedroom is located separate from these. The living room is located between the two bedrooms in the front. About 78 percent are satisfied with this dwelling unit, and their mean satisfaction score is about 64. However, they indicate much dissatisfaction with kitchen size.

2. Apartment building form

The most striking design feature of the Seoul Olympic village is the radial layout of apartment buildings in the inner block. This kind of building siting is intended to create a strong focus and a grand scale. The radial axes converge on a community center which contain a recreation facility as well as pedestrian accessible retail shops. With the radial siting of the buildings, the apartment form appears radically different from that of the other apartment complex. In the outer block, high-rise buildings of different heights -- such as 8-story, 12-story, and 24-story -- are grouped into court-centered clusters.

The investigation is focused on the outer block. From figure 4-31, the building coverage is about 17 percent and FAR is about 183 percent.

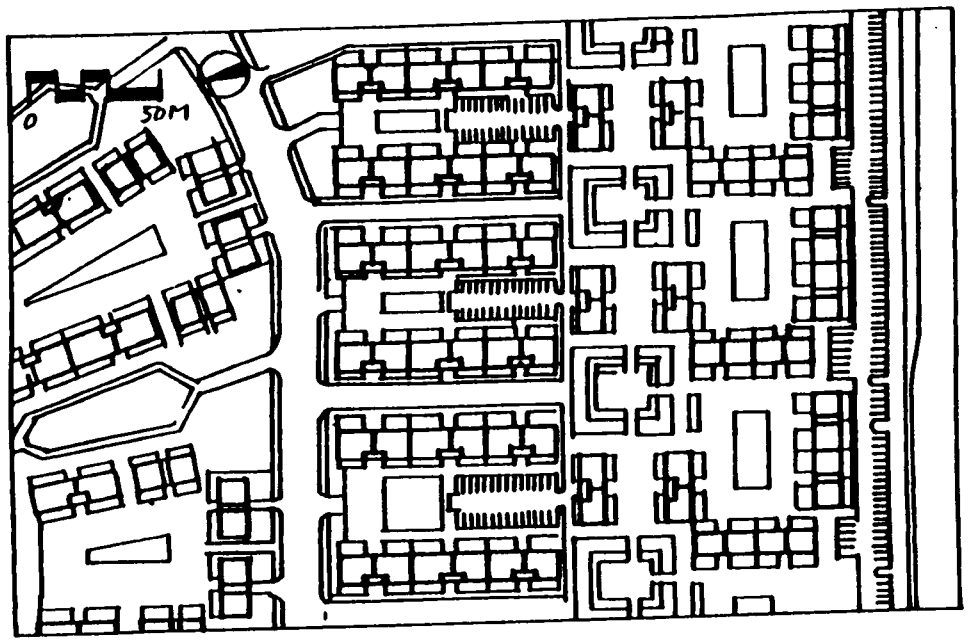
Fifty five percent of the respondents are satisfied with the apartment building, and their mean score of overall satisfaction is about 63. In terms of the physical components (table 4-28), 70 percent are satisfied with the type of unit access, and 60 percent are satisfied with the building length, while about 33 percent are dissatisfied with auditory and visual privacy.

Table 4-27: Percentage of response of overall satisfaction with apartment building by unit size in Seoul Olympic Village apartment complex

		Apartment building satisfaction			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=56)	28	27	45	0
Medium unit	(N=25)	24	20	56	0
Large unit	(N=31)	32	32	36	0

Table 4-28: Percentage of response of subjective evaluation by components of apartment building in Seoul Olympic Village apartment complex

	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	very Dissatisfied
Building height	18.2	34.5	29.1	18.2	0
Building length	12.7	49.1	36.4	1.8	0
Access type to the unit	16.4	54.5	23.6	5.5	0
Building siting	9.1	34.5	29.1	18.2	9.1
Auditory privacy	1.9	18.9	24.5	32.1	22.6
Visual privacy	5.6	18.5	25.9	33.3	16.7



	Olympic
Date of construction completed	1988
Developer	Public
Residential area	16 acre
Number of dwelling unit	338
Net density	57 units per acre
Building coverage	16.8 %
Floor Area Ratio	183 %
Building height	8-story, 12-story and 24-story
Percentage of playground and park	6.4 %
Percentage of road and parking area*	16 %

*exclude underground parking area

Figure 4-31: Site layout plan of Olympic village apartment complex

3. The form of other spatial components: road pattern, parking and public open spaces

The road pattern for this site is clearly loop type (see figure 4-32), and parking lots, both ground parking (see figure 4-33) and underground parking (see figure 4-34), branch off the loop.

There are two major pedestrian walkways. One goes through the middle of the radial layout of buildings, the other goes through the court-type layout of buildings. Each court contains a small-sized neighborhood park and playground (see figure 4-35) and is connected by the walkway. Table 4-29 shows that the respondents are highly satisfied with every physical components in Olympic Village apartment complex. But about 25 percent are dissatisfied with the playground size.

Figure 4-32: A view of inner road in Olympic village apartment

Figure 4-33: Ground parking arrangement in Olympic village apartment

Figure 4-34: Entrance of underground parking in Olympic village apartment

Figure 4-35: A view of playground in Olympic village apartment

Table 4-29: Percentage of response of overall satisfaction with space around or between buildings by unit size in Seoul Olympic Village apartment complex

	Satisfaction with the space around or within buildings				
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=56)	61	23	14	2
Medium size	(N=25)	64	20	16	0
Large size	(N=31)	58	26	13	3

Table 4-30: Percentage of response of subjective evaluation by spatial components in Seoul Olympic Village apartment complex

	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	very Dissatisfied
Inner road pattern	16.1	42.9	28.6	10.7	1.8
Size of parking lot	16.1	55.4	19.6	7.1	1.8
Parking arrangement	16.1	53.6	25.0	3.6	1.8
Playground size	5.4	37.5	32.1	23.2	1.8
Playground location	5.4	39.3	39.3	16.1	0
Size of open space	19.6	44.6	19.6	12.5	3.6
Location of open space	20.0	43.6	25.5	7.3	3.6

IV-6. Bundang Hyundai Apartment Complex

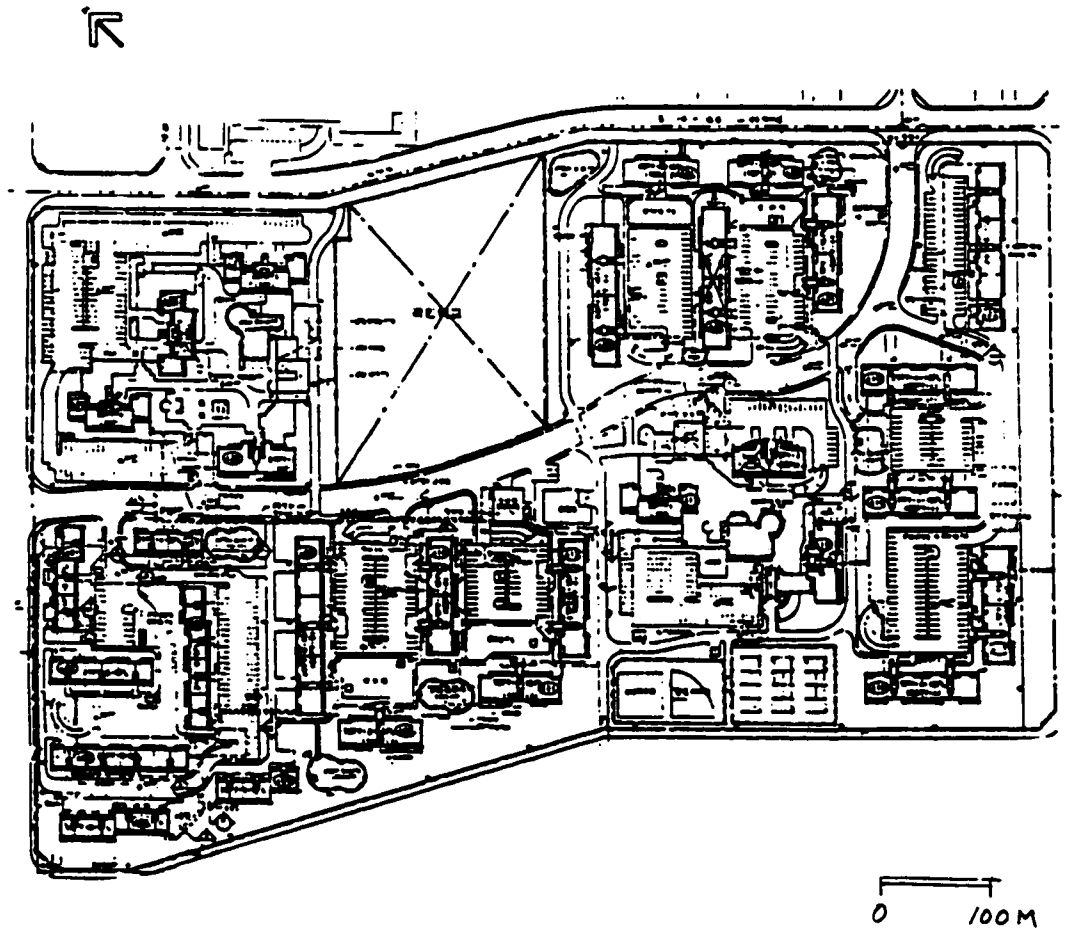
Bundang Hyundai apartment complex is a part of Bundang new town development that is located 25 km south-east of the central business district of Seoul.

This complex was constructed in 1992 as a community of 1,659 dwelling units in 31 acres, shown in figure 4-36. Overall housing density is about 54 units per acre.

1. Dwelling unit form

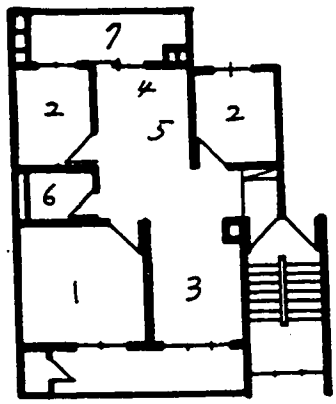
The small-size unit is a type of three bedroom and side entrance. This unit was designed as a three bedroom apartment. Therefore, the size of *Anbang*, living room and kitchen is somewhat smaller than in a two bedroom unit (figure 4-37). In addition, there is no utility room in this unit, but the rear balcony can be used for laundry. Net area of this unit is 58.5 sq. meters with 8.1 meters in depth. From Table 4-31, 72 percent are satisfied with the small size unit. The mean satisfaction score is 62.8.

From the analysis of the evaluation for each physical component (table 4-32), a high percentage of the respondents seem to be dissatisfied with the size of the living room, kitchen, and other bedrooms, while they are somewhat satisfied with the room layout.



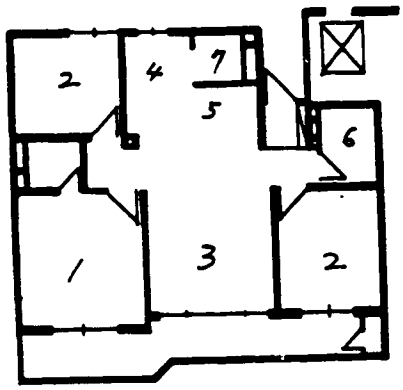
Source: Yim et al. (1994). A Study on Plannig Srandard and Density of Large-Scale Residential Developemnt. Seoul, Korea Research Institute for Human Settlement. p 74.

Figure 4-36: Bundang Hyundai apartment complex



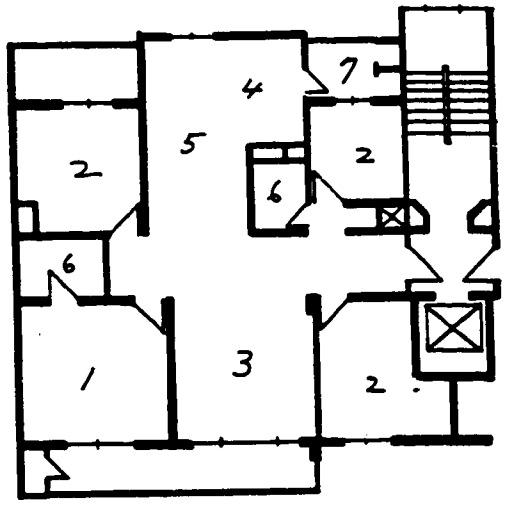
Small-size unit

	Size (sq.m)	Percentage
1. Anbang	12.96	22.2
2. Ohter room(s)	14.49	24.8
3. Living room	10.8	18.5
4. Kitchen	8.4	14.4
5. Dining space	K+D	K+D
6. Bathroom	3.6	6.2
7. Utility room	NA	NA
8. Passage way	8.25	14.1
Total	58.5	100.0



Medium-size unit

	Size (sq.m)	Percentage
1. Anbang	15.21	18.5
2. Ohter room(s)	21.78	26.5
3. Living room	14.04	17.1
4. Kitchen	10.67	13.0
5. Dining space	K+D	K+D
6. Bathroom	7.39	9.0
7. Utility room	2.08	2.5
8. Passage way	10.89	13.3
Total	82.06	100.0



Large-size unit

	Size (sq.m)	Percentage
1. Anbang	18.9	14.9
2. Ohter room(s)	39.08	30.8
3. Living room	18.9	14.9
4. Kitchen	20.42	16.1
5. Dining space	K+D	K+D
6. Bathroom	10.14	8.0
7. Utility room	2.16	1.7
8. Passage way	17.37	13.7
Total	126.97	100.0

Figure 3-37: Types of dwelling unit in Bundang Hyundai apartment complex

Table 4-31: Percentage of response of overall satisfaction with dwelling unit by unit size in Bundang Hyundai apartment complex

		Housing unit satisfaction			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=82)	21	45	34	0
Small unit	(N=25)	24	48	28	0
Medium unit	(N=28)	7	36	57	0
Large unit	(N=29)	31	52	17	0

Table 4-32: Percentage of response of subjective evaluation by components of dwelling unit and unit size in Bundang Hyundai apartment complex

	Small size unit		Medium size unit		Large size unit	
Size factors	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied
Anbang	36	12	36	14	48	7
Other bedroom	12	44	30	30	31	28
Living room	17	61	25	25	33	15
Kitchen	13	54	19	65	69	19
Dining space	9	41	12	48	56	19
Bathroom	21	50	41	15	62	17
Utility room	45	18	11	54	41	24
Location factor	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied
Anbang	65	12	71	0	76	7
Other bedroom	48	12	41	22	55	7
Living room	46	21	54	11	61	4
Kitchen	39	22	31	42	62	12
Dining space	38	10	21	50	42	19
Bathroom	20	28	54	14	55	7
Utility room	36	9	32	39	41	24

The medium-size unit has three bedrooms, its net area is about 82 sq. meters with 8.4 meters in depth. This unit is the type configured with two bedrooms and a living room in the front (i.e., B+L+B type). The kitchen, the dining space, and utility room are designed as one area located at the back of the unit, and there is no rear balcony in this unit. Only 43 percent are satisfied with the unit, and average satisfaction score is 54. The residents are highly dissatisfied with the kitchen size, and about 50 percent are dissatisfied with the size and location of the dining space.

The large-size unit is Korean-style type of room layout, and its net area is about 127 sq. meters with 11.6 meters in depth. This unit has the largest kitchen and dining space proportionally as compared to units in other complexes. Therefore, a higher percentage (70 %) of the respondents are satisfied with the size of the kitchen and 56 percent are satisfied with the size of the dining space.

2. Apartment building form

The building siting is mostly laid out "court" fashion (see figure 4-38), and there is a separation in the layout of middle-rise and high-rise buildings. Mid-rise means five stories, while high-rise ranges from 16 stories to 30 stories.

Figure 4-38: A view of apartment building in Bundang Hyundai apartment complex

This separation serves to make for clearly differentiated neighborhoods. Each building has a sloped roof, instead of a flat roof to create a variation of facade treatment. From figure 4-39. each building consists of between 36 and 64 dwelling units depending on the number of stories and the length of the building. The building coverage is about 21 percent and FAR is about 200 percent on the basis of the mapped area.

As shown table 4-33, 54 percent of the respondents express satisfaction with the apartment building, and their average satisfaction score is 57, that is the lowest score for all complexes. As regards the evaluation of the physical components (table 4-34), the residents are somewhat less

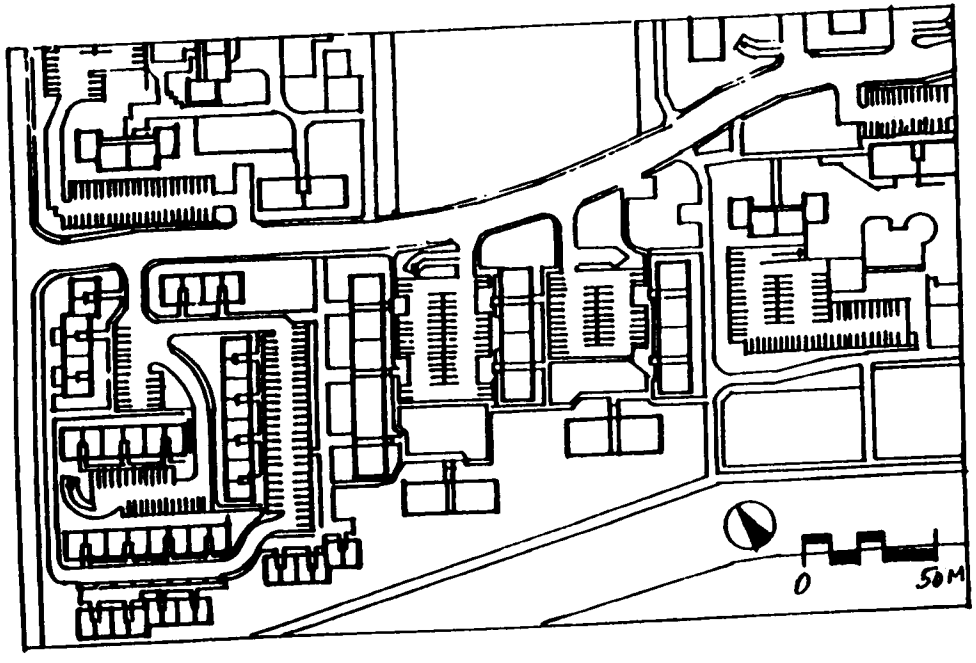
satisfied with auditory privacy and visual privacy than with other components.

Table 4-33: Percentage of response of satisfaction with apartment building by unit size in Bundang Hyundai apartment complex

		Apartment building satisfaction			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=82)	16	38	44	2
Small size	(N=25)	24	28	44	4
Medium size	(N=28)	11	39	50	0
Large size	(N=29)	14	45	38	3

Table 4-34: Percentage of response of subjective evaluation by components of apartment building in Bundang Hyundai apartment complex

	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	very Dissatisfied
Building height	11.0	37.8	24.4	19.5	7.3
Building length	7.3	42.7	40.2	9.8	0
Access type to the unit	5.1	44.9	32.1	14.1	3.8
Building siting	7.5	32.5	27.5	21.3	11.3
Auditory privacy	5.0	16.3	32.5	31.3	15.0
Visual privacy	7.5	15.0	38.7	28.8	10.0



	Bundang Hyundai
Date of construction completed	1992
Developer	Private
Residential area	16 acre
Number of dwelling unit	1014
Net density	62 units per acre
Building coverage	12.4 %
Floor Area Ratio	193 %
Building height	5-story, 16-story and 30-story
Percentage of playground and park	3.6 %
Percentage of road and parking area*	25 %

*exclude underground parking area

Figure 4-39: Site layout plan of Bundang Hyundai apartment complex

3. The form of other spatial components: road patterns, parking and public open spaces

The main road pattern on this site is clearly loop type that divides the complex into two sections, and parking lots, both underground parking (see figure 4-40)and ground-level parking (see figure 4-41), branching off the loop. Playgrounds are isolated and fragmented by being located at the corner of the apartment buildings, as shown in figure 4-42. There are four small resting areas located in a court-type of siting (see figure 4-43). It is the designer's intention to offer more open space and to provide transitional space between public space (parking lots) and private space (the dwelling unit).

From table 4-35, seventy five percent of the respondents are satisfied with the space around or within buildings, and their average satisfaction score is about 65. There is no relationship between unit size and overall satisfaction with the space around or within buildings. As regards the evaluation of the physical components (table 4-36), a higher percentage say that they are satisfied with the size and arrangement of parking lots and main road pattern.

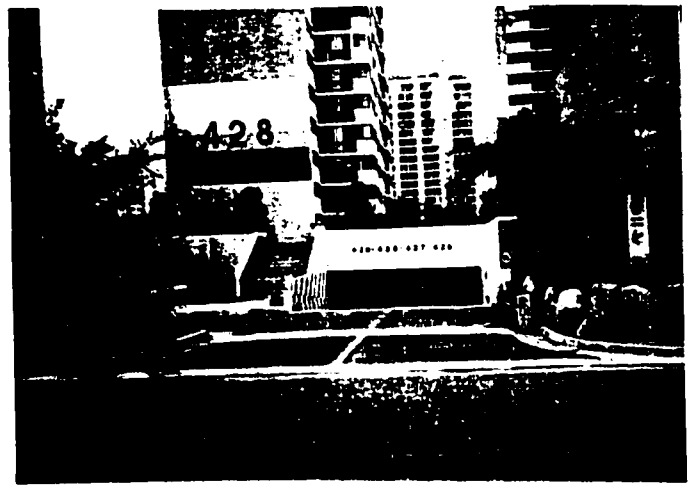


Figure 4-40: Entrance of underground parking lot in Bundang Hyundai apartment complex

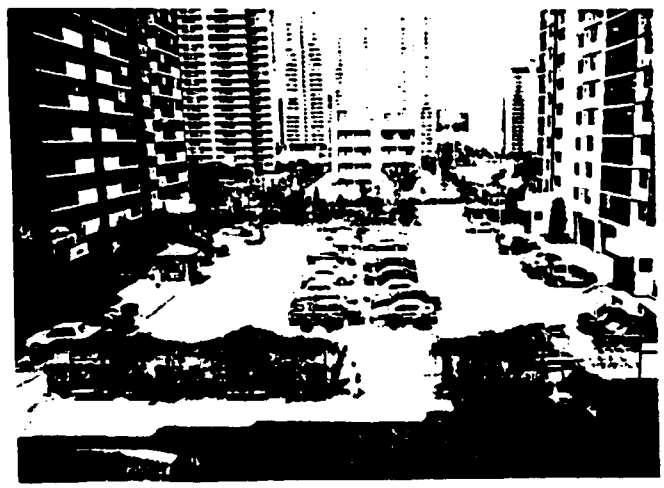


Figure 4-41: Ground parking arrangement in in Bundang Hyundai apartment complex

Figure 4-42: A view of playground in in Bundang Hyundai apartment complex

Figure 4-43: A view of resting area in Bundang Hyundai apartment complex

Table 4-35: Percentage of response of overall satisfaction with space around or between buildings by unit size in Bundang Hyundai apartment complex

		Satisfaction with space			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=81)	31	44	25	0
Small unit	(N=24)	17	50	33	0
Medium unit	(N=28)	32	47	21	0
Large unit	(N=29)	41	38	21	0

Table 4-36: Percentage of response of subjective evaluation by spatial components in Bundang Hyundai apartment complex

	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	very Dissatisfied
Inner road pattern	7.6	49.4	34.2	7.6	1.3
Size of parking lot	17.5	45.0	23.8	12.5	1.3
Parking arrangement	10.3	47.4	37.2	3.8	1.3
Playground size	5.2	29.9	49.4	15.6	0
Playground location	6.6	34.2	39.5	15.8	3.9
Size of open space	7.4	35.8	37.0	17.3	2.5
Location of open space	10.0	32.5	37.5	16.3	3.7

IV-7. Suse Samsung Apartment Complex

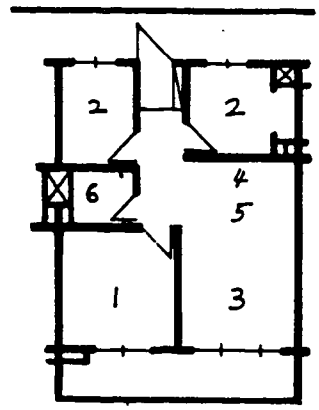
Suse Samsung apartment complex is located on a fringe area of Seoul, about 16 km south-east of downtown Seoul. This apartment complex was completed by two different developers in 1994: they shared the design and construction of the project.

1. Dwelling unit form

This complex provides only two types of dwelling units. As shown in figure 4-44, the small-size unit is the rear-entrance type with three bedrooms. Its net area is about 59 sq. meters with 8.3 meters in depth. This unit was designed to put a kitchen, a dining space, and a living room together without a utility room. The front balcony area can be used for laundry.

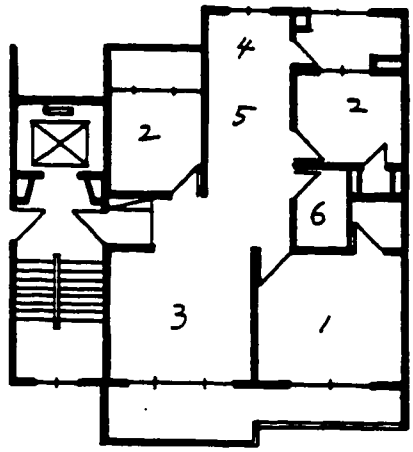
From table 4-37, 78 percent are satisfied with the small unit, and the mean satisfaction score is 64. However, a high percentage is dissatisfied with the size of the utility room, the kitchen, and the other bedrooms (table 4-38).

In the medium-size unit, net area is about 83 sq. meters with 10.7 meters in depth. This unit is the B+L type which means one bedroom and a living room in the front, both of the same size. The kitchen and dining space are located between the two bedrooms in the back, its shape appears narrow and deep. Eighty five percent are satisfied with this unit, and their average satisfaction score is up to 74, the highest score.



Small-size unit

	Size (sq.m)	Percentage
1. Anbang	12.96	22.1
2. Ohter room(s)	16.11	27.5
3. Living room	9.9	16.9
4. Kitchen	8.58	14.6
5. Dining space	L+D+K	L+D+K
6. Bathroom	4.07	6.9
7. Utility room	NA	NA
8. Passage way	7.05	12.0
Total	58.67	100.0



Medium-size unit

	Size (sq.m)	Percentage
1. Anbang	17.55	21.1
2. Ohter room(s)	17.91	21.6
3. Living room	17.55	21.1
4. Kitchen	12.96	15.6
5. Dining space	K+D	K+D
6. Bathroom	7.22	8.7
7. Utility room	NA	NA
8. Passage way	9.9	11.9
Total	83.09	100.0

Figure 4-44: Types of dwelling units in Suse Samsung apartment complex

Table 4-37: Percentage of response of overall satisfaction with dwelling unit by unit size in Suse Samsung apartment complex

		Housing unit satisfaction			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=40)	43	35	22	0
Small unit	(N=20)	30	40	30	0
Medium unit	(N=20)	55	30	15	0

Table 4-38: Percentage of response of subjective evaluation by components of dwelling unit and unit size in Suse Samsung apartment complex

	Small size unit		Medium size unit	
Size aspects	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied
Anbang	35	20	70	5
Other bedroom	5	60	30	40
Living room	30	25	90	5
Kitchen	10	65	37	16
Dining space	7	29	28	22
Bathroom	40	25	35	15
Utility room	27	73	45	15
Location aspects	Satisfied	Dis-satisfied	Satisfied	Dis-satisfied
Anbang	50	10	80	5
Other bedroom	32	21	40	10
Living room	44	17	85	0
Kitchen	11	56	59	12
Dining space	14	57	47	0
Bathroom	45	15	45	15
Utility room	0	57	58	5

From table 4-38, the residents are most often satisfied with the physical components. In particular, they are highly satisfied with the size and location of *Anbang* and the living room, but 40 percent are dissatisfied with the size of the other rooms.

2. Apartment building form

The building siting is characterized by "court" fashion with high-rise buildings as shown in figure 4-45 and 4-46. The apartment buildings have a stepped elevation for the variation of skyline. Each building consists of between 36 and 96 dwelling units depending on the size of the dwelling unit. The building coverage is about 22 percent and FAR is about 314 percent, which is the highest among the selected sites. This high FAR is largely due to the mitigation in architectural regulations.

Table 4-39 shows that 60 percent of the respondents are satisfied with the apartment building, and the mean satisfaction score is 59.

Regards to physical components of the apartment building, (table 4-40), even though most residents are satisfied with the building height, they are very dissatisfied with the auditory and visual privacy because of excessive proximity of parking to

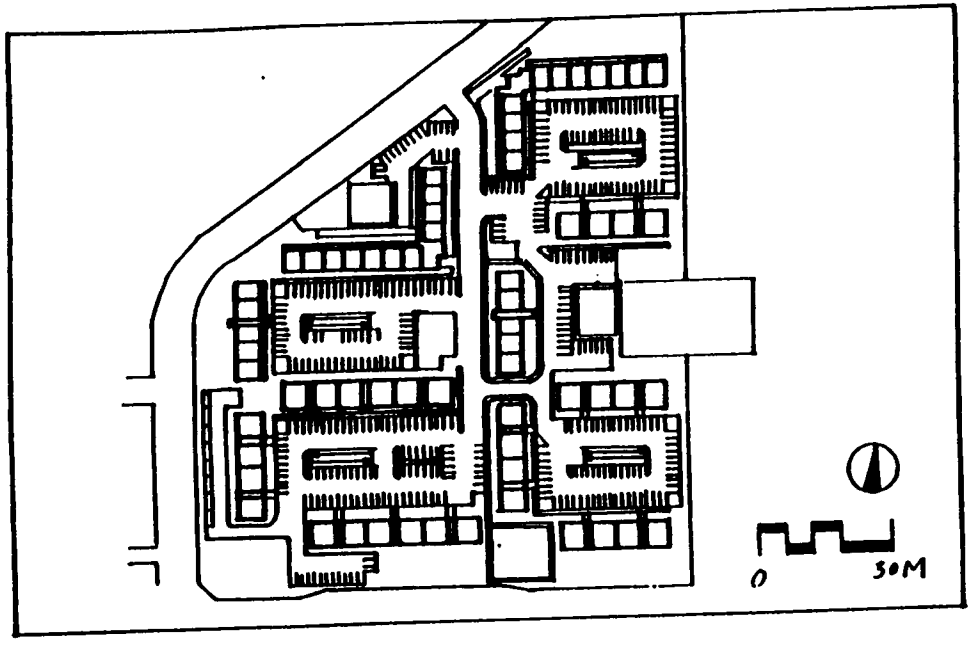
dwelling unit windows, as shown figure 4-47. In addition, 45 percent do not like the building siting.

Table 4-39: Percentage of response of overall satisfaction with apartment building by unit size in Suse Samsung apartment complex

		Apartment building satisfaction			
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=40)	28	32	35	5
Small size	(N=20)	20	30	45	5
Medium size	(N=20)	35	35	25	5

Table 4-40: Percentage of response of subjective evaluation by components of apartment building in Suse Samsung apartment complex

	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	very Dissatisfied
Building height	10	50	35	5	0
Building length	7.5	37.5	45	5	5
Access type to the unit	5.1	48.7	15.4	17.9	12.8
Building siting	0	22.5	32.5	30	15
Auditory privacy	2.5	12.5	30	25	30
Visual privacy	0	2.5	42.5	40	15



	Suse Samsung
Date of construction completed	1994
Developer	Private
Residential area	8.4 acre
Number of dwelling unit	930
Net density	111unit s per acre
Building coverage	17.8 %
Floor Area Ratio	253%
Building height	14-story and 15 story
Percentage of playground and park	4 %
Percentage of road and parking area*	41 %

*exclude underground parking area

Figure 4-45: Site layout plan of Suse Samsung apartment complex

Figure 4-46: A view of Suse Samsung apartment complex

Figure 4-47: A view of parking lot and dwelling unit windows

3. Form of other spatial components: road patterns, parking and public open spaces

Road pattern at this site is hard to specify with one access road, that branches off a major road and that bisects the complex. All parking areas are connected to this access road. In the middle of the parking area, there is an access-ramp that leads to the underground parking. There is one playground (see figure 4-48) and one neighborhood park that is shared with a neighboring apartment.

From table 4-41, 65 percent are satisfied with this space and their satisfaction score is 60, the lowest score. In addition, they indicate that they are dissatisfied with most physical components of the space around or within buildings (see table 4-42). In particular, about 50 percent are dissatisfied with the parking lot size and the location and size of open space.

Table 4-41: Percentage of response of overall satisfaction with space around or between by unit size in Suse Samsung apartment complex

	Satisfaction with the space around or within buildings				
Housing size		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
Total	(N=40)	23	42	30	5
Small unit	(N=20)	30	45	25	0
Medium unit	(N=20)	15	40	35	10

Table 4-42: Percentage of response of subjective evaluation by spatial components in Suse Samsung apartment complex

	Very Satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	very Dissatisfied
Inner road pattern	2.5	30	50	10	7.5
Size of parking lot	0	5	47.5	37.5	10
Parking arrangement	0	18.9	59.5	13.5	8.1
Playground size	2.6	28.9	57.9	10.5	0
Playground location	2.6	36.8	55.3	5.3	0
Size of open space	2.5	20.0	32.5	37.5	7.5
Location of open space	2.6	20.5	28.2	38.5	10.3

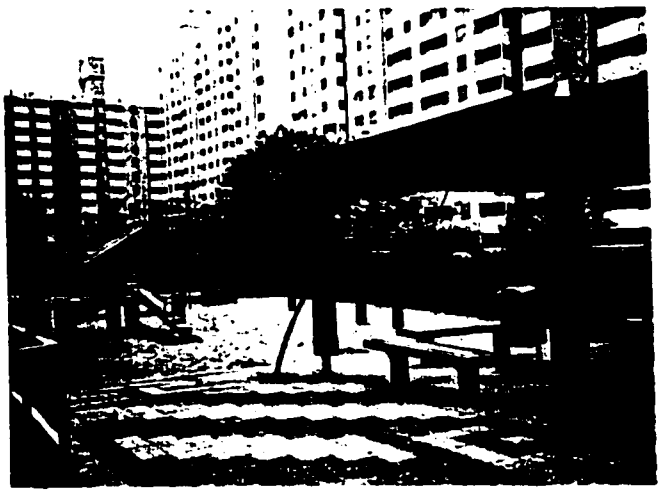


Figure 4-48: A view of playground in Suse Samsung apartment comlex

IV. Comparison of the Levels of Satisfaction between Seven Apartment Complexes

Seven cases of apartment complexes have been analyzed using the basic elements of apartment form: dwelling unit, apartment building, grouping of apartment buildings, and space around or between buildings.

This section will compare differences in levels of resident satisfaction between seven apartment complexes according to different apartment forms.

1. Dwelling unit form

Among small units of all five apartment complexes studied in this dissertation, the small unit in the Suse Samsung apartment complex was rated somewhat higher than all others on overall satisfaction, while the small unit in the Mokdong-1 was rated the least satisfactory. The small unit in the Suse Samsung complex has a rear entrance and three bedrooms, while that in the Mokdong-1 complex has two-bedrooms and a rear entrance. About 56 percent of those living in a small unit in the Mokdong-1 are dissatisfied with their dwelling unit. The complex gas the narrowest width of all small units smallest width. Thus, the shape of every room in Mokdon-1 results in a

narrow-deep form as compared to other two-bedroom units, which may cause dark areas around both the entrance and the kitchen. This could be one reason for the high degree of dissatisfaction. The small unit in the Jamsil Usung apartment complex has two-bedrooms and a rear entrance and only 32 percent of the respondents expressed dissatisfaction with their dwelling unit. However, there is no significant difference in overall satisfaction with the small dwelling units among the different apartment complexes. As regards the subjective evaluation of physical components, there is no significant difference in the level of satisfaction with the *Anbang* size and the location of every room among small units. In regards to the size of other bedroom(s), the two-bedroom type as shown in the Jamsil Usung complex and the Mokdong-1 complex is much more satisfactory than the three-bedroom type. In addition, residents indicate that they are much more satisfied with living room size and kitchen size in Jamsil Usung than those in other small units.

Among medium units of all six apartment complexes, the unit in Suse Samsung complex was rated the highest in overall satisfaction with dwelling unit; Jamsil Usung was rated the second highest, while Apkujung Hyundai, Olympic Village, and Bundang hyundai were rated the least satisfactory. From this point of view, the B+L type unit

elicits much more satisfaction than the B+L+B type unit. The B+L type has a larger *Anbang* and a living room, but a smaller kitchen and dining space than the B+L+B type. As regards the subjective evaluation of physical components, respondents are much more satisfied with the size of *Anbang* and living room in the medium unit of Suse Samsung and Jamsil Usung, while those in the unit of Olympic Village and Bundang Hyundai are the least satisfied. The medium units of Apkujung Hyundai are rated the least satisfactory in respect to kitchen size and location. About 67 percent of the respondents living in the medium unit of Apkujubg Hyundai are dissatisfied with both kitchen size and location.

Among large units of all six apartment complexes, the large units in Mokdong-1 and Apkujung Hyundai are rated the least satisfactory. Others show no significant difference in the level of overall satisfaction with the dwelling unit. As regards the subjective evaluation of physical components, the respondents are the most satisfied with *Anbang* size in the large unit of Bundang Hyundai, while residents indicate the least satisfaction with *Anbang* location in the large unit of Banpo Jukong-1, located in the back of the dwelling unit. In addition, they are less satisfied with living room size in the units of the Olympic Village and Suse Samsung than in other complexes. In respect to kitchen size, the

large unit of Bundang Hyundai elicited the greatest satisfaction because it has the largest kitchen size proportionately.

2. Apartment building form

As regards overall satisfaction with apartment building, the Olympic Village, Bundang Hyundai and Suse Samsung are rated less satisfactory than other complexes. About 46 percent of residents living in Bundang Hyundai, 45 percent in Olympic Village and 40 percent in Suse Samsung are dissatisfied with their apartment building. One of the reasons may be building height. In the late-1980s, 24-story apartment buildings became popular because of improved techniques in building construction and regulatory mitigation.[2] Since then, apartment complexes have been developed with greater density (e.g., usually more than FAR 200% and less than FAR 300%). These same three complexes also are rated somewhat less satisfaction as regards visual and auditory privacy, a problem that could be related to

[2] In 1990, by the change in the architectural regulation, the limitation of the ground coverage was mitigated from 25 percent to 30 percent, the FAR was mitigated from 250% to 300%, the distance regulation between two apartment buildings was mitigated from 1.25H to 1.0H (H: apartment building height).

residential density. This is especially the case in Suse Samsung complex where only 2 percent of the residents are satisfied with visual privacy, while only 14 percent are satisfied with auditory privacy.

3. Space around or between buildings

Table 4-43 shows the spatial characteristics of the seven apartment sites.

Table 4-43: Spatial characteristics of the seven apartment complexes

	Banpo Jukong-1	Apkujung Hyundai	Jamsil Usung	Mokdong-1	Olympic Village	Bundang Hyundai	Suse Samsung
Building siting	parallel	parallel	court	court with different story bldgs	court with different story bldgs	court	court
Road pattern	small grid	large grid	No pattern	cul-de-sac	loop	loop	No pattern
Parking	street	cul-de-sac	No pattern	cul-de-sac	cul-de-sac	cul-de-sac	No pattern
Pedestrian system	no	no	no	yes	yes	yes	no
Playground	Int.*	Int.	Int.	Seg.**	Seg.	Seg.	Int.

- * Integrated
- ** Segregated

When I examined satisfaction with the space around or between buildings, Banpo Jukong-1, Mokdong-1, and the Olympic Village are rated much higher than other complexes. Banpo Jukong-1, Mokdong-1, and the Olympic village are publicly sponsored projects, Therefore, they provide a relatively larger area for open space than privately sponsored projects. As

regards the subjective evaluation of physical components, the respondents living in Jamsil Usung and Suse Samsung are the least satisfied with inner road pattern. Mokdon-1 and the Olympic Village complexes are rated as the most satisfactory with their playground and open space.

Chapter Five

Analysis of Resident satisfaction: Residents' evaluation of apartment forms

Introduction

This chapter contains a description of the social, economic, and demographic characteristics among the sample. Following this chapter is an analysis of residents' evaluation of the typical types of apartment form. In detail, it presents a comparison of residents' evaluation of types of apartment form classified according to dwelling unit, apartment building, grouping of apartment buildings and space between or around buildings.

V-1. Descriptive characteristics of the sample

Table 5-1 summarizes the social, economic, and demographic characteristics of the entire sample[1]. These characteristics of the sample are described as to income difference, household size, age, ownership, and duration of residence.

---

[1] The sample size of each category varies from 391 to 463 because of massing data. Especially, there is more missing data on income category. About 16 percent of entire sample refused to reveal their household income.

Table 5-1: Sample characteristics

	Characteristics	Percentage of Responses			
		Small unit	Medium unit	Large unit	Total
1. Income*	Less than 150	41	11	4	17
	151-250	37	45	25	36
	251-350	15	27	33	26
	more than 351	7	17	38	21
	Total	100 (N=109)	100 (N=143)	100 (N=139)	100 (N=391)
2. Household size	1-2 persons	19	6	9	11
	3-4 persons	71	76	58	68
	more than 5 persons	10	18	33	21
	Total	100 (N=123)	100 (N=170)	100 (N=170)	100 (N=463)
3. Age	20-29	16	8	5	9
	30-39	39	39	22	38
	40-49	36	39	46	41
	more than 50	9	14	27	12
	Total	100 (N=123)	100 (N=168)	100 (N=167)	100 (N=458)
4. Ownership	Own	65	80	87	78
	Rent	35	20	13	22
	Total	100 (N=121)	100 (N=169)	100 (n=165)	100 (N=460)
5. Duration of residence	New comer	27	18	16	19
	Short-term	38	36	20	31
	Medium-term	23	15	25	21
	Long-term	12	31	39	29
	Total	100 (N=123)	100 (N=170)	100 (N=170)	100 (N=463)
Mean Income*		210	273	396	299
Mean of household size		3.6 persons	4.0 persons	4.2 persons	3.9 persons
Mean of duration of residence		2 years 10 months	5 years 1 month	5 years 6 months	4 years 8 months

* Unit =10,000 won ($1= about 900 won at 1995)

1. Income

The mean income of the entire sample is about 3 million won (about $3,300) per month in 1995 monetary term. The average monthly income for salary wage earners' household of all cities in Korea is about 1.5 million won in 1995.[2] From this, the population in this study can be defined as "upper-middle income families". Analyzing the sample in greater detail, the average monthly income for the small unit families is approximately 2.1 million won (about $2,300 per month), while the average income for the medium unit families is about 2.7 million won (3,000 per month), and the average income for the large unit families is about 3.9 million won per month (about $4,300 per month). From this point of view, there are considerable differences in household income according to different dwelling unit size.

This considerable difference is also confirmed by investigating the distribution of income groups by dwelling unit size. Almost 40 percent of the respondents in small units earn below the level of 1.5 million won, while 11 percent in medium units and only 4 percent in large units earn below this level. In medium units, most residents are classed in the

[2] National Statistical Office, Republic of Korea (1997). *Major statistics of Korean Economy*. pp156-157.

income range of 1.5 million won-2.5 million won (about 45 percent) and 2.5 million won-3.5 million won (about 27 percent). In large units, about 37 percent fall into the income range of above 3.5 million won, and about 33 percent belong in the income range of 2.5 million won-3.5 million won.

2. Household size

While the household size of the respondents ranges from one to nine persons, the mean size of the entire sample is 3.9 persons per household. From Table 5-1, most of the respondents (68 percent) belong to nuclear families which consist of husband, wife and child(ren), even in the case of large dwelling units. Twenty-one percent of the sample represent families with more than 5 persons. These may be considered extended families that consist of the nuclear family with related individuals from other generations.

In the small dwelling unit, most of the respondents (about 72 percent) belong to families of 3-4 persons, 19 percent in families with 1-2 persons, while only 9 percent consist of families with more than 5 persons. The mean size of households in the small unit is 3.6 persons. In the medium dwelling unit, 76 percent are comprised of families with 3-4 persons, about 18

percent constitute families with more than 5 persons, and small portion (6 percent) consist of 1-2 member households. The mean size of all households in the medium units is 4 persons. In the large unit, about 58 percent constitute families with 3-4 persons, 33 percent of families with more than 5 persons, and 9 percent of 1-2 member households. The mean size is 4.2 persons per household.

3. Age

Table 5-1 shows the distribution of respondents' ages in the sample. Forty-one percent of the respondents fall within the age range of 40-49 years, while 38 percent fall within the age range of 30-39 years. More specifically, in small units, about 39 percent of the respondents are represented in the age range of 30-39 years, about 36 percent in the range of 40-49 years, about 15 percent in the range of 20-29 years, and only 9 percent in the range of over 50 years. In medium units, about 39 percent of the respondents are represented in the age range of 40-49 years, about 39 percent in 30-39 year range, about 14 percent are over 50 years old, while about 8 percent fall within the range of 20-29 years. In large units, about 46 percent of the respondents fall between the ages of 40-49

years, about 27 percent over 50 years, about 22 percent between 30-39 years, and about 5 percent between 20-29 years. Apparently, there is a similar pattern of age distribution between residents in small units and those in medium units. Residents in large units fall within a somewhat older age range than those in other size units.

4. Ownership

About 78 percent of the sample owned their apartments while 22 percent rented. This represents a much higher percentage when compared to the average ownership status in Seoul. In 1990, sixty five percent of those living in apartments in Seoul owned their residence.

Moreover, the percentage of ownership increases as the dwelling unit size increases. About 87 percent of those inhabiting large units owned their apartments, while 65 percent of those in small units owned their apartments. This ownership pattern may relate to household income. Higher income individuals are inclined to live in bigger apartments and to own these apartments.

5. Duration of Residence

While the duration of residence ranges from one month to twenty three years, the average duration for the entire sample is about four years and 8 months.

Duration of residence has been grouped into four categories: new comer, short-term, mid-term, and long-term residence. I have classified duration of residence that is less than one year as a newcomer. The duration of residence from one to less than three years has been categorized as short-term residence, while mid-term residence id defined from three to less than six years. Residence of more than six years is regarded as long-term residence.

A high percentage (65 percent) of those dwelling in small units have lived in their apartments less than three years. In medium units, 36 percent are short-term residents, while 31 percent are long-term residents. In large units, 39 percent are long-term residents, while 25 percent are mid-term residents. As the unit size increases, the duration of residence also seems to increase in some level.

V-2. Differences on Residents' Evaluation by Types of Apartment Forms

This section presents an analysis of types of apartment form by examining the extent to which residents are satisfied with each type of apartment form. As described in chapter two, there exist several typical types of apartment form grouped according to dwelling unit, apartment building, grouping of apartment buildings and space between or around buildings. The subjective evaluations of those types were elicited by asking the residents to state the level of satisfaction with each physical component which constitutes a typical apartment form. In this study, the subjective evaluation of physical components are measured using a five-point scale (very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, very dissatisfied).

To compare the residents' evaluation of types of apartment form, a frequency distribution table of percentage and mean value was constructed for this study. This frequency distribution table shows the percentage of both satisfied and unsatisfied residents, while the mean satisfaction level is calculated by assigning a numeric value to each level of

satisfaction (i.e., 5=very satisfied, 4=satisfied, 3=neither satisfied nor dissatisfied, 2= dissatisfied, 1= very dissatisfied). The residents who responded 'very satisfied' and 'satisfied' are categorized as the satisfied group, while those who responded 'vary unsatisfied' and 'unsatisfied' are classed as the unsatisfied group.

1. Type of Dwelling Unit

1) Small-size unit

As described in chapter two, there are three types of the small unit: 1) side-entrance and three-bedroom type, 2) rear-entrance and two-bedroom type, and 3) rear-entrance and three-bedroom type. A Chi-square test and Duncan's multiple range test were used to compare residents' evaluation of each physical component according to type of small unit. Table 5-2 shows the subjective evaluation of both size and location aspects of each physical component. Residents' evaluations varied significantly when assessing the size and location of other bedroom, dining space size, and utility room size in each type of the small units. Specifically, the residents are much more satisfied with the size of the other bedroom and the

dinging space in the rear-entrance and two-bedroom type than those of other types of small units. The utility room size and location of the other room in side-entrance and three-bedroom units is much more satisfactory than those of other types.

Table 5-2: Subjective evaluation of types of the small unit

Size aspects

	3-bedroom/side (n=50)				2-bedroom/rear (n=53)				3-bedroom/rear (n=20)			
	Percent satisfied	Percent neutral	Percent dis-satisfied	Mean	Percent satisfied	Percent neutral	Percent dis-satisfied	Mean	Percent satisfied	Percent neutral	Percent dis-satisfied	Mean
Anbang	38	42	20	3.2	28	46	26	3.0	35	45	20	3.2
Other room(s)[a]	12	42	46	2.6*	21	57	21	3.0*	5	35	60	2.3**
Living room	33	30	37	2.9	30	44	26	3.0	30	45	25	3.1
Kitchen	13	43	44	2.5	21	35	44	2.8*	10	25	65	2.2**
Dining space[b]	5	40	55	2.3**	11	59	30	2.8*	7	64	29	2.9*
Bathroom	33	36	31	3.0	31	48	21	3.0	40	35	25	3.2
Utility room[c]	36	33	31	3.0*	23	35	42	2.6	28	0	72	2.1**

Neutral: neither satisfied nor dissatisfied
* and ** are significantly different, alpha=0.05 (compared by each row)

a: Chi-square=17.7, df=6, (p=0.007)
b: Chi-square=17.0, df=8 (P=0.03)
c: Chi-square=16.2, df=8 (P=0.04)

Continued table 5-2

Location aspects

	3-bedroom/side (n=50)				2-bedroom/rear (n=53)				3-bedroom/rear (n=20)			
	Percent satisfied	Percent neutral	Percent dis-satisfied	Mean	Percent satisfied	Percent neutral	Percent dis-satisfied	Mean	Percent satisfied	Percent neutral	Percent dis-satisfied	Mean
Anbang	70	24	6	3.7	57	32	11	3.5	50	40	10	3.5
Other room(s)	48	38	14	3.3	40	43	17	3.2	32	47	21	3.2
Living room	57	30	13	3.4	51	40	9	3.4	44	39	17	3.3
Kitchen	46	34	20	3.2*	32	40	28	3.0*	11	33	56	2.4**
Dining space	39	44	17	3.2*	23	49	28	2.9	14	29	57	2.5**
Bathroom	36	44	20	3.2	34	51	15	3.2	45	40	15	3.4
Utility room[a]	40	44	16	3.3*	40	41	19	3.2*	0	43	57	1.9**

Neutral: neither satisfied nor dissatisfied
* and ** are significantly different, alpha=0.05 (compared by each row)

a: Chi-square=35.4, df=8, p=0.000

2) Medium-size unit

As described in chapter two, there are four types of the medium unit: 1) B+L type, 2) B+L+B type, 3) L+B+B type, and 4) B+L+B and rear entrance type. Table 5-3 shows the subjective evaluation of both size and location for each physical component. Residents' evaluation varied significantly in regard to most components of the medium unit. In the B+L type, residents are much more satisfied with the size of *Anbang* and the living room than residents of other types. However, kitchen size and dining space size in the L+B+B type are rated much more satisfactory than those of other types. There is no significant difference on the satisfaction with kitchen and dining space size between the B+L+B and the B+L type. Moreover, satisfaction with living room location in the B+L type is much higher than that in the B+L+B type. Especially in the B+L+B and rear entrance type, residents are very dissatisfied with the size of the kitchen and the size and location of the dining space. From these results, I can conclude that the B+L type is much more satisfactory dwelling unit than any other type and The B+L+B with rear entrance is the least satisfactory type.

Table 5-3: Subjective evaluation of types of the medium unit

Size aspects

	B+L type (n=50)				B+L+B type (n=54)				L+B+B type (n=28)				B+L+B/rear (n=38)			
	S	N	D	Mean	S	N	D	Mean	S	N	D	Mean	S	N	D	Mean
Anbang[a]	68	22	10	3.7*	26	41	33	3.0**	18	46	36	2.9**	47	37	16	3.5*
Other room(s)	20	37	43	2.8	21	31	40	2.8	18	46	36	2.9	18	46	39	2.8
Living room[b]	67	23	10	3.7*	26	44	30	2.9**	75	18	7	2.9**	13	37	50	2.5***
Kitchen[c]	23	47	30	3.0	24	30	46	2.7**	46	35	19	3.3*	5	27	68	2.3**
Dining space[d]	15	46	39	2.7	24	39	37	2.8**	41	48	11	3.3*	3	36	61	2.4***
Bathroom[e]	22	58	20	3.0**	30	38	32	3.0**	43	53	4	3.4*	31	58	11	3.2
Utility room[f]	36	34	30	3.2	26	31	43	2.7	22	48	30	2.9	19	45	36	2.8

S: Percent satisfied, N: Percent neither satisfied nor dissatisfied, D: Percent dissatisfied
*, ** and *** are significantly different, alpha=0.05 (compared by each row)

a: Chi-square=35, df=12, p=0.001
b: Chi-square=55, df=12, p=0.000
c: Chi-square=31, df=12, p=0.002
d: Chi-square=23, df=12, p=0.03
e: Chi-square=19, df=12, p=0.08
f: Chi-square=20, df=12, p=0.07

Continued table 5-2

Location aspects

	B+L type (n=50)				B+L+B type (n=54)				L+B+B type (n=28)				B+L+B/rear (n=38)			
	S	N	D	Mean	S	N	D	Mean	S	N	D	Mean	S	N	D	Mean
Anbang	80	14	6	3.9	67	29	4	3.7	79	14	7	3.9	62	30	8	3.7
Other room(s)	43	49	8	3.4	43	42	15	3.3	46	36	18	3.3	27	51	22	3.1
Living room[a]	70	28	2	3.7*	58	36	9	3.5*	71	25	4	3.8*	38	40	22	3.2**
Kitchen[b]	45	34	21	3.2*	41	30	29	3.1	21	43	36	2.8**	11	33	66	2.4**
Dining space[c]	32	54	14	3.2*	31	32	37	2.9*	20	56	24	3.0*	6	39	55	2.5**
Bathroom	31	48	21	3.0	42	33	25	3.2	50	36	14	3.4	38	48	14	3.2
Utility room[d]	54	39	7	3.5*	41	32	27	3.1	37	56	7	3.3	29	45	26	3.0**

S: Percent satisfied, N: Percent neither satisfied nor dissatisfied, D: Percent dissatisfied
* and ** are significantly different, alpha=0.05 (compared by each row)

a: Chi-square=17, df=9, p=0.046
b: Chi-square=31, df=9, p=0.002
c: Chi-square=22, df=9, p=0.009
d: Chi-square=27, df=9, p=0.00

3) Large-size unit

There are two types of the large unit in this study: 1) Korean style and 2) western style. Table 5-4 shows the subjective evaluation of both size and location aspects of each physical component. As shown in table 5-3, the only significant difference in satisfaction exists for kitchen size between Korean style and western style units. Residents in Korean style units are more satisfied with the kitchen size than those in western style units. The Korean style type is somewhat more satisfactory to residents than the western style type in terms of the size of *Anbang* and other rooms and the location of the living room, but these differences are not significant. From these results, there is no significant difference on the level of satisfaction between Korean and western style in terms of the subjective evaluation of the physical components.

Table 5-4: Subjective evaluation of types of the large unit

Size aspects

	Korean style (n=82)				Western style (n=88)			
	Percent satisfied	Percent neutral	Percent dis-satisfied	Mean	Percent satisfied	Percent neutral	Percent dis-satisfied	Mean
Anbang	46	29	15	3.4	44	26	30	3.2
Other room(s)	37	44	19	3.2	30	50	20	3.1
Living room	54	33	13	3.5	60	26	14	3.5
Kitchen[a]	36	17	47	2.9	25	34	41	2.8
Dining space	33	29	38	2.9	37	37	26	3.1
Bathroom	48	25	27	3.3	53	34	13	3.4
Utility room	37	35	28	3.0	36	37	27	3.1

Neutral: neither satisfied nor dissatisfied

a: Chi-square=10.8, df=4, p=0.03

Location aspects

	Korean style (n=82)				Western style (n=88)			
	Percent satisfied	Percent neutral	Percent dis-satisfied	Mean	Percent satisfied	Percent neutral	Percent dis-satisfied	Mean
Anbang	74	20	6	3.9	63	24	13	3.6
Other room(s)	49	41	10	3.4	43	36	21	3.3
Living room	74	25	1	3.8	67	26	7	3.7
Kitchen	46	26	28	3.2	44	20	26	3.2
Dining space	36	32	32	3.1	46	32	22	3.3
Bathroom	55	36	9	3.5	56	31	13	3.5
Utility room	48	37	15	3.4	51	34	15	3.4

Neutral: neither satisfied nor dissatisfied

2. Types of Apartment Building

Types of apartment buildings for this study were classified by their height and unit-access type, as mentioned in chapter two.

Building height ranged between medium-rise(5-story) and high-rise (more than 12-story). As shown in table 5-5, residents living in medium-rise buildings are much more satisfied with building height than those in high-rise buildings. Seventy-six percent of respondents in the medium-rise buildings are satisfied with building height, while 56 percent of those in the high-rise are satisfied with building height.

Table 5-5: Residents' evaluation of apartment building height

	High-rise		Medium-rise	
Mean[a]	3.5**		4.03*	
Distribution[b]	Percent	# of responses	Percent	# of responses
Very satisfied	11	37	35	46
Satisfied	44	145	41	55
Neither satisfied nor dissatisfied	31	101	18	24
Dissatisfied	11	36	5	7
Very dissatisfied	3	9	1	1
Total	100	328	100	133

a: * and ** are significantly different, alpha=0.05.
b: Chi-square=39.4, df=4, p<0.001

This finding is also supported by the results shown in table 5-6. Table 5-6 shows residents' preference for the apartment building by their building height. Residents were asked about the type of apartment building in which they would most like to live. Seventy-seven percent of the respondents living in medium-rise building preferred to live in medium-rise apartments, while only 21 percent prefer to live in 12-15 story building. However, 59 percent of the respondents in high-rise preferred living in high-rise buildings, while 40 percent preferred living in medium-rise apartments. In addition, most residents living in both the high-rise and the medium-rise buildings do not want to live in buildings taller than 16-stories.

Table 5-6: Percentage of apartment building type to prefer to live

Prefer to live	Medium-rise	12-15 story building	16-19 story building	More than 25 story building	Total
High-rise (n=326)	40	59	1	0	100
Medium-rise (n=130)	77	21	1	1	100

Chi-square=55.6, df=3, $p<0.001$

There are three kinds of unit-access types analyzed in this study: 1) corridor type, 2) core with elevator type, and 3) walk-up. Table 5-7 describes the results of residents' evaluation of unit-access type. Residents evaluate the walk-up as the most satisfactory, the next higher satisfaction is the core with elevator, while corridor type is the least satisfactory. Seventy percent of those living in walk-up buildings are satisfied with this unit-access type, while 66 percent residing in core with elevator access are satisfied, and only 23 percent residing in corridor type building are satisfied.

Table 5-7: Residents' evaluation of unit-access type

	Corridor		Core/elevator		Walk-up	
Mean[a]	3.5*		3.5*		4.0**	
Distribution[b]	Percent	# of responses	Percent	# of responses	Percent	# of responses
Very satisfied	4	4	11	25	26	32
Satisfied	19	18	55	124	44	55
Neither satisfied nor dissatisfied	35	34	25	57	24	30
Dissatisfied	34	33	8	17	4	5
Very dissatisfied	8	8	1	3	2	3
Total	100	97	100	226	100	125

a: * and ** are significantly different, alpha=0.05.
b: Chi-square=103, df=8, p<0.001

I assumed that the corridor access would encourage social interaction between neighbors because many units use the same corridor on each floor. However, table 5-8 shows that there is no significant relationship between unit-access type and number of socially close neighbors. On the other hand, in the case of core access with elevator, 54 percent have 1-3 socially close neighbors, which is a somewhat higher percentage than those of corridor or walk-up types. In addition, 31 percent living in walk-up and 23 percent living in corridor type have 4-6 socially close neighbors. These percentages are a little higher than that of core with elevator type.

Table 5-8: Relationship between unit-access type and number of socially close neighbors

	Corridor type	Core/elevator	Walk-up
None	14	14	13
1-3 neighbors	43	54	40
4-6 neighbors	28	19	31
more than 7 neighbors	15	13	16
Total (N=460)	100 (N=98)	100 (N=231)	100 (N=131)

Chi-square=9.7, d.f.=6, p=0.13

3. Grouping of apartment buildings

A grouping of apartment buildings can be classified into the parallel type and the court type. The court type can further be divided into court type with same height buildings and court type with different height buildings.

As shown in table 5-9, the parallel type of building siting is the most satisfactory compared to other types of building siting. Sixty-two percent of the respondents in parallel-type grouping are satisfied with building siting, and 45 percent in

Table 5-9: Residents' evaluation of building siting

	Parallel		Court-1[c]		Court-2[d]	
Mean[a]	3.94*		3.6**		3.47**	
Distribution[b]	Percent	# of responses	Percent	# of responses	Percent	# of responses
Very satisfied	17	25	8	9	5	9
Satisfied	45	66	37	39	30	62
Neither satisfied nor dissatisfied	22	33	32	34	32	66
Dissatisfied	16	24	16	17	23	46
Very dissatisfied	0	0	7	7	10	21
Total	100	148	100	106	100	204

a: * and ** are significantly different, alpha=0.05.
b: Chi-square=39.9, df=8, p<0.001
c: Court-1: Court-centered layout with different story buildings
d: Court-2: Court-centered layout with same story buildings

court with different height buildings are satisfied, while only 35 percent in court with same height buildings are satisfied. This result may be related to the residential density (e.g., number of dwelling units per acre). Typically, the court-type accommodate more dwelling unit on same size land area by plotting another apartment building.

4. Space around or between apartment buildings

For this study the space around or between apartment buildings includes road pattern, parking arrangement, playground, and open space (e.g., neighborhood park or greenery space).

Table 5-10 shows residents' evaluation of road pattern. Among those, the cul-de-sac pattern is the most satisfactory, and the next most satisfactory is the grid and loop system. Non-pattern is the least satisfactory. Non-pattern means that the road pattern is hard to define, so road and parking lots are more complexly interconnected.

In terms of the evaluation of playground, there is not significant difference in satisfaction between "integrated' and "separated" system, as shown in table 5-11. However, residents

are much more satisfied with separated open space than with integrated open space, as shown in table 5-12. About 60 percent of the respondents are satisfied with the separated open space, while about 40 percent are satisfied with the integrated open space.

Table 5-10: Residents' evaluation of road pattern

	Grid		Loop		Cul-de-sac		Non-pattern	
Mean[a]	3.58**		3.56**		3.88*		3.28***	
Distribution[b]	Percent	# of responses	Percent	# of responses	Percent	# of responses	Percent	# of responses
Very satisfied	13	19	10	14	10	5	5	6
Satisfied	43	63	47	63	70	35	40	50
Neither satisfied nor dissatisfied	34	50	32	43	18	9	40	50
Dissatisfied	10	15	9	12	2	1	10	14
Very dissatisfied	0	0	2	2	0	0	5	6
Total	100	147	100	134	100	50	100	126

a: *, **, and *** are significantly different, alpha=0.05.
b: Chi-square=31.1, df=12, $p<0.01$

Table 5-11: Residents' evaluation of Playground

Size aspect

	Integrated		Separated	
Mean[a]	3.18		3.32	
Distribution[b]	Percent	# of responses	Percent	# of responses
Very satisfied	7	18	6	11
Satisfied	28	73	38	69
Neither satisfied nor dissatisfied	43	115	39	72
Dissatisfied	20	52	16	30
Very dissatisfied	2	5	1	1
Total	100	263	100	183

a: not significant
b: not significant

Location aspect

	Integrated		Separated	
Mean[a]	3.2		3.34	
Distribution[b]	Percent	# of responses	Percent	# of responses
Very satisfied	7	19	7	12
Satisfied	31	83	40	73
Neither satisfied nor dissatisfied	39	103	36	65
Dissatisfied	20	53	15	28
Very dissatisfied	3	7	2	3
Total	100	265	100	181

a: not significant
b: not significant

Table 5-12: Residents' evaluation of open space

Size aspects

	Integrated	Separated
Mean[a]	3.21**	3.58*

Distribution[b]	Percent	# of responses	Percent	# of responses
Very satisfied	12	34	17	32
Satisfied	29	78	42	79
Neither satisfied nor dissatisfied	30	83	25	46
Dissatisfied	24	66	13	25
Very dissatisfied	5	12	3	5
Total	100	273	187	187

a: * and ** are significantly different, alpha=0.05.
b: Chi-square=16.5, df=4, p<0.01

Location aspect

	Integrated	Separated
Mean[a]	3.16**	3.57*

Distribution[b]	Percent	# of responses	Percent	# of responses
Very satisfied	11	31	17	32
Satisfied	26	69	41	76
Neither satisfied nor dissatisfied	35	93	26	48
Dissatisfied	23	63	13	23
Very dissatisfied	5	23	3	6
Total	100	269	100	185

a: * and ** are significantly different, alpha=0.05.
b: Chi-square=21.1, df=4, p<0.001

V-3. Conclusion

This chapter, firstly, has described the social, economical, and demographic characteristics among the sample. The population in this study can be defined as "upper-middle income families". The mean household income was 3 million won per month that is much higher than the average income for salary wages earners' household of all cities. About 68 percent of respondents belong to nuclear families. Seventy-nine percent fall within either the age of 30-39 years or 40-49 years. About 78 percent owned their apartments and their average duration of residence is about 5 years.

Secondly, this chapter has analyzed types of apartment form. Three types of the small units were examined. The residents are much more satisfied with size of the other bedroom and the dining space in the rear-entrance and two bedroom type than those of other types, while they are much more satisfied with the utility room size and location in side-entrance and three bedroom unit. In the medium unit, the residents living in the B+L type are much more satisfied with the size of *Anbang* and the living room than those living in other types, but there is no significant difference on the

satisfaction with kitchen and dining space size between the B+L+B and the B+L types. In the large units, there is mostly no significant difference on satisfaction with both size and location aspects of each physical components between western and Korean styles.

In types of apartment buildings, medium-rise (5-story) building is much more satisfactory on building height than high-rise buildings. In addition, residents evaluate the walk-up as the most satisfactory on unit-access type, the next higher satisfaction is the core with elevator, while corridor is the least satisfactory. The parallel type of building siting is more satisfactory then the court type of building siting.

As regards types of road patterns, the cul-de-sac pattern is the most satisfactory, and the next most satisfactory is the grid and loop system. Non-pattern is the least satisfactory. In open space types, residents are much more satisfied with "separated" open space than with "integrated" open space. There is no significant difference between playground types.

Chapter Six

Analysis of Resident satisfaction: Variables to affect Resident Satisfaction

Introduction

This chapter examines the relationship between resident satisfaction and various objective and subjective variables. In detail, the first section reveals the relationship between overall satisfaction and various objective and subjective variables by using several statistical techniques. The second section identifies using a multiple regression analysis important variables that significantly affect satisfaction with apartment forms.

VI-1. Association between Residents' Overall Satisfaction and Independent Variables

This section, first, describes levels of overall satisfaction with apartment forms for the entire sample. Then it analyzes the relationship between overall satisfaction and each objective and subjective variable. Subjective variables include residents' evaluation of the physical components of apartment form, while objective variables include the social,

economic, and demographic characteristics of the resident, as well as physical characteristics of the apartment environment, as mentioned in chapter three.

To reveal the relationship between the overall satisfaction and each variable, two statistical techniques are used in this chapter: 1) Pearson's correlation coefficient, and 2) Duncan's multiple range test and Chi-square test. Table 6-1 shows statistical techniques to reveal the association between dependent and independent variables according to independent variables.

Table 6-1: Statistical techniques to reveal association between dependent variable and independent variable

Statistical techniques	Independent Variables
Duncan's multiple range test and Chi-square test	-Age -Ownership -Duration of residence -Number of socially close neighbors -Types of dwelling unit -Building height -Building siting -Unit access type -Previous housing type
Pearson's correlation analysis	-Household income -Household size -Density within dwelling unit -Floor where resident live -All subjective variables

Pearson's correlation coefficient, abbreviated as γ, is most appropriate when two variables that seem to be associated with each other represent a continuous value, that is, when they are measured on an interval scale. On the other hand, if the independent variables are types of categorical data that are measured on an ordinal or a nominal scale, Duncan's multiple range test and Chi-square test are used to reveal the relationship between two variables. For this analysis, the satisfaction score, measured on an interval scale from zero to 100, is changed to the categorical data type by grouping into very satisfied (score 76-100), satisfied (score 51-75), dissatisfied (score 26-50), and very dissatisfied (score 0-25).

The subjective evaluation of the physical components of apartment form measured on an ordinal scale can be regarded as a continuous type by assigning the value of 1,2,…,5. Lobovitz (1970) showed negligible error existed when ordinal variables were treated as if they confirmed to interval scales. The bias due to such a violation of assumptions will not be large. Therefore, Pearson's correlation coefficient is used to reveal the relationship between overall satisfaction and each of the subjective evaluation variables.

The tests of Pearson's correlation coefficient, Duncan's multiple range test and Chi-square test are used to reveal the variables significantly related to overall satisfaction. Of various independent variables, only selected variables, which are associated significantly with overall satisfaction, are employed a stepwise multiple linear regression analysis in order to identify major factors affecting resident satisfaction and to examine their relative importance.

As table 6-2 indicates, 25 percent of the respondents indicated a satisfaction score with the dwelling unit ranging from 76 to 100. That means, they can be regarded as very satisfied with their housing unit. Forty five percent are satisfied with their dwelling unit because their satisfaction scores range from 51 to 75. Combining those who indicate that they are "very satisfied" with those who claim to be "satisfied", 70 percent of respondents indicate positive sentiments toward their dwelling unit. Thus, the mean satisfaction score with the dwelling unit is up to 62.8 with a standard deviation of 16, as shown in table 6-2 and table 6-3.

As regards the apartment building, 28 percent of respondents are very satisfied with their apartment building, 40 percent are satisfied, 30 percent are dissatisfied, and 1 percent are very dissatisfied. The mean satisfaction score with

apartment building become 62.8 with a standard deviation of 17. In addition, combining those who indicate they are a "very satisfied" with those who claim to be a "satisfied," 77 percent of respondents indicated positive feelings toward the space around or within buildings. Only 22 percent are dissatisfied with the space around or within buildings. Their mean satisfaction score rises 67.9 with a standard deviation of 17.

Table 6-2: Overall satisfaction with the elements of apartment form

Satisfaction score	100-76	75-51	50-26	25-0	Total
Satisfaction with the dwelling unit	114 (25)	209 (45)	134 (29)	6 (1)	463 (100)
Satisfaction with the apartment building	126 (27)	187 (40)	143 (30)	7 (2)	463 (100)
Satisfaction with the space around or between buildings	184 (40)	170 (37)	105 (22)	3 (1)	462 (100)

Table 6-3: Mean of overall satisfaction score

	Mean	Std. Deviation
Satisfaction with the dwelling unit	62.9	15.7
Satisfaction with the apartment building	62.8	17.4
Satisfaction with the space around or between buildings	67.9	17.2

As a whole, living in the apartment complexes studied is rated quite satisfactory by apartment residents, while residents are somewhat more satisfied with the space around or within buildings than with either the dwelling unit or the apartment building. It is interesting to note that the level of satisfaction with living in apartment is quite high especially as compared to low level of satisfaction for high-rise and compact housing in western cultures. Generally, in western society, high-density housing has low level of satisfaction because the residents think it is not appropriate to have high densities in their neighborhood, which are related with heavy traffic, crime, and poor maintenance. In addition, high-rise apartment, they think, is few rooms, less privacy, and less yard space than single-family housing, so it is unsuited for family with young children. However, several researches found that high density housing could be satisfied when a development is adequately designed and managed (Francescato et al., 1977; Rothblatt and Garr, 1983; Bergdoo, 1991).

In Korean, apartment complexes as "planned high-density housing environments" provide a package of dwellings, parking space, recreational facilities (e.g., playgrounds, and usable open space), and other services (e.g., retail shops, post office, school, etc.) in a minimum of space. In addition,

apartments usually are designed to ease household responsibilities and to provide a greater sense of security than single-family housing. From these reasons, apartments are quite satisfactory among people in Korea.

1. Satisfaction with the dwelling unit

Dwelling unit size for this study is categorized as either a small-size unit, a medium-size unit, or a large-size unit. According to the unit size, there exist significantly different room layout that may affect differently resident satisfaction with the dwelling unit.

This section presents which of independent variables (including subjective and objective variables) will affect significantly overall satisfaction with the dwelling unit grouped by unit size.

1) Small-size unit

Table 6-4 shows the relationship between overall satisfaction with the small unit and each of the objective and subjective variables. It is interesting to note that among objective variables, only building siting is related to overall

satisfaction with the small unit. Seventy percent of the respondents, who were living in a court-centered layout with same story building, expressed a satisfaction with their dwelling unit. This compares with only 44 percent of respondents, who were living in a court-centered layout with different story buildings, who are satisfied with their dwelling unit.

Among subjective variables, all of the Pearson's correlation coefficients are positive and significant. That means, all subjective evaluations of the physical components of the dwelling unit contribute positively to satisfaction with the small unit. The size of *Anbang* is most strongly related to satisfaction with the dwelling unit (γ=0.47). The greater the satisfaction with the *Anbang* size, the greater the satisfaction with the dwelling unit. Location of the *Anbang* (γ=0.45), the living room (γ=0.42), and the other bedroom(s) (γ=0.39) is also significantly related to satisfaction with the dwelling unit. Size of the utility room (γ=0.40), the living room (γ=0.38), and the kitchen (γ=0.33) is strongly associated with satisfaction with the dwelling unit as well.

Table 6-4: Associations between overall satisfaction with the small unit and objective and subjective variables

Objective personal characteristics

	Association level	Significance
1. Household income	γ=0.03	not significant
2. Age	Percent satisfied	
20-29	70 (n=20)	not significant
30-39	67 (n=48)	
40-49	57 (n=44)	
more than 50	64 (n=11)	
3. household size	γ= -0.02	not significant
4. Ownership	Percent satisfied	
Own	61 (n=79)	not significant
rent	62 (n=42)	
5. Duration of residence	Percent satisfied	
New comer	74 (n=34)	not significant
Short-term	63 (n=46)	
Medium-term	64 (n=28)	
Long-term	40 (n=15)	
6. Number of socially close neighbors	Percent satisfied	
None	57 (n=14)	not significant
1-3	64 (n=53)	
4-6	62 (n=36)	
More than 7	74 (n=19)	

Continued table 6-4

Objective physical characteristics

	Percent satisfied	Significance
1.Types of dwelling unit 3-bedroom/side 2-bedroom/rear 3-bedroom/rear	Percent satisfied 68 (n=50) 57 (n=53) 70 (n=20)	not significant
2. Building height High-rise Walk-up	Percent satisfied 59 (n=73) 70 (n=50)	not significant
3. Density within the unit	γ= -0.02	not significant
4. Floor where resident live	γ= -0.06	not significant
5. Building siting Parallel Court-1 Court-2	Percent satisfied 64 (n=25) 44 (n=25) 70 (n=73)	Significant*
6. Unit access type Corridor Core	Percent satisfied 66 (n=50) 61 (n=73)	not significant
7. Previous housing type Single-family housing Apartment	Percent satisfied 61 (n=28) 63 (n=71)	not significant

*p<0.1

Continued table 6-4

Subjective evaluation of physical components of the dwelling unit

	Association level	Significance level
Size aspect		
Anbang	0.47	P<0.001
Other room	0.28	P<0.01
Living room	0.38	P<0.001
Kitchen	0.33	P<0.001
Dining space	0.29	P<0.001
Bathroom	0.37	P<0.001
Utility room	0.40	P<0.001
Location aspect		
Anbang	0.45	P<0.001
Other room	0.39	P<0.001
Living room	0.42	P<0.001
Kitchen	0.34	P<0.001
Dining space	0.29	P<0.01
Bathroom	0.28	P<0.01
Utility room	0.31	P<0.01

2) Medium-size unit

Table 6-5 shows the relationship between overall satisfaction with the medium unit and each objective and subjective variable. Among objective variables, ownership, types of the medium unit, and unit-access type are related significantly to overall satisfaction with the medium unit. If residents own their apartments, they are much more satisfied

with the dwelling unit than are renters. As seen in Table 6-5, 69 percent of respondents who were owners are satisfied with their dwelling unit. This compared with only 52 % of renters who indicate satisfaction with their dwelling unit. Residents living in a B+L type of room layout are much more satisfied than those in the B+L+B type. Furthermore, residents in core-type apartment buildings are much more satisfied with their dwelling unit than those in corridor-type buildings.

Among subjective variables, size of the living room is most strongly associated with satisfaction with the dwelling unit (γ=0.48). Location of the dining space (γ=0.39) and the living room (γ=0.39) is also significantly related to satisfaction with the dwelling unit. However, the *Anbang* size (γ=0.31) and location (γ=0.27) are significantly related to satisfaction with the dwelling unit, but have a low level of correlation.

Table 6-5: Associations between overall satisfaction with the medium unit and objective and subjective variables

Objective personal characteristics

	Percent Satisfied	Significance
1. Household income	γ=0.08	not significant
2. Age	Percent satisfied	
20-29	64 (n=14)	not significant
30-39	57 (n=65)	
40-49	73 (n=66)	
more than 50	74 (n=23)	
3. household size	γ= -0.04	not significant
4. Ownership	Percent satisfied	
Own	69 (n=133)	Significant*
rent	52 (n=52)	
5. Duration of residence	Percent satisfied	
Newcomer	70 (n=30)	not significant
Short-term	61 (n=62)	
Medium-term	56 (n=25)	
Long-term	71 (n=53)	
6. Number of socially close neighbors	Percent satisfied	
None	72 (n=18)	not significant
1-3	62 (n=87)	
4-6	69 (n=35)	
More than 7	60 (n=30)	

* $p<0.10$

Continued table 6-5

Objective physical characteristics

	Overall satisfaction	Significance
1.Types of dwelling unit	Percent satisfied	
B+L type	82 (n=50)	Significant*
B+L+B type	46 (n=54)	
L+B+B type	79 (n=28)	
B+L+B/Rear	63 (n=38)	
2. Building height	Percent satisfied	
High-rise	64 (n=140)	not significant
Walk-up	77 (n=30)	
3. Density within the dwelling unit	γ= -0.11	not significant
4. Floor where resident live	γ= -0.08	not significant
5. Building siting	Percent satisfied	
Parallel	70 (n=67)	not significant
Court-1	50 (n=50)	
Court-2	68 (n=68)	
6. Unit access type		
Corridor	54 (n=48)	Significant**
Core	71 (n=120)	
7. Previous housing type	Percent satisfied	
Single-family housing	63 (n=41)	not significant
Apartment	68 (n=105)	

* P<0.01

** P<0.05

Continued table 6-5

Subjective evaluation of physical components of the dwelling unit

	Association level	Significance level
Size aspect		
Anbang	0.31	P<0.001
Other room	0.27	P<0.001
Living room	0.48	P<0.001
Kitchen	0.28	P<0.001
Dining space	0.35	P<0.001
Bathroom	0.23	P<0.01
Utility room	0.30	P<0.001
Location aspect		
Anbang	0.27	P<0.001
Other room	0.27	P<0.001
Living room	0.39	P<0.001
Kitchen	0.25	P<0.01
Dining space	0.39	P<0.001
Bathroom	0.27	P<0.001
Utility room	0.33	P<0.001

3) Large-size unit

The relationship between overall satisfaction with the large unit and each of the objective and subjective variables is shown in Table 6-6. Among objective variables, household size, ownership, number of socially close neighbors, and density within the dwelling unit, are related significantly to overall satisfaction with the large unit. Household size is related negatively to satisfaction with the large unit. In

other words, the larger the family unit, the lower the degree of satisfaction with the dwelling unit, but its association with satisfaction with the large unit is not very strong (γ=-0.13). Therefore, density within the dwelling unit also has a negative relationship with satisfaction with the large unit (γ=-0.13). Residents with lower density were more satisfied than those with higher density. Ownership relates significantly to satisfaction with the large unit. In addition, number of socially close neighbors is related to satisfaction with the large unit. Those who have 4-6 socially close neighbors express the greatest satisfaction with their dwelling unit, while those without socially close neighbors indicate the least satisfaction with their dwelling unit.

Among subjective variables, location of the living room is most strongly related to satisfaction with the dwelling unit (γ=0.45). In the order of level of correlation, location of the kitchen (γ=0.41), location of the other bedrooms (γ=0.41), location of the dining space (γ=0.37) are all significantly related to satisfaction with the dwelling unit.

Since all of the subjective variables are significantly associated with satisfaction with the housing unit, they all are employed in the multiple regression analysis.

Table 6-6: Associations between overall satisfaction with the large unit and objective and subjective variables

Objective personal characteristics

	Association level	Significance
1. Household income	γ=0.06	not significant
2. Age	Percent satisfied	
20-29	78 (n=9)	not significant
30-39	70 (n=37)	
40-49	80 (n=76)	
more than 50	80 (n=45)	
3. household size	γ= -0.13	Significant*
4. Ownership	Percent satisfied	
Own	85 (n=143)	Significant***
rent	45 (n=22)	
5. Duration of residence	Percent satisfied	
New comer	73 (n=26)	not significant
Short-term	66 (n=35)	
Medium-term	88 (n=42)	
Long-term	81 (n=67)	
6. Number of socially close neighbors	Percent satisfied	
None	65 (n=31)	Significant*
1-3	80 (n=81)	
4-6	88 (n=41)	
More than 7	71 (n=17)	
8. Previous housing type	Percent satisfied	
Single-family housing	78 (n=51)	not significant
Apartment	76 (n=98)	

* p<0.1

*** p<0.001

Continued table 6-6

Objective physical characteristics

	Proportion satisfied	Significance
1.Types of dwelling unit Korean-style Western-style	Percent satisfied 78 79	 not significant
2. Building height High-rise Walk-up	Percent satisfied 77 (n=117) 81 (n=53)	 not significant
3. Density within the dwelling unit	γ= -0/13	Significant*
4. Floor where resident live	γ= -0.01	not significant
5. Building siting Parallel Court-1 Court-2	Percent satisfied 79 (n=79) 75 (n=75) 81 (n=81)	 not significant

* p<0.1

Subjective evaluation of physical components of the dwelling unit

	Association level	Significance
Size aspect		
Anbang	0.32	P<0.001
Other room	0.18	P<0.05
Living room	0.35	P<0.001
Kitchen	0.33	P<0.001
Dining space	0.35	P<0.001
Bathroom	0.35	P<0.001
Utility room	0.31	P<0.001
Location aspect		
Anbang	0.36	P<0.001
Other room	0.41	P<0.001
Living room	0.45	P<0.001
Kitchen	0.41	P<0.001
Dining space	0.37	P<0.001
Bathroom	0.34	P<0.001
Utility room	0.26	P<0.001

2. Satisfaction with the apartment building

Income level, floor where resident lives, and building siting are related significantly to overall satisfaction with the apartment building, as shown in table 6-7. Higher income people are much more satisfied with the apartment building than lower income people. The reason is that apartment buildings for higher income people usually have a good security system and are managed well. Height of floor of residence has a negative relationship with satisfaction with the apartment building. As the height of the floor of residence increases, the level of satisfaction decreases. Furthermore, residents of parallel type siting are much more satisfied with the apartment building than those of other types.

Among subjective variables, siting with the neighboring buildings (γ=0.55) and visual privacy (γ=0.55) are most strongly related to satisfaction with the apartment building. The more satisfied with siting with adjacent buildings, the more satisfied with the apartment building, and further, satisfaction with visual privacy from the outside is the most important factor affecting satisfaction with the apartment building. Auditory privacy is also strongly associated with satisfaction with the apartment building (γ=0.51). Building

length (γ=0.38), building height (γ=0.33), and type of access to housing unit (γ=0.33) are each significantly related to satisfaction with the apartment building, but they show somewhat weaker levels of association.

Table 6-7: Associations between overall satisfaction with the apartment building and objective and subjective variables

Objective personal characteristics	Association level	Significance
1. Household income	γ=0.16	Significant**
2. Age 20-29 30-39 40-49 more than 50	Percent satisfied 65 (n=43) 66 (n=150) 67 (n=186) 72 (n=79)	not significant
3. household size	γ= -0.01	not significant
4. Ownership Own rent	Percent satisfied 69 (n=355) 63 (n=98)	not significant
5. Duration of residence New comer Short-term Medium-term Long-term	Percent satisfied 70 (n=90) 63 (n=143) 73 (n=95) 66 (n=135)	not significant
6. Number of socially close neighbors None 1-3 4-6 More than 7	Percent satisfied 57 (n=63) 66 (n=221) 73 (n=112) 71 (n=66)	not significant

** P <0.05

Continued table 6-7

Objective physical characteristics

	Association level	Significance
1. Dwelling unit size Small unit Medium unit Large unit	Percent satisfied 68 (n=122) 67 (n=170) 68 (n=171)	not significant
2. Building height High-rise Walk-up	Percent satisfied 65 (n=330) 73 (n=130)	not significant
3. Density within the dwelling unit	γ= -0.03	not significant
4. Floor where resident live	γ= -0.09	Significant**
5. Building siting Parallel Court-1 Court-2	Percent satisfied 78 (n=149) 62 (n=107) 63 (n=207)	Significant**
6. Unit access type Corridor Core	Percent satisfied 64 (n=99) 69 (n=362)	not significant
7. Previous housing type Single-family housing Apartment	Percent satisfied 67 (n=120) 63 (n=274)	not significant

** $p<0.05$

Continued table 6-4

Subjective evaluation of physical components of the apartment building

	Correlation coefficient	Significance level
1. Siting with neighboring buildings	0.55	P<0.001
2. Visual privacy	0.55	P<0.001
3. Auditory privacy	0.50	P<0.001
4. Building length	0.37	P<0.001
5. Building height	0.33	P<0.001
6. Access type to housing unit	0.33	P<0.001

3. Satisfaction with the space around or within buildings

Table 6-8 shows the relationship between overall satisfaction with the space around or within buildings and each objective and subjective variable. Among objective variables, income level, household size, ownership, and building siting are related significantly to overall satisfaction with the space around or within buildings.

Among subjective variables, size of the green/open space (γ=0.61) is most strongly related to satisfaction with the space around or within buildings. The greater satisfaction with size of the green/open space, the greater satisfaction with the

space around or within buildings. That means, those with larger open spaces are more satisfied with the space around or within buildings than those with smaller open spaces. Location of the green/open space (γ=0.56), size of the parking lot (γ=0.49), and location of the parking lot (γ=0.43) are strongly associated with overall satisfaction with the space around or within buildings. In addition, playground size (γ=0.39) and its location (γ=0.33) are significantly related to satisfaction with the space, but they show somewhat weaker level of association.

Table 6-8: Associations between overall satisfaction with the space around or within buildings and objective and subjective variables

Objective personal characteristics

	Association level	Significance
1. Household income	γ=0.12	Significant**
2. Age	Percent satisfied	
20-29	81 (n=43)	not significant
30-39	74 (n=150)	
40-49	76 (n=186)	
more than 50	80 (n=79)	
3. household size	γ= -0.09	Significant**
4. Ownership	Percent satisfied	
Own	80 (n=355)	Significant**
rent	65 (n=98)	
5. Duration of residence	Percent satisfied	
New comer	80 (n=90)	not significant
Short-term	75 (n=143)	
Medium-term	76 (n=95)	
Long-term	78 (n=135)	
6. Number of socially close neighbors	Percent satisfied	
None	57 (n=63)	not significant
1-3	66 (n=221)	
4-6	73 (n=112)	
More than 7	71 (n=66)	

** $p<0.05$

Continued table 6-8

Objective physical characteristics

	Association level	Significance
1. Dwelling unit size Small unit Medium unit Large Unit	Percent satisfied 79 (n=121) 75 (n=170) 76 (n=171)	not significant
2.Building height High-rise Walk-up	Percent satisfied 84 (n=330) 83 (n=132)	not significant
3.Density within the dwelling unit	γ= -0.01	not significant
4.Floor where resident live	γ= -0.04	not significant
5.Building siting Parallel Court-1 Court-2	Percent satisfied 78 (n=149) 85 (n=107) 71 (n=206)	Significant**
6. Unit access type Corridor Core	Percent satisfied 72 (n=99) 78 (n=361)	Significant*
2. Previous housing type Single-family housing Apartment	Percent satisfied 78 (n=120) 76 (n=274)	not significant

* $p<0.1$
** $p<0.05$

Continued table 6-8

Subjective evaluation of physical components of the sapce around or within buildings

	Correlation coefficient	Significance level
1. Size of green/open space	0.61	P<0.001
2. Location of green/open space	0.56	P<0.001
3. Size of parking lot	0.49	P<0.001
4. Parking arrangement	0.44	P<0.001
5. Inner road patterning	0.43	P<0.001
6. Playground size	0.39	P<0.001
7. Playground location	0.33	P<0.001

VI-2. Important Variables of Resident Satisfaction with Apartment Forms

Multiple linear regression analysis is used here to identify important variables that significantly affect satisfaction with apartment forms. Multiple regression analysis is to examine the relationship between a single dependent variable and several independent variables. The method of least squares can be used to estimate all of the coefficients. The regression coefficient offers an estimate of how much change in the dependent variable is produced by one unit of change in the independent variable. If one of the regression coefficients is positive, this variable indicates a positive relationship to a dependent variable. In addition, the regression coefficient can indicate the relative importance of independent variables. Since the variables are measured in different type of units, the magnitudes of the coefficients cannot be compared to each other. To compare the relative importance of variables, all variables need to be standardized to a mean of 0 and a standard deviation of 1. Through the process of standardization, standardized regression coefficients are calculated, and these can be used to compare the relative importance of variables. For example, if the absolute value of the standardized

regression coefficient of one variable is bigger than that of anther variable, the former variable can be regarded as more importantly relative to a dependent variable than anther variable.

Furthermore, the step wise variable-selection method is used to select important independent variables in the regression analysis. The purpose of the variable-selection method is to eliminate variables which are of little use for the regression equation. Therefore, the equation becomes a simple, and easy to interpret model. The step-wise variable-selection method is carried out in the following way: variables are entered and removed one at a time in the equation, until the *F* statistics do not indicate that any variables in the equation should be removed. For example, one variable is entered in the equation, if the significant level of the variable is less than the entry level (a default value is 0.15), and it will be removed if its significant level appears to be more than the stay level (a default value is 0.15). I set up 0.3 as a entry level and 0.1 as a stay level for this study.

1. Predictors of overall satisfaction with the dwelling unit

As regards overall satisfaction with the small size unit, all 14 subjective variables that measure residents' evaluation

of the physical components of the dwelling unit are significantly associated with satisfaction with dwelling unit. In addition, one objective variable – -building siting– -also is related significantly to satisfaction with dwelling unit. Therefore, a total of 15 variables is used in the regression analysis.

The result of the regression analysis in the small-size unit is shown in table 6-9. Of the fifteen variables, four variables; including size of the *Anbang*, size of the bathroom, size of the utility room, and location of the living room; are selected for predicting overall satisfaction with dwelling unit. The regression model using these four independent variables can account for about 40 percent of the observed variability in satisfaction with the dwelling unit. Of these variables, size of the *Anbang* is the most important variable affecting satisfaction with the dwelling unit, as is indicated by a standardized coefficient of 0.31. Location of the living room is the second most important variable, while size of the utility room is the third, and size of the bathroom is the least significant variable in accounting for satisfaction with the dwelling unit.

For the medium-size unit, three objective variables (ownership, dwelling unit type, and unit-access type) and all

Table 6-9: Predictors of overall satisfaction with the small unit

Dependent Variable: Satisfaction with the small size unit

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	10309.05876	2577.26469	16.483	0.0001
Error	98	15322.90240	156.35615		
C Total	102	25631.96117			

Root MSE	12.50425	R-square	0.4022
Dep Mean	61.01942	Adj R-sq	0.3778
C.V.	20.49224		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	13.858056	6.10627711	2.269	0.0254
SIZE1	1	5.876651	1.63141813	3.602	0.0005
SIZE6	1	3.579406	1.45316074	2.463	0.0155
SIZE7	1	3.242874	1.22445581	2.648	0.0094
LOC2	1	2.736247	1.69736461	1.612	0.1102

Variable	DF	Standardized Estimate	Variance Inflation
INTERCEP	1	0.00000000	0.00000000
SIZE1	1	0.31438826	1.24873515
SIZE6	1	0.21317298	1.22782517
SIZE7	1	0.22458031	1.17878977
LOC2	1	0.14628649	1.34994135

Size1: Evaluation of Anbang size
Size6: Evaluation of bathroom size
Size7: Evaluation of utility room size
Loc2 : Evaluation of other bedroom location

14 subjective variables are entered into a multiple regression analysis. Of these variables, size of living room, size of dining space, location of other bedroom, and dwelling unit type are more important than other variables in predicting satisfaction with the dwelling unit, as shown in Table 6-10. A regression model employing these three independent variables accounts for about 36 percent of the observed variability in satisfaction with the dwelling unit. In a medium size unit, size of the living room appears to be the most important variable affecting satisfaction with the dwelling unit, as indicated by a standardized coefficient of 0.31. Size of the dining space is the second most important variable, while dwelling unit type is the third most important variable in accounting for satisfaction with the dwelling unit.

For the large-size unit, four objective variables (household size, ownership, number of socially close neighbors, and density within the dwelling unit) and all 14 subjective variables are used in a multiple regression analysis. Table 6-11 shows that the location of the living room and kitchen, the size of dining space, utility room and bathroom, and ownership are all important variables in predicting satisfaction with the dwelling unit. The regression model using these six independent

Table 6-10: Predictors of overall satisfaction with the medium unit

Dependent Variable: Satisfaction with the medium size unit

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	13667.21008	2733.44202	16.627	0.0001
Error	144	23673.38325	164.39849		
C Total	149	37340.59333			

Root MSE	12.82180	R-square	0.3660
Dep Mean	61.20667	Adj R-sq	0.3440
C.V.	20.94837		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	23.090236	5.87690468	3.929	0.0001
SIZE3	1	4.887455	1.25111254	3.906	0.0001
DTYPE1	1	5.231327	2.69834937	1.939	0.0545
DTYPE2	1	-6.099038	2.50530214	-2.434	0.0161
SIZE5	1	3.674997	1.39462670	2.635	0.0093
LOC2	1	3.810618	1.45085659	2.626	0.0096

Variable	DF	Standardized Estimate	Variance Inflation
INTERCEP	1	0.00000000	0.00000000
SIZE3	1	0.30800158	1.41194099
DTYPE1	1	0.15095756	1.37710104
DTYPE2	1	-0.18032078	1.24615634
SIZE5	1	0.20305738	1.34872363
LOC2	1	0.17834616	1.04729504

Size3 : Evaluation of living room size
Size5 : Evaluation of dining room size
Loc2 : Evaluation of living room location
Dtype1: Dummy variable if unit type is B+L type, Dtype1=1
Dtype2: Dummy variable if unit type is B+L+B type, Dtype2=1

Table 6-11: Predictors of overall satisfaction with the large unit

Dependent Variable: Satisfaction with the large size unit

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	6	13207.72883	2201.28814	17.212	0.0001
Error	132	16881.81074	127.89251		
C Total	138	30089.53957			

Root MSE	11.30896	R-square	0.4389
Dep Mean	65.94245	Adj R-sq	0.4134
C.V.	17.14974		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	13.941279	6.31949108	2.206	0.0291
SIZE5	1	3.108390	1.18530742	2.622	0.0098
SIZE6	1	2.051938	1.26555073	1.621	0.1073
SIZE7	1	2.918138	1.07075706	2.725	0.0073
LOC3	1	4.794929	1.51122857	3.173	0.0019
LOC4	1	3.016143	1.16862133	2.581	0.0109
OWNER	1	-8.536974	2.92631677	-2.917	0.0042

Variable	DF	Standardized Estimate	Variance Inflation
INTERCEP	1	0.00000000	0.00000000
SIZE5	1	0.20029509	1.37246698
SIZE6	1	0.12109306	1.31231934
SIZE7	1	0.19228639	1.17121829
LOC3	1	0.23469341	1.28726552
LOC4	1	0.18981014	1.27248579
OWNER	1	-0.19481290	1.04915741

Size5: Evaluation of dining space size
Size6: Evaluation of bathroom size
Size7: Evaluation of utility room size
Loc3 : Evaluation of living room location
Loc4 : Evaluation of Kitchen location
Owner: dummy variable if ownership is owner, owner=0
if ownership is renter, owner=1

variables accounts for about 44 percent of the observed variability in satisfaction with the dwelling unit. Of these variables, the location of the living room is the most important variable affecting satisfaction with the dwelling unit, as is indicated by a standardized coefficient of 0.23. Size of the dining space is the second most important variable and size of the utility room is the third most important variable, and location of the kitchen is the fourth most significant variable in accounting for satisfaction with the dwelling unit.

2. Predictors of overall satisfaction with the apartment Building

Table 6-12 shows the result of the multiple regression analysis in terms of overall satisfaction with the apartment building. A total of 9 variables is used in this analysis. Three of them are objective variables such as household income, floor where resident lives, and building siting. The others are six subjective variables that measure residents' evaluation of the apartment building

Table 6-12: Predictors of overall satisfaction with the apartment building

Dependent Variable: Satisfaction with the apartment building

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	7	61726.79518	8818.11360	59.764	0.0001
Error	361	53265.17772	147.54897		
C Total	368	114991.97290			

Root MSE	12.14697	R-square	0.5368
Dep Mean	63.28997	Adj R-sq	0.5278
C.V.	19.19257		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	7.791700	3.20770673	2.429	0.0156
BLDG1	1	2.311365	0.76217207	3.033	0.0026
BLDG3	1	1.952013	0.74909363	2.606	0.0095
BLDG4	1	4.121542	0.78200523	5.270	0.0001
BLDG5	1	3.448052	0.72750279	4.740	0.0001
BLDG6	1	5.688618	0.81631535	6.969	0.0001
INCOME	1	0.007634	0.00283740	2.691	0.0075
SITE1	1	-3.467727	1.44310214	-2.403	0.0168

Variable	DF	Standardized Estimate	Variance Inflation
INTERCEP	1	0.00000000	0.00000000
BLDG1	1	0.12619519	1.34954067
BLDG3	1	0.10739212	1.32367970
BLDG4	1	0.25028447	1.75751467
BLDG5	1	0.20777957	1.49781677
BLDG6	1	0.32318673	1.67625770
INCOME	1	0.09865997	1.04784965
SITE1	1	-0.09241156	1.15262591

Bldq1: Evaluation of building height
Bldq3: Evaluation of unit-access type
Bldq4: Evaluation of building siting
Bldq5: Evaluation of auditory privacy
Bldg6: Evaluation of visual privacy
Income: Household income
Site1: Dummy variable if siting=1 then site1=1
if siting=2 or 3 then site1=0

Seven variables are important in predicting satisfaction with the apartment building: evaluation of building height, evaluation of unit-access type, evaluation of building siting, evaluation of auditory privacy, evaluation of visual privacy, income, and building siting. The regression model indicates that five subjective evaluation variables together with income have positive relationship with overall satisfaction with the apartment building. A regression model employing these seven variables explains about 53 percent of the observed variability in satisfaction with the apartment building.

In terms of relative importance of variables, the evaluation of visual privacy has proved the most important variable in accounting for satisfaction with the apartment building, as indicated by a standardized coefficient of 0.32. That is, the greater satisfaction with visual privacy, the greater satisfaction with the apartment building. The evaluation of building siting is the second most important variable with a standardized coefficient of 0.25. The more satisfied a resident is with building siting, the more satisfied she is with the apartment building. The evaluation of auditory privacy is the third most important variable, while the evaluation of unit-access type is the fourth most important variable affecting satisfaction with the apartment building.

3. Predictors of satisfaction with the space around or within buildings

Of 13 objective variables, four variables - - household income, household size, ownership, and building siting - - are entered into a regression analysis. In addition, all seven subjective variables that measure the residents' evaluation of the physical components of the space around or within buildings are also entered into the analysis. Table 6-13 shows the results of this multiple regression analysis.

Seven variables proved to be important in predicting satisfaction with the space around or within buildings: evaluation of road pattern, evaluation of parking lot size, evaluation of parking arrangement, evaluation of playground size, evaluation of open space size, income, and building siting. A regression model with these seven variables can account for about 54 percent of the observed variability in satisfaction with the space around or within buildings.

In terms of relative importance among variables, satisfaction with the open space size is the most important variable in accounting for overall satisfaction with the space around or within buildings, as is indicated by a standardized coefficient of 0.42. Evaluation with parking arrangement is the

second most important variable that affects overall satisfaction with the space around or within buildings, by a standardized coefficient of 0.23. Evaluation of playground size represents the third most important variable in accounting for satisfaction with the space around or within buildings, by a standardized coefficient of 0.12 .

Table 6-13: Predictors of overall satisfaction with the space around or between buildings

Dependent Variable: Satisfaction with the space around or within buildings

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	7	58828.60531	8404.08647	58.442	0.0001
Error	352	50618.18357	143.80166		
C Total	359	109446.78889			

Root MSE	11.99173	R-square	0.5375
Dep Mean	67.70556	Adj R-sq	0.5283
C.V.	17.71159		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	6.559394	3.52442626	1.861	0.0636
SPACE1	1	2.212857	0.88101539	2.512	0.0125
SPACE2	1	3.891446	0.91254837	4.264	0.0001
SPACE4	1	1.958783	1.02835754	1.905	0.0576
SPACE5	1	2.430259	0.83311611	2.917	0.0038
SPACE7	1	7.006576	0.71978252	9.734	0.0001
INCOME	1	0.008110	0.00277183	2.926	0.0037
SITE2	1	2.268904	1.50395363	1.509	0.1323

Variable	DF	Standardized Estimate	Variance Inflation
INTERCEP	1	0.00000000	0.00000000
SPACE1	1	0.10477727	1.32444343
SPACE2	1	0.22945855	2.20362367
SPACE4	1	0.10130987	2.15307110
SPACE5	1	0.12010707	1.29027485
SPACE7	1	0.42049528	1.42020897
INCOME	1	0.10757653	1.02888361
SITE2	1	0.05613620	1.05380875

Space1: evaluation of road pattern
Space2: evaluation of parking lot size
Space4: evaluation of parking arrangement
Space5: evaluation of playground size
Space7: evaluation of open/green space size
Income: Household income
Site2 : Dummy variable if siting=2, then site2=1
if siting=1 or 3 then site2=0

VI-3. Conclusion

The chapter has analyzed the relationship between resident satisfaction and various objective and subjective variables. It is interesting to note that most personal and physical variables studied are not significantly related to the level of satisfaction with apartment forms. Among those variables, dwelling unit type, building siting, and income are significantly related to satisfaction. However, these objective variables are somewhat weaker predictors of satisfaction compared to other significant subjective evaluation variables. Dwelling unit type appears to be related only to satisfaction with the medium unit.

As regards satisfaction with the small unit, size of the *Anbang* is the most important variable affecting satisfaction. Location of the living room is the second most important variable, while size of the utility room is the third, and size of the bathroom is the least significant variable in accounting for satisfaction with the dwelling unit. In the medium unit, size of the living room appears to be the most important variable affecting satisfaction with the dwelling unit. Size of the dining space is the second most important variable, while dwelling unit type is the third most important variable in

accounting for satisfaction with the dwelling unit. In the large unit, the location of the living room is the most important variable affecting satisfaction with the dwelling unit. Size of the dining space is the second most important variable and size of the utility room is the third most important variable, and location of the kitchen is the fourth most significant variable in accounting for satisfaction with the dwelling unit.

Moreover, the evaluation of visual privacy, building siting, and auditory privacy have proved important variables in accounting for satisfaction with the apartment building, while the evaluation of open space, parking lot and playground size were major predictors of satisfaction with the space around or between buildings.

Chapter Seven

Conclusion

The major objective of this research has been the study of the relationship between apartment form and resident satisfaction in the Seoul metropolitan area. To achieve this objective, the study followed three steps. The first was to investigate patterns of apartment form in the Seoul metropolitan area; the second, to survey resident satisfaction with different apartment forms; the third step, to discover the important factors affecting resident satisfaction with apartment forms.

VII-1. Patterns of Apartment Form and Resident Satisfaction

Apartment form in Korea ca be defined by four basic elements: 1) dwelling unit, 2) apartment building, 3) grouping of apartment buildings, and 4) space around or between buildings. Seven apartment complexes in the Seoul metropolitan area were selected and their forms analyzed by defining types derived from the typo-morphological characteristics of dwelling unit, apartment building, grouping of apartment building and space around or between buildings. Site selection was based

primarily on the need for diversity in dwelling unit design, building design, building siting, and site design.

For this study was Resident satisfaction solicited through a questionnaire survey and informal interview with residents. A total of 512 questionnaires and 133 interviews were collected. Of these, 463 questionnaires and 128 interviews were used for data analysis. The data were analyzed using several statistical means of percentage distribution, Chi-square test, analysis of variance, and a stepwise multiple regression analysis.

Apartments in the study sample appear to be quite satisfactory housing in the Seoul metropolitan area. More than 70 percent of the respondents are satisfied with their dwelling unit, apartment building, and space around or between buildings. This finding may be based on the advantages of apartment residential development in Korea. Apartment complexes as "planned high-density housing environments" provide a package of dwellings, parking space, recreational facilities (e.g., playgrounds, and usable open space), and other services (e.g., retail shops, post office, school, etc.) in a minimum of space. In addition, apartments usually are designed to ease household responsibilities and to provide a greater sense of security than single-family housing. In the West, people have a negative image of high-density housing. However, high density

housing can be satisfying when it is adequately designed and managed. For example, Rothbaltt and Garr (1986) argue that greater satisfaction for high density housing is largely due to the high satisfaction with site and management characteristics of condominiums (park, security, and cultural and entertainment activities. For these reasons, apartments are rated quite satisfactory by people in Korea.

1. Dwelling unit

This study describes three types of dwelling unit in this study defined by their size: 1) small-size unit, 2) medium-size unit, and 3) large-size unit.

In the small-size unit, there are three different forms for room layout: 1) side-entrance and three-bedroom, 2) rear-entrance and two-bedroom, and 3) rear-entrance and three-bedroom. Residents in the three-bedroom type with both side- and rear-entrance, as shown in Bundang Hyundai and Suse Samsung complexes, are slightly more satisfied with the dwelling unit than those in the two-bedroom type, as shown in Jamsil Usung and Mokding-1 complexes, but their difference in satisfaction is not statistically significant. With regard to design of the small-size unit, more attention should be paid to matching people's needs with the number of rooms. Usually, in a three-

bedroom unit, kitchen and bedrooms appear to be too small. This study shows that residents are much more satisfied with the size of the other bedroom and kitchen in the rear-entrance and two-bedroom type than those of other types of small units.

Four types of medium-size unit were examined: 1) B+L type,[1] 2) B+L+B type,[2] 3) L+B+B type[3] and 4) B+L+B with rear entrance[4]. The B+B+L and B+L+B types with rear entrance are early models of room layout in the design of the medium-size unit. The B+L type (as shown in Jamsil Usung and Suse Samsung comlexes) and the B+L+B type (as shown in Olympic village and Bundang Hyndai complexes) became popular room layouts in the later design of medium-size unit. In terms of design, the B+L type usually has a larger living room and *Anbang*, but a smaller kitchen and dining space than the B+L+B type. The type of B+L+B with rear entrance, as shown in the Apkujung Hyundai complex, is the least satisfactory to residents. In a comparison of the B+L type and the B+L+B type, residents evaluated the B+L type as much more satisfactory than the B+L+B type. Specifically, in the B+L type, residents are much more satisfied with the size of *Anbang* and the living room than those of the B+L+B type,

---

[1] One bedroom and a living room in the front of the unit
[2] A living room locates between two bedrooms in the front of the unit
[3] A living room locates the side of two rooms in the front of the unit
[4] B+L+B type and main entrance locates in the back of the unit. It is designed for the corridor type apartment building

but no difference in satisfaction was expressed with the size and location of the kitchen and the dining space in both types.

In the large-size unit, there are two types described in this study, Korean- and western-style. This study found that the Korean-style large unit, as shown in Jamsil Usung, Mokdong-1, and Bundang Hyundai complexes, is somewhat more satisfactory to residents than the western style, but the difference is not significant. Judging from the subjective evaluation of each component, the only significant difference in satisfaction exists for kitchen size between the two types. In other words, residents in Korean style units are more satisfied with the kitchen size than those in western style units.

2. Apartment building

Types of apartment building were classified by their height and unit-access type. Building height ranged between medium-rise (usually 5-story) and high-rise (more than 12-story). This study found that medium rise buildings were much more satisfactory to residents than high-rise buildings. In addition, almost all respondents (99 percent) do not prefer to live in buildings taller than 16-stories. One of the reasons could be the high residential density which causes the usual problems of crowding, a loss of visual and auditory privacy.

Generally, residential density increases with each added building story. High-rise buildings have been built and will continue to be built by reaching the limit of FAR regulations in urban area. With this finding, high-rise development needs to be reconsidered in urban housing policy in Korea.

There were three kinds of unit-access analyzed in this study: 1) corridor type, 2) core with elevator type, and 3) walk-up. Residents evaluated the walk-up as the most satisfactory, ranked second was the core with elevator, while the corridor type was the least satisfactory. The reason may be that the core type provides more privacy from neighbors and greater security from crime than the corridor type.

3. Grouping apartment buildings

Groupings of apartment buildings can be classified as either the parallel or the court type. The court type can be further divided into court-centered layout with different story buildings and court-centered layout with same story buildings. The parallel type of building siting was the most satisfactory compared to other two types. The parallel siting, as shown in Banpo Jukong-1 and Apkujung Hyundai complexes, was used in the early stages of apartment development (i.e., in the early 1970s), and was intended to orient all buildings toward the

south. In addition, parallel siting is less dense than the court type because the court type was developed to accommodate more units by plotting another building or extending a building to the side.

4. Space around or between buildings

For this study, the space around and between buildings includes road pattern, parking arrangement, playground, and open/green area (e.g., neighborhood park or greenery space).

Road patterns were classified into four categories: grid, loop, cul-de-sac, and no pattern. These road patterns affect parking arrangement and open/green space layout. A grid road pattern is formed of rectangular blocks, each block containing one or two buildings as shown in the Banpo Jukong-1 complex, and has street parking lots along a line parallel to the building. For this type, one section of blocks is usually assigned to playground and open/green space (It is called an "integrated" playground or open/green space).

The loop road with attached parking lots began to prevail as the type of road pattern in the mid-1970s, as shown in Olympic Village and Bundang Hyudai complexes. The loop road pattern usually serves to reduce construction costs by reducing the total length of the road and provides for the partial

separation between automobiles and a pedestrian pathway. In this type, several small playgrounds and open/green spaces are designed along with a pedestrian pathway (called "separated" playgrounds or open/green space).

The cul-de-sac road system was first developed in the Mokdong apartment complex. It was intended to separate the automobile from the pedestrian.

Using residents' evaluation of road system, the cul-de-sac pattern was the most satisfactory, and the next most satisfactory were the grid and the loop. No significant difference in satisfaction appeared between the grid and the loop. Non-pattern was the least satisfactory. A non-pattern system is shown in Jamsil Usung and Suse Samsung complexes. These complexes have hard-to-define road patterns, so that road and parking lots are more complexly interconnected.

In terms of the evaluation of playground, there was no significant difference in satisfaction between the "integrated' and the "separated" system. However, residents were much more satisfied with separated open/green space than with integrated open/green space. For example, the residents in Mokdong-1 complex were more satisfied with playgrounds and open/green space than residents of other complexes because several

playgrounds and open/green spaces are located along a pedestrian way.

VII-2. Factors Related to Satisfaction with Apartment Form

A literature review has shown that people's subjective judgement and evaluation together with the objective characteristics of their situation were related to feelings of satisfaction. The variables selected for this study included objective personal characteristics, objective physical characteristics, and subjective evaluation of apartment forms. A total of 37 independent variables were examined to identify which were more important than others for generating satisfaction with apartment form. Of these, there were six objective personal variables, six objective physical variables, and twenty-seven subjective evaluation variables.

In a small-size unit, the evaluation of *Anbang* size was found to be the most important influence on satisfaction with dwelling unit. Evaluation of bathroom and utility room size was also shown to be important factors affecting satisfaction.

In a medium-size unit, the evaluation of the living room size appeared to be the most important variable affecting

satisfaction. The evaluation of dining space size was the second most important variable, while dwelling unit type was the third most important variable affecting satisfaction.

In a large-size unit, the evaluation of the living room location constituted the most important variable affecting satisfaction. Size of the dining space was the second most important variable, size of the utility room was the third most important variable, while location of the kitchen is the fourth most significant in accounting for satisfaction.

The physical layout of each room in a dwelling unit can serve as an important factor in desirable housing. To improve satisfaction with a dwelling unit, priority should be given to enlarging *Anbang* and bathroom size in small units, living room size and dining space in medium units, and improving living room location and dining space in large units.

With regard to apartment buildings, seven variables were revealed to be important in predicting satisfaction with the apartment building: income level, building siting type, and subjective evaluations of building height, of unit-access type, of building siting, of auditory privacy, and of visual privacy. In terms of the relative importance of variables, the evaluation of visual privacy has proved the most important variable in accounting for satisfaction with the apartment

building. That is, the greater the satisfaction with visual privacy, the greater the satisfaction with the apartment building. Court type siting was deemed less satisfactory then parallel type siting. Court-type siting may produce a problem of visual privacy among unit on the corners of the apartment buildings because residents living in these units can see inside other dwelling units. The evaluation of building siting proved to be the second most important variable. The more satisfied a resident was with building siting, the more satisfied she was with the apartment building. The evaluation of auditory privacy presented the third most important variable, while the evaluation of unit-access type was the fourth. Mokdong-1 complex was the highest rating on satisfaction with visual and auditory satisfaction. However, in Suse Samsung complex, the overwhelming majority of residents are dissatisfied with visual and auditory privacy because of the proximity of parking or walkway to bedroom windows. Therefore, efforts should be made to provide more visual and auditory privacy in the design of apartment complexes.

In addition, seven variables proved important in predicting satisfaction with the space around or between buildings: income level, building siting type, and subjective evaluations of road pattern, of playground size, of parking lot

size, of parking arrangements, and of open/green space size. In regard to the relative importance among these variables, the evaluation of the open space size was the most important in accounting for overall satisfaction with the space around or between buildings. The evaluation of parking lot size was the second most important variable affecting overall satisfaction, while the evaluation of playground size represents the third most important variable in accounting for. Therefore, to improve satisfaction with space around or between buildings, priority should be given to improving the quality of open/green space and playgrounds.

It is interesting to note that most personal and physical variables studied were not significantly related to the level of satisfaction with apartment forms. Among those variables, dwelling unit type, building siting, and income are significantly related to satisfaction. However, these objective variables are somewhat weaker predictors of the satisfaction than other significant subjective evaluation variables. Dwelling unit type is related only to the satisfaction with the medium unit. The subjective evaluation variables, which are significantly associated with overall satisfaction with apartment forms, could be very useful information to designers,

developers, and housing policy makers endeavoring increase people's satisfaction with their residential environment.

VII-4 Further Studies

This dissertation provides a study of apartment forms in the Seoul metropolitan area and their influence on resident satisfaction. To accept the limitations of the methodology and satisfaction models employed in this study would suggest that further studies are required.

First, there may exist some limitation in the generalization of our findings to other apartment residential developments. This study contains only seven project samples, so the sample may not be representative of the population within the Seoul metropolitan area. Bearing this in mind, this study needs to expand the survey to a more diverse and greater number of apartment complexes. However, the size of the resident sample in this study can provide confidence that most of these findings should be applied to future designs of apartment complexes. The present research could be further enhanced by larger samples of apartment projects and residents.

Second, there are some constraints on the use of the model to predict resident satisfaction. Although the study variables measuring personal and physical characteristics as well as

subjective evaluation are sufficiently comprehensive to account for a large portion of the variance in resident satisfaction, it will be necessary in future studies to include other variables of design characteristics not examined in this study, such as the location of an apartment complex, its age, its size, maintenance and so on. In this research, the location of the apartment complexes was considered in the selection process. Most apartment complexes studied were located about 10 to 15 km from the central business district of Seoul. Other location factors such as travel time or distance to work place, will be important factors affecting housing satisfaction. As regards age of an apartment complex, the development year of the studied apartment complexes ranges from the early 1970s to the early 1990s. This study did not consider the age of apartment complexes because of the small sample involved. In western society, the age of neighborhood is generally related positively to housing satisfaction. The high satisfaction engendered by an older housing environment could be related to satisfaction with neighbors, friendships, and a sense of belonging. The size of the apartment complex (in terms of total number of dwellings) could play an important role in affecting housing satisfaction because it may be related to

site and management characteristics such as park, security, educational facilities, and entertainment activities.

Third, this study has examined the causal relationship between the dependent variables as resident satisfaction and various independent variables as personal factors, physical factors, and subjective evaluations. It will be necessary in future studies to broaden the scope of this study. In other words, there is a need to study other physical factors affecting resident subjective evaluations. For example, it would be interesting to uncover some of the design characteristics affecting satisfaction with the living room. The shape (or ratio of width-to-depth) of the living room, its wall and floor covering materials, size of window, duration of sunlight, etc. may affect satisfaction with the living room.

Finally, this study was conducted at one temporal point, so the need for continued research arises to monitor changes in resident satisfaction over time. The comparison between changes in factors affecting resident satisfaction over time could provide useful information to designers and developers.

Bibliography

Altman, I. (1975). the Environment and Social Behavior: Privacy, Personal Space, Territory and Crowding. California, Brooks/Cole.

Amerigo, M. and J. I. Aragones (1990). "Residential Satisfaction in Counsel Housing." Journal of Environmental Psychology 10: 313-325.

_____ (1997). "A Theoretical and Methodological Approach to the Study of Residential Satisfaction." Journal of Environmental Psychology(17): 47-57.

Bonnes, M., M. Bonaiuto, et al. (1991). "Crowding and Residential Satisfaction in the Urban Environment: A Contextual Approach." Environment and Behavior 23(5): 531-552.

Bruin, M. J. and C. C. Cook (1997). "Understanding Constraints and Residential Satisfaction among Low-income single-parent Families." Environment and Behavior 29(4): 532-553.

Campbell, A., P. E. Converse, et al. (1976). The quality of American Life. New York, Russell Sage Foundation.

Choi, J. (1992). The Traditional Characteristics Reflected in the Plan of Modern Apartment House in Korea. Proceedings of International Symposium on Housing. KNHC. Seoul.

Conzen, M. R. G. (1960). Alnwick, Northumberland: A Study in Town Plan Analysis. London, George Philip & Son Lts.

Cook, C. (1988). "Components of Neighborhood Satisfaction: Responses from Urban and Suburban Single Parent Women." Environment and Behavior 20: 115-149.

Korea National Housing Corporation (1980). Collection of Site Planning: 1978-1980. Seoul, KNHC.

_____(1992). 30-Year-History of Korea National Housing Corporation. Seoul, KNHC.

_____(1995). Population and Housing Statistics Information. Seoul, KNHC.

Cutter, S. (1982). "Residential Satisfaction and the Suburban Homeowner." Urban Geography(Oct.-Dec.): 315-327.

Davis, E. E. and M. Fine-Davis (1981). "Predictors of Satisfaction with Housing and Neighborhood: A Nationwide Study in the Republic of Ireland." Social Indicators research 9: 577-494.

De Jong, G.F. (1977). "Residential Preferences and Migration." Demography 14(2): 169-178.

Deutschman, H. D. (1972). "The Residential Location Decision: Study of Residential Mobility." Socio-economic planning Sciences 6: 349-364.

Francescato, G., S. Weidemann, et al. (1979). Residents' Satisfaction in HUD-Assisted Housing: Design and Management Factors, U.S. Department of Housing and Urban Development.

Fried, M. (1982). "Residential Attachment: Sources of Residential and Community Satisfaction." Journal of Social Issues 38(3): 107-119.

Galster, G. C. and G. W. Hesser (1981). "Residential Satisfaction: Compositional and Contextual Correlates." Environment and Behavior 13(6): 735-758.

Gans, H. J. (1982). The Urban Villagers: Group and Class in the Life of Italian-American. New York, the Free Press.

Hall, E. T. (1966). The Hidden Dimension. New York, Doubleday.

Jang, S. (1978). "A Study of the Houses In Toyedong, a Traditional Village near Andong." Journal of the Architectural Institute of Korea 22(81): 3-10.

Speare, A. Jr. (1974). "Residential Satisfaction as an Intervening Variable in Residential Mobility." Demography 11: 1773-1788.

Kaitilla, S. (1993). "Satisfaction with Public Housing in Papua New Guinea: The Case of West Taraka Housing Scheme." Environment and Behavior 25(4): 514-545.

Kim, Kwang-joong. (1992). Regulatory impacts on Suburban Residential Form: Case study of Bellevue, Washington. Urban Planning and Design. Seattle, University of Washington.

Kim, Ki-Yon. (1987). A Study on Apartment Building Siting and Characteristics Among Publicly Sponsored Complexes in Seoul, Korea. Urban Landscape. Seoul, Seoul National University.

Labovitz, S. (1970). "The Assignment of Numbers to Rank Order Categories." American Sociological Review 35: 515-524.

Lansing, J. B., R. W. Marans, et al. (1970). Planned Residential Environment. Ann Arbor, institute for Social Research.

LeBrasseur, R., K. Blackfold, et al. (1988). "The Leford Test of Tenant Locus of Control: Introducing an Effective Measure of Relating locus of Control and Housing Satisfaction." Environment and Behavior 20(3): 300-319.

Marans, R. W. and W. Rodgers (1975). Toward an understanding of Community satisfaction. Metropolitan America in Contemporary Perspective. A. H. Hawley and V. P. Rock. New York, Sage Publication.

Michelson, W. H. (1976). Man and His Urban Environment: A Sociological Approach, Addison-Wesley.

Milgram, S. (1970). "The Experience of Living in Cities." Science(167): 1461-1468.

Moudon, A. V. (1992 [a]). "A Catholic Approach to Organizing Waht Urban Designers Should Know." Journal of Planning Literature 6(4): 331-349.

_____ (1992 [b]). The Evolution of Common Twentieth-Century Residential Forms: An American Case Study. International Perspective on urban Landscape. J. W. R. Whitehand and P. J. Lazkhan. London, Routledge.

National Statistical Office (1997). Major Statistics of Korean Economy. Seoul: Republic of Korea.

Newman, S. J. (1977). Perceptions of Building Height: An Approach to Research and Some Preliminary Findings. Human Response to Tall Building. D. J. Conway. Stroudsburg, Dowden, Hutchinsin &Ross, Inc.

Rapoport, A. (1975). "Toward a Redefinition of Density." Environment and Behavior 7: 133-158.

Rent, G. S. and C. S. Rent (1978). "Low-Income Housing: Factors Related to Residential Satisfaction." Environment and Behavior 10(4): 459-487.

Rothblatt, D. N. and D. J. Garr (1896). "Suburbia: An International Perspective on Levels of satisfaction with the Physical Environment." Journal of Planning Education and Research 5(2): 94-106.

Rotter, J. B. (1966). "Generalized Expectancies for Internal versus External Control of reinforcement." Psychology Monography 80: 1-20.

Savasdisara, T. (1988). "Residents' Satisfaction and Neighborhood Characteristics in Japanese Urban Communities." Landscape and Urban Planning 15: 201-210.

Vance, James E. Jr. (1990). The Continuing City: Urban Morphology in Westen Civilization. Baltimore, MD, Johns Hopkins University Press.

Weidermann, S. and J. R. Anderson (1985). A Conceptual Framework for Residential Satisfaction. Home Environments. I. Altman and C. H. Werner. New York, Plenum Press: 153-182.

Western, J. S., P. D. Weldon, et al. (1974). "Housing and Satisfaction with environment in Singapore." AIP Journal(May): 201-208.

Winter, J., T. Coomes, et al. (1993). "Satisfaction with Space around the Home on Large Private Sector Estates: Lesson from Surveys in Southern England and South Wales, 1985-89." Town Planning Review 64: 65-88.

Wisenfeld, E. (1992). "Public Housing Evaluation in Venezuela: A Case Study." Journal of Environmental Psychology 12: 213-223.

Yi, C. (1985). "Urban Housing Satisfaction in a Traditional Society: A Case Study in Taichung, Taiwan." Urban Studies 22: 1-12.

Yim, Chnag-Bok, et al. (1994). A Study on Planning Standard and Density of Large-Scale Residential Development. Seoul, Korea Research Institute for Human Settlement.

Appendix A

Questionnaire

Please answer the questions by filling out the underlined part or by marking one of the given items.

1. Subjective evaluation about the dwelling unit.
Please check the appropriate category.

1.2 How satisfied are you with the size of each of the following rooms concerning overall size of your dwelling unit?

	Very satisfied	Satisfied	neither satisfied nor dissatisfied	dissatisfied	Very dissatisfied
*Anbang**					
other bedroom(s)					
living room, if applicable					
Kitchen					
dining area, if applicable					
bathroom(s)					
utility room** if applicable					

* It usually is the largest bedroom for the head of household and his spouse in the dwelling unit.

** It is usually for laundry and storage.

1.2. How satisfied are you with the location of each of the following rooms concerning the room layout of your dwelling unit?

	Very satisfied	Satisfied	neither satisfied nor dissatisfied	dissatisfied	Very dissatisfied
*Anbang**					
other bedroom(s)					
living room, if applicable					
Kitchen					
dining area, if applicable					
bathroom(s)					
utility room** if applicable					

* It usually is the largest bedroom for the head of household and his spouse in the dwelling unit.
** It is usually for laundry and storage.

1.3. Considering all items in the question 2.1 and 2.2, how much do you give the score of overall satisfaction with the dwelling unit from 0 to 100? (100 for totally satisfied, 0 for totally dissatisfied) _____

From now on, I would like to ask the needs and wants of the residents.

1.4. Which of the spaces on the following list would you like to enlarge even though overall size of the unit remains same? the first priority _____ the second priority _____
1) the *Anbang* 2) other bedroom(s) 3) the living room 4) the kitchen 5) the dining space 6) the bathroom 7) the utility room 8) the storage attic
9) the balcony 10) others: specify _____

1.5. Which of the areas listed above would you like to reduce even though overall size of the unit remains same? the first priority _____ the second priority _____

1.6. Which of the following list would you like to do if you could make enlargements or addition to your house?
the first priority _____ the second priority _____

1) nothing
2) to enlarge the *Anbang*
3) to enlarge other bedroom(s)
4) to make an additional bedroom
5) to enlarge a living room
6) to make a living room
7) to enlarge the kitchen
8) to enlarge the dining space
9) to make a dining space
10) to enlarge the bathroom
11) to make an additional bathroom
12) to build a storage space
13) to enlarge the utility room
14) to enlarge the balcony in the front of the dwelling unit
15) to enlarge the balcony in the back of the dwelling unit
16) others: specify _____

1.7. Could you mark the type of transformation done in your dwelling unit and write the reason?

Example of reason: 1)need more space, 2)increase the family size, 3) decrease the family size, 4) for comfort, 5)better appearances, 6) need storage space, 7) too old, etc.

Mark	Type of transformation	the reason
	1. enlarge a living room by removing the front balcony	
	2. enlarge a living room by removing a bedroom	
	3. enlarge a bedroom by combining another bedroom	
	4. enlarge a bedroom by removing a balcony	
	5. enlarge a kitchen by removing a rear balcony	
	6. enlarge a kitchen by removing a utility room	
	7. enlarge a kitchen by removing a bedroom	
	8. removing a closet	
	9. removing a furniture to be provided by the developer	

2. Subjective evaluation about the neighborhood

2.1 I would like to ask about your apartment building. Please check the appropriate category.

	Very satisfied	Satisfied	neither satisfied nor dissatisfied	dis-satisfied	Very dissatisfied
the height of the Apartment building					
the length of the Apartment building					
Access-unit type* to your house					
The siting with adjacent buildings**					
noise from the neighbors					
visual privacy from the neighbors					

* Access-unit types can divided into corridor, walk-up-staircase, staircase with elevator.
** The building siting can be divided into parallel type and court type.

2.2. Considering all items in the question 2.1, how much do you give the score of overall satisfaction with the apartment building from 0 to 100? (100 for totally satisfied, 0 for totally dissatisfied) _____

2.3. How many neighbors do you have a close relationship with?
1) none 1) 1-3 neighbors 3) 4-6 neighbors 4)7-9 neighbors 5) more 10 neighbors

2.4. How does the access-unit type of your building affect to make neighbors with a close relationship?

	most		neither		most	
encouraged	_____	_____	_____	_____	_____	discouraged

2.5. Which the apartment building would you prefer to live? _____ and then, which floor level would you prefer to live? _____ floor level

1) Walk-up apartment (5-story) 2) 12- to 15-story apartment 3) more than 25-story apartment

2.6. I would like to ask about spaces around or within buildings. Please check the appropriate category.

	Very satisfied	Satisfied	neither satisfied nor dissatisfied	dis-satisfied	Very dissatisfied
Inner road pattern in the apartment site					
Parking lot size					
Parking arrangement type					
Playground size					
Playground location					
Open space size					
Open space location					

2.7. Considering all items in the question 2.6, how much do you give the score of overall satisfaction with the space around or within apartment buildings from 0 to 100? (100 for totally satisfied, 0 for totally dissatisfied) _____

2.8. Please check the appropriate category.
How would you like to describe your neighborhood? (the relationship among your building, neighboring buildings, green space and, road)

	most		neither		most	
Monotonous	_____	_____	_____	_____	_____	varied
closed	_____	_____	_____	_____	_____	opened
spacious	_____	_____	_____	_____	_____	dense

3. Objective characteristics of household and housing
3.1 the number of bedrooms in the dwelling unit _____
3.2 Have a living room in the dwelling unit? Yes___ No___
3.3 The size of your family: _____ persons
3.4 the number of child(ren)?
Under 6 year-old _____ persons 7-12 year-old _____ persons
3.5 The type of housing ownership: own _____ rent_____
3.6 The length of residence: _____ years _____ months
3.7 floor number where you live in? _____ story
3.8 The elevator in the apartment building: yes___ no ___
3.9 your age: _____
1) 20-29 2) 30-39 3) 40-49 4) 50-59 5) more than 60
3.10 The monthly family income: _____ won
3.11 The floor number you live in: _____
3.12 The elevator: yes____ no _____

If you moved in, answer the following questions.
3.13 The type of your previous house:_____
1) detached housing 2) apartment 3) row house 4) others: specify _____
3.14 your previous housing ownership: own_____ rent____
3.15 The length of previous residence: _____years ___ months

Appendix B
Data Coding of Questionnaires

```
options ps=60 nodate;
data osk;
     input
#1 id 1-3 site 4 siting 5 road 6 pedes 7 playgrnd 8 aptsize 9 apttype
10
   (size1-size10) (1.)  (loc1-loc7) (1.)  y1 28-29
   expand1 30 expand2 31 reduce1 31 reduce2 33 want1 34-35 want2 36-37
   (modify1-modify30) (1.)      (bldg1-bldg3) (1.)
#2 (bldg4-bldg6) (1.)  y2 4-5 frndlnb 6 access 7 accfrnd 8
   aptht 9 wantht 10-11 (space1-space8) (1.)  y3 20-21
   (percep1-percep3) (1.)      nbedrms 25 livingrm 26 hhsize 27
   presch1 28 elmsch 29 ownershp 30 yrsresd 31-32 monresd 33-34
   flrlevel 35-36 elevtr 37 age 38 income 39-42 prehtype 43 preownsp 44
   pyrsresd 45-46 pmonresd 47-48;

   if y2=99 then y2=100;
   if y3=99 then y3=100;

    lngthrs= yrsresd+ monresd/12;
   plngthrs=pyrsresd+pmonresd/12;
   HDENSITY=HHSIZE/NBEDRMS;

        if age=1 then agegroup='20-29';
   else if age=2 then agegroup='30-39';
   else if age=3 then agegroup='40-49';
   else if age=4 then agegroup='50-59';
   else if age=5 then agegroup='60-  ';

     IF Y1>=0 and Y1<=25 THEN SATDW='4-VERY DISSATISFIED';
   ELSE IF Y1>25 and Y1<=50 THEN SATDW='3-DISSATISFIED';
   ELSE IF Y1>50 and Y1<=75 THEN SATDW='2-SATISFIED';
   ELSE IF Y1>75 and Y1<=100 THEN SATDW='1-VERY SATISFIED';

      IF Y2>=0 and Y2<=25 THEN SATBU='4-VERY DISSATISFIED';
   ELSE IF Y2>25 and Y2<=50 THEN SATBU='3-DISSATISFIED';
   ELSE IF Y2>50 and Y2<=75 THEN SATBU='2-SATISFIED';
   ELSE IF Y2>75 and Y2<=100 THEN SATBU='1-VERY SATISFIED';

       IF Y3>=0 and Y3<=25 THEN SATSP='4-VERY DISSATISFIED';
   ELSE IF Y3>25 and Y3<=50 THEN SATSP='3-DISSATISFIED';
   ELSE IF Y3>50 and Y3<=75 THEN SATSP='2-SATISFIED';
   ELSE IF Y3>75 and Y3<=100 THEN SATSP='1-VERY SATISFIED';


LINES;
00111111113333332 22444444460    04050 0 0 0 0 0 0 0 0 0 16160 170 544
443705331034444333370333314111050002020200210100
002111111122 2222 2 33   2 4041290702110 0 0 0 1818180 0 0 0 0 0 0 444
443603331034344333602  31300109000104010011100O
```

00311111114244344 4 43444448083261205170 0 0 0 0 0 0 0 0 0 0 0 0 0 554
5328043310343233422603223131010700030201 50
00411111112232 3233333333335013 14160 0 0 0 0 0 0 0 0 0 0 0 0 0 0 554
4449933310244113332503343140011605010301001110 00
00511111113233333 214444 2 5023 0311110 0 110 0 110 0 0 15150 0 0 334
3226043310344443242603343140110506010202002101 08
00611111112342244 4 4444 4360187902080 0 0 0 0 0 0 0 0 0 0 150 180 444
4537023310234444344703343142010100030102002106 00
00711111114343242 4243422427028 12031 0 1 0 0 0 0 0 0 0 0 1 0 0 0 555
5539023310255555555995553141120203010202002202 00
0081111111223 143 3 444444440146 0207110 0 0 0 11110 0 0 0 15180 0 545
4115033110334433333502333130010700040401001113 00
00911111114444342222444 4360596 07030 0 0 0 0 0 0 0 0 0 0 0 0 0 0 453
4447013320745553255803453142010003040 2 210300
01011111113342 32 2 3343 3245129 0204110 0 0 0 0 0 0 0 0 0 0 0 0 0 232
333491312042333 4350333315002050005030150111000
011111111111111311 1111 3 2023900409180 0 130 110 0 0 181515170 0 555
4247043410444444444903443150310706050304502103 00
01211111114243142 1153541448059 0815190 0 0 0 17170 0 0 1515180 0 555
433702341034555445 8033531200300030401015011
01311111113343344 34444 4348023 0503170 0 0 0 0 0 0 0 0 0 100 100 555
5348043310245551144904333142020400050203002201 00
01411111112242133 3344444447043690803 0 0 0 0 0 0 0 0 0 0 0 0 0 0 555
5559923310344443433803343130120009030202502201 08
0151111111222222 2 243443227057 02070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 443
444605341053333 3370333315001050005040400110800
01611111114241224 4 424223460467 11021 0 0 0 0 111 0 0 0 1 1 1 0 0 544
4237023210234333245504453142020105020200902103 00
01711111113232244 3344444447024610307110 0 0 0 0 110 0 0 0 0 0 110 443
3338033310235543344902333150020100040305001110 00
01811111113332 3 333333 3 6042 07110 0 0 0 130 0 0 0 0 0 150 0 0 444
4336023320833333222402223140020500020103 00
0191111111332113211232311324035 05070 0 0 0 0 0 0 0 0 0 0 1 0 0 0 234
4326013320533332233704333131020100040202002104 00
02011111113333332 2 42333334034 0205110 0 0 0 0 0 0 0 0 0 0 0 170 43
3236053420544442244801 3140010805010303002107 00
021111111144 3 43 44 3 438034 05071 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
3336023 10333333333603 312 108030305
02211111114334 43 4 4444 4370293 0312180 0 0 0 0 0 0 0 0 0 0 0 0 0 334
4438023331454443343803433130020005050 1
02311111114442254 1 44 4 4485946314070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
2324923410344443333803133140010304020303502104 00
02411111114233233 33333333 6025 03080 0 0 0 0 0 0 0 0 0 0606080 0 544
4426023310333443234702223141110007030202502103 00
025111111143422331114433342506 4 10040 0 0 0 0 0 120 0 0 0 0 0 0 0 44
2226533210333432222702343131010500030203502202 00
0261111123324 43341 324433360925 03140 0 0 0 130 0 0 0 0 0 0 1 0 0 555
4337033410345554231603334150011700050402502 1
027111112332553424115232242459238111 50 0 0 0 0 0 0 0 0 0 0 1 0 0 0 555
3234543410342222255453334171210600020303001108 00
0281111123544444 44555535 95149211120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 341
4335013120724442232903334131020002030101202101 06
02911111233343343 3 434333350138201060 0 0 0 0 0 0 0 0 0 0 0 100 0 333
3335043410543323234504554130011101050402501106 02

030111112323333322222341343651347110 50 0 0 0 0 0 0 0 17171515180 0 443
231553331033323223370344414112000701020450210200
031111112354533324425453344 80 0211110 0 0 0 150 0 0 0 0 150 150 554
433602321034442 3260334413001080005040400211000
032111112333334322434333323806498100 70 0 0 0 0 0 0 0 0 0 0 0 0 0 555
53385231 044444555590243415001100004030300210402
033111112333212323134332233704 3 07050 0 0 0 0 0 0 0 0 0 0 0 0 0 111
311502341034333224260223312001230003040500210300
03411111232242333 33444344470619802111 10 0 0 0 190 0 0 0 0 15110 0 443
333603321014444111150333314201030003020200210300
035111112322211423 2 42222234513 10130 0 0 0 0 0 0 0 0 0 0 0 0 0 0 434
422305321033444433360243414001130802 04 210100
036111112332433232333333333506897110 30 0 0 0 0 0 0 0 0 0 0 0 0 0 334
223492322103332323350344414012010305030200210500
0371111123234444 4 4444244480124502030 0 0 0 0 0 0 0 0 0 0 1 1 0 0 444
4338023210434443 4380344414001140005030250 21
038111112344533443334343443904122021111 0 0 0 0 0 0 0 0 0 15170 0 555
555805351015555555580345417001100001 03 110500
039111112333442331224454232709 8 1412110 0 0 130 0 0 180 0 190 0 0 444
434702321024444334470355415001000802030200220500
040111112333433444 3 4443344801964031 10 0 0 0 0 0 0 0 0 0 0 150 0 0 444
444803351034444334470232415001190003040200110610
041111112334333434444544234460154705020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
532602321034333444353233314002100001010250220300
0421111123223 3332223333 245012 0212110 0 0 0 0 0 0 181 0 1 0 0 0 234
433552311023333 4 5602443140012000050302002101 00
043111112322444444 223333460127 02030 0 0 0 0 0 1 0 0 0 0 0 0 0 0 555
555902331025555555590345413001060302030300210200
044111112322523335335441344702 4 03111 0 0 0 0 1 0 0 0 0 0 0 0 0 0 555
34590134101 555231180335414001120005040300210500
0451111123233233 3 2 434233360486 04070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 443
434803331034443325470253415011040505030400210300
0461111123334443 4 4444 337014 05111 0 0 0 0 0 0 0 0 0 0 0 0 0 0 54
434703331034233434460344415011040004030300210600
047111112333433332333333333508149041 10 0 0 0 0 0 0 0 0 0 0 0 0 0 333
323502321033333223350333414002000303030200210500
048111112312444333244442244801897021 10 0 0 0 0 0 0 0 0 0 0 0 0 0 544
432303331012233324480334414111030003020250210600
04911111232344342 2 424124360135702110 0 0 0 0 0 0 0 0 0 19190 180 445
353701332083444313370234141201030604020200
0501111123555553323344444449 0 05110 0 0 0 0 0 0 0 0 0 0 150 1218444
544902311035555534490344313001070402010300
05111111233244443 343444437016 0211180 0 0 0 0 0 0 0 0 19190 0 0 554
433903341024444224480333315011120003030250140300
05211111235344 431424443 2370359 11160 0 0 0 0 110 0 0 0 0 0 0 0 0 544
413402321034344445580244313001020102 01 11
053111112333444422 3 444333370275 02110 0 0 0 0 0 0 110 0 0 0 160 0 0 543
433602321034444334370244415001020405030150211000
05411111324442 224444244 70422 02070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 555
444604342124444324480343504011170002040300210500
055111113244434334444444444480469704051 70 0 0 0 0 0 0 0 0 1515180 0 444
442803321033444324480223 51
056111113222323333334453343701895021 21 0 0 110 0 0 0 0 1 1 1 1 0 0 555
533603334033333222260333414011040003030500211200

```
057111113224444442334444244851 4  03070 0 0 0 0 0 0 110 0 0 0 0 100 544
433903331024553424490244415011220001040300110500
058111113234524451253352444601 5  0207110 0 0 0 0 0 0 0 0 0 0 0 0 0 555
554802351034555555599155516001100002040200111500
05911111324442244 444241 4 708 2912  0 0 0 0 0 150 0 0 0 0 1 0 0 0 555
542802331035555525590555415011010501030400 11
060111113234544444441344444601524020 80 0 0 0 0 0 0 0 151515150 0 0 555
544701331012444334470 4  514021020003030200211000
061111113243453443433344344702864011 20 0 0 0 0 0 0 180 0 1516180 0 334
333703331043334344370 3  414001020004040200210300
06211111322443444 4424434448014  05080 0 0 0 0 0 0 0 0 0 0 0 0 0 0 555
555901351032555555590355514022020204020200220302
06311111324  34 2 3 445433 807   15  160 0 0 0 1 0 0 1 0 0 1 1 0 0 555
454803331  555 555490355415001030003030300210400
06411111324554 233333334 2345612404100 0 0 0 0 0 0 0 0 0 0 150 0 0 33
422502321  5554555580355415101    0301    210100
0651111132435232235 444444380641205080 0 0 0 0 180 0 0 0 0 0 0 0 0 555
544903331024443333480 2 41400103080101
06652322122311 2332222313334514  10110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 223
222301211033333334455455214002001001130100110009
06711111323343322 2234444326049  14120 0 0 0 0 100 0 0 0 0 19180 0 555
542801331035555555580235414002010502030400220200
0681111132113333131122333360 9   02140 0 0 0 0 0 0 0 0 0 0 1 0 0 0 431
231704322052443444470212412011200002 05    110500
0691111132224233222 3342 445045  071512180 0 0 180 0 0 0 19190 0 0 334
433703322045444  558025541500117000203    210300
0701111132444334434344444449036850502170 0 0 0 0 0 0 0 0 15160 0 0 554
444902331043344334480333412001150004040500220400
07111111323443233 2233342337095  14080 0 0 0 0 0 0 0 0 0 0 190 0 0 554
222401331  333244436034341400201000303050021 1100
07211111324433331 1144333335094  14150 0 0 0 0 0 0 0 0 0 0 0 0 0 0 543
533501131024444444450155412001200202040500210300
0731111132334344444333433347041780209 0 0 0 0 0 1 1 0 0 0 1 1 1 0 0 555
423703341044555445580434413001060104040400210501
0741111132334333222233433228070  01130 0 0 0 0 0 0 0 0 0 0 0 0 0 0 555
543953341015444444490455414021010801020800210410
0751111132544444444433544490         0 0 0 0 0 0 0 0 0 0 0 190 0 0 444
   80333103555344559033341400105020103070011 1205
0761111132424444333 4  4443909234031 40 0 0 0 0 0 0 0 0 0 10100 0 0 444
444902321034444442290344414111000605 0 3200210200
0771111132434443344443433335060  1614110 0 0 0 0 0 0 0 0 0 0 0 0 0 443
211402321032243234475323415021020202 03    210803
07811111323322444 555442344803567050 90 0 0 0 0 0 0 170 0 0 0 1 0 0 555
321505351045555445590234513001100002030600210600
0791111132335432434 33542239065  03100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 555
333902331035544325590145414201000202010200220200
08011111322343242 2 423234470142 02040 0 0 0 0 0 0 110 0 0 0 0 0 0 444
333703341024444333360433415001200302 04    210206
0811111132435444333443434447093 19    110 0 0 0 0 110 0 0 0 19110 0 533
313753334204444555490355415021100501030300114006
0821111132324444443332444 480    03  0 0 0 0 0 0 0 0 110 0 0 0 0 0 0 444
243803341033444  448022441301110000305050011 2000
0831111132224342 3242232 2 55123 01020 0 0 0 0 0 110 110 0 0 0 0 0 0 342
242702341024555224480144414001100003030400111200
```

```
0842111124332223332 33221336035  08090 0 0 0 0 0 0 0 110 0 0 0 0 0 333
3226021420731112233404443130011502061303001105O3
0852111124333223323 32222325935      0 0 0 0 0 0 0 0 0 0 190 0 0 0 443
2224731421042222233482233140011004061 0300110305
0862111124333223223 33322325435  0911110 0 0 0 0 110 0 0 0 0 0 0 0 443
2223051520842222233552233130011800051502001130O0
0872111124222223332 22222224945  0711110 0 0 0 0 0 0 0 0 0 0 0 0 0 333
3224921421131112233603333120011702061502001120O0
08821111244334 44 3 4332  47047300713110 0 0 0 0 0 0 0 0 151616180 0 333
4338021310222332222402343140010303011302501103O1
0892111124243224 3 4443242701475020S0 0 0 0 0 0 0 0 0 0 0 190 0 0 433
2436041320732233322402224140040407051402802402O4
0902111124533233324 54423337046320712170 0 0 0 0 180 0 1519190 0 0 442
4437041410242224455703443142010206121103002102O0
0912111124343233114 3322 336043  07120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 233
2336552220542223322553443120011302031501501109O0
09221111243222233 3 22 22225631  05020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 112
2325532220732223311583333130011400011403001110O0
09321111243342 4124 3332 447043  07100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
4236021210231323322403223130011004011101S0
09421111242122 3233 3232 3360459807080 0 0 0 0 0 0 0 111115150 0 0 322
2224051420932223433532433130110203071202002204O0
0952111124431323444 43343443032910504170 0 0 0 110 0 0 0 15150 0 0 444
5446011420732324444403343142010200121203003100O6
0962111124333223333 32222326048  0811110 0 0 0 0 0 0 170 0 0 0 0 0 444
2223531320932222233652233140010704061305001110O5
0972111124322223313 42432234524911107170 0 0 0 0 0 0 0 0 15150 170 442
4437021221332423232753443140010203131108O0
0982111124242325243 444224460341911080 0 0 0 0 0 0 0 0 0 0 0 0 0 332
3325021310322432323401233140120211312030011040O
0992111124542323244 43332227037  05110 0 0 0 0 0 0 0 0 0 0 0 0 0 433
4226022420444443144703423141120100031205002103O0
1002111124322324233 434334340322 0511110 0 0 0 180 0 0 0 0 0 180 0 332
4446021310342332244703333160020008031303001110O0
1012111124323233333  44444448034970504110 0 0 0 0 110 0 0 0 0 18180 232
5437022320344444233702333141110302131203002103O0
1022111124542334 4  54333447 341 0507110 0 0 0 0 0 0 0 1515150 0 0 555
555802131035442 44470444314111030004120200220200
1032111124433233 555 43423448022  03070 0 0 0 0 0 0 0 0 180 150 0 0 443
2137522320643442332804423120010500081S    210700
1042111124442234244 442434470351 05080 0 0 0 0 0 0 0 0 0 0 0 0 0 442
3337021420343334444804433142020104131204002103O0
1052111124331111223 332223349221903040 0 0 0 0 0 0 0 0 0 0 0 0 0 444
4559031110133235555994443142020200031202002104O0
1062111124533224322 523324470239103050 0 0 0 0 0 0 0 0 0 0 0 0 0 442
3337021320643333455854323130130102031202004103O0
1072111124222222223 22222323034710507170 0 0 0 0 110 0 0 0 15170 0 332
4449021110133334455853333130010104021402001105O0
1082111124433333334 443333350341805070 0 0 0 0 0 0 0 0 150 190 0 0 444
4446021220532323333603343141120011041204002208O0
1092111124432233223 333233340427104070 0 0 0 0 1 180 0 0 0 0 1 1 1 443
2336021320933333322604223141110607011205002202O0
1102111124424323333 434123350471907110 0 0 0 0 0 0 0 0 1915150 0 0 332
4425021320833332233503343140210508081301001101O0
```

11121111243223333 3 333333345241 03050 0 0 0 0 0 0 0 0 190 150 0 0 332
443703142072233333 702343140220306031303002111 00
11221111244321 32222333234248341205071 10 0 0 0 0 0 0 0 0 0 0 0 0 0 433
43250313105333322225043131411105010513030011 0300
11321111244212333 24 433233260340 05110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 332
33260212103344344225033231420201050312 140600
11421111242211 1 313 5552233484319070511 0 0 0 0 0 0 0 0 170 160 0 0 442
233403151033332232 503443140111100051303502102 00
11521111244443 4444 4 42 448043 0 0 0 0 0 0 0 0 0 171519170 0 444
4448051510542444444 70 553140011311141403001109 04
11621111243212222 3254423334034720514110 0 0 0 0 130 0 1715150 180 332
432705141044232 33603333140011908061403001105 00
11721111244231 22 3 33112360349 0307110 0 0 0 0 0 0 0 0 0 0 0 0 0 322
33360525213211133436034431400101070614015021 1507
11821111245332244 3 534224360259711121 70 0 0 0 0 0 0 0 190 190 0 0 332
44470513201323322445035531400118000113050011 0600
11921111244233333 43 43333365231903050 0 0 0 0 0 0 0 0 110 150 0 0 432
44470313103322344448034331500112000814020011 1600
12021111243242332 3 433223370749 0411110 0 0 0 0 0 0 0 0 0 0 0 0 0 33
32360413105334422337024331600110000313020011 0800
12121111245344444444 544444480201 01 1 0 0 0 0 0 1 1 0 0 1 0 0 1 0 0 555
44480414209433444438045531411107000112015011 0200
12221111324432445 435245 4934690805170 0 0 0 11110 0 1915150 0 0 444
24255523208343344446021351402105041012040021 0400
12321111323323242432322223252456707090 0 0 0 0 0 110 0 1715150 0 0 333
32245523103222333224012351400107001313032021 0400
12421111324342345534554444470404307121 20 0 0 0 0 0 0 0 0 16150 0 0 234
33260223205423333335022351511200021312100021 0607
12521111324443344444555554490 08110 0 0 0 0 18180 0 1515150 0 0 445
42380225207444455229034413011000507120500110 300
12621111324333243433433323254349706070 0 0 0 0 110 0 110 15150 0 0 333
23347222103222322224012241500110000314040011 0609
12721111324333333 44422337025 0308110 11110 0 0 0 0 0 190 180 0 333
332603242 34443333602424140010206071303001107 00
12821111322342243443524244450542 07080 0 0 0 0 0 0 0 0 0 0 0 0 0 0 443
44450423203324244235033351300112000214 210700
12921111322444344444444444244801 02050 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
22570323102314314326523241500116060814040021 0206
13021111323243434244444344470122902031 10 0 0 0 110 0 0 1119190 0 0 443
44370523209322333224022251300116020515020021 0300
13121111322331332334443234348 13 0502170 0 0 0 0 0 0 0 0 0 190 0 0 445
33455122212534311116035451400109040614 110807
13221111324342233324444323470436908021 50 0 0 0 1 1 0 0 0 1 1 0 0 0 434
43370223103423344336035551500111001014045024 1500
13321111323344544433545454490 14 01050 0 0 0 0 0 0 0 150 0 0 0 0 0 0 555
44490223103433333449033341500115030613020011 0210
13421111324343342332444334370 14 0206110 0 0 0 0 0 140 0 0 0 0 0 0 0 544
54480223210533344446 02 41200108041414025011 1002
13521111322343443 2 3324344470849 1202110 0 0 0 0 0 110 0 1715190 0 0 445
41270223102434424338033441300113111213050021 0500
13621111322131333122444334370 47 07130 0 0 0 0 0 0 0 180 1715190 1616555
33380223208323145457011141400111020413020021 0500
13721111322332233122524233250146202090 0 0 1 0 0 1 0 0 1 0 1 0 0 0 333
21130224102433223335033341300110000215040021 0400

```
13821111322343332222434443380l7  02030 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
444802231034333234480334514021030011131000210300
13921111324444 43 222343 4340039 1605110 0 0 0 110 0 180 0 0 0 0 0 344
42260324209424433337022241501108081411    120100
140211113244424523314442442809427071511O 0 0 0 0 100 0 151519180 0 444
442802242032244142460124514011060011l2    210200
141211113254541543533l5 135805 8 09  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 354
544702231034255252440333414012031009130300210303
14221111322222232 223222222483567050l0 0 0 0 0 0 0 0 1111151918100 334
223512222054223322345345414011050304130350210203
143211113243423422433232343504539040l0 0 0 0 0 11180 0 0 0 0 0 0 0 243
42350222205222344435044451402107000512030011030O
1442111132344223  43243424 60846     0 0 0 0 0 0 170 0 1519190 0 0 335
31240223103433335  6035241 021051006120400210500
145211113223322422313233332301S  07160 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
33250124209333333224032 5141120008131304002l0606
14621111324344442   4444442803489051311O 0 0 0 0 110 0 0 19190 0 0 344
33378223208444434449033351402102050512050022020O
14721111322354343 31555555570141 0207110 0 0 0 0 0 0 0 0 1919190 0 0 445
42270323208513324337512251402104001312200021030O
14821111322 4334434344433447005  03080 0 0 0 0 0 0 0 0 170 190 0 0 555
54480323203544423448023451503105000612020013060O
149211113233442433334 222460589608030 0 0 110 0 0 0 0 0 0 0 0 0 0 444
42470323103444444448044351400110000913040033030O
1503321112334234442 333333460349 06110 0 0 0 0 0 0 0 0 1819190 0 0 333
34360112208444333335033421200100021111010022010G
151332111211553111  114433 4834781407110 0 0 0 0 180 0 170 190 0 0 422
34360314214223333225023421300108041203020021
1523321112323323343 33222337025  02080 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 332
22360213309322344338032221510101001112020021050O
1533321112333223322 443 33370358905080 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
33370214102223233335033321410201060913030011080O
1543321112332233444 333 2335030940508110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 332
33350312203433344446033421402108000113020022030O
1553321112444435443 444444490329804110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 552
55595313209544455559021521401110000212035021040O
1563321112544334344 5 533348075  04110 0 0 0 0 0 110 0 0 0 0 0 0 0 0 333
43380113203434443337033421301201000813012021100O
1573321112332323233 33333336034  0205110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 434
33360213207223333336023321200105000515    112500
1583321112433334333 444334470249604110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 432
53590313209334444338033421510105050913060024021l
1593321112233242332 233224260179 02130 0 0 110 0 0 0 180 1 1 1 0 0 333
33360312211233344447034421401102001012020021050O
1603321112334333323 333334450218904050 0 0 0 0 0 110 0 0 0 0 0 0 0 0 443
44450313102444443336035521411106040712010522010З
1613321112333333333 44422445031980502110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
23240313205423334445031121420203010412010021040O
1623321112344444444 444444480319 05070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 443
44480324205433334448032221420201030512030022020O
1633321112243333332 4333333502 1604120 0 0 0 130 110 0 0 1515180 0 343
32375 131034442442290333214011020607130350220200
16433211124245 5544 4444 449002  03  0 0 0 0 0 0 0 0 0 1919190 1218443
34370314205434444558034421420102030312015022020l
```

16533211124343 23 3 4443323400 4311 0 0 0 0 0 0 0 0 0 15180 180 0 233
22355515102322333457044321 3012 10130400110500
1663321112223334444 424444365285904050 0 0 0 0 0 0 0 1 1 1 1 0 1 1 441
111302142103244 52260111214201040808120200
1673321112343434444 555444480312404050 0 0 0 0 0 0 0 0 0 15160 0 0 223
232301121034233445590311212002000307110130
1683321112333223233 4442244605397080516 0 0 0 0 1 0 0 0 1 1 0 0 0 444
32360314207433334236033321420103000912010 0
16933211123332 3233 4432 3240439 07050 0 0 0 0 0 0 0 0 0 0 0 0 0 0 442
42160114205444442338034421200100050812020021030 0
1703321112332223333 333323360349805130 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
32260314206222222224022221300203060513025021040 0
1713321112334432332 42443334913 02140 0 0 0 0 0 020 0 050 090 0 0 332
31249112205223222114942221200100080611030 0
17233211124342333 3 3332 335026 04110 0 0 0 0 0 0 0 0 0 0 0 180 0 333
33360213210333333226043421401205060613 210204
1733321112223334443 333223370341505070 0 0 0 0 0 0 110 0 0 0 0 0 0 0 333
34270213102443343438023421412202001212020022020 0
1743321112334134444 334123470247504050 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
434503152034344545 80345214021080010130200210600
1753321112433333444 434444455421 11 0 0 0 0 0 110 0 0 0 0 0 0 0 0 444
44380114103333334447022221200200020311010021050 0
1763321112233143343232113238013970204 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 123
35360113202433244549045421400202051113025022030 0
1773321112544333444 444334485 8704010 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
42380513103433342227035421400107001213010021011 0
17833211215343343242443435447211104 0 110 0 0 0 180 0 0 0 0 0 0 0 444
33370323207433344448033431400202000711015 0
17933211212233 3 234334 33553 05 0 0 0 0 0 0 0 0 0 0 0 0 0 0 443
42480322102233344228022231200102080815 210500
18033211214242234333434434360459704110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
22160323103333333337033331500106000913030021050 0
18133211214333213333333333360627911040 0 0 0 0 0 0 0 0 0 0 190 0 0 434
34260223210323333225021231500103001213 220400
18233211214333332223535444 6032 11050 0 0 0 0 0 0 0 0 0 0 0 0 0 0 555
121601241023112331140 3140011303061303002103020
18333211214332223344434434470643107110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
44470122103333333338034431401203001513 231000
18433211214443323142444443480469 11120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
42380222103444434448035431301109101012020 0
18533211214241234444424223470261703111 10 0 0 0 0 0 0 0 0 0 0 0 0 0 444
42470522102433333337034331402112001213020 0
18633211214244 42 422234 336074970307110 0 0 0 0 0 0 0 0 19190 0 0 344
34460222103333333226033331411100101012020021010 6
18733211214444444444433323338032 05110 0 0 0 0 0 0 0 0 190 190 0 0 444
33475423205424333338033331400107001113 210400
1883321121424 1343325342213704545070 50 0 0 0 110 0 0 0 0 0 0 0 0 545
42280222205444422449032431400101000413 110400
18933211212231122111433111448459807110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
42452323209444444558723431 4
19033211213333333343444333370351904110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
54480223 05444444336033331401103090813025021030 0
19133211214343232244444323480823504110 0 0 0 0 0 0 0 0 1519160 0 0 244
23180224205434332439034331402101040912 220300

```
1923321121332223333344433338054990408O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
33365323210322322439033314001100010130500210300
193332113122222423444444446024  0307110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
32440522212324223238024241411102001512    210300
194332113123434222234444444603   0407110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 432
23240124207422223224022341411100011212030021070 8
195332112142222344444444444803   04110 0 0 0 0 0 110 0 0 0 0 0 0 0 444
42460222209433344338023331401115001113
196332112142444242234444  602 9 11030 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 343
43345223206323333424833431402110000912    110200
197332112123422324244444  704   07140 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 334
42480324103444434337022431401101001413    210600
198332112132333333334443324453281050311O 0 0 0 0 0 0 0 0 0 0 0 0 0 443
44480223202444424224044421411100051212030032050O
199332112121223333332333333702479020 30 0 0 0 0 0 0 0 0 0 190 0 0 443
33378523208444444226533431400113061013025021040O
20033211213222232 224322 345024711112110 0 0 0 0 0 0 0 0 0 0 0 0 0 444
42370221209433331336033331410105020912030011040O
201332112155533333225553332404 14070 0 0 0 0 0 0 0 0 0 0 0 0 0 555
 1 502232085555555560  531200112000815    112000
202332112143322333334443213803591051l0 0 0 0 0 110 0 0 1515150 0 0 323
44480222205333343339032331400101071213
20333211214 443444344 4444470236 0314110 0 0 0 0 0 0 0 1716150 0 0 44
33260223208433322238044431411101001212    210700
204332112142422344424442334802679031l0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
42160222206322233225022231411100080213030022030 7
205332112133333333333333333502 1 03  0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
333502 32053333333350333315001050004130300210400
206332112143432242345342224806811 11050 0 0 0 0 0 0 0 0 1515150 0 0 434
44480222211344422226045331411100051212025021080O
207332112133333233333333248046  11050 180 0 0 0 0 0 0 0 0 150 0 0 444
44480323103233333337033431300113070714050021060O
208332112144 333333444333246535790508110 0 0 0 1 0 0 0 0 0 0 0 0 0 434
44370222209422233334544331400201001114020021130O
209332113143422344444443344603l9 05  110 0 150 130 0 19191515190 0 444
44480222210555544449044413001010312130400210500
210332113133444434434244444802159040l0 0 0 0 0 0 180 0 150 190 0 0 444
44490123203323344448033341500107050213050021050O
211332113131321242245242133405178080l0 0 0 0 0 0 0 0 19190 150 190 333
22250121205133344224042241502201051112050022030O
212332113144433444444444334485452707080 0 0 0 0 0 0 0 0 0 0 0 0 0 0 334
33280222101333333238033241400112040113025021030l
213332113134423324424332423503492051l0 0 0 0 0 150 0 0 170 150 100 433
23240223203333333335022441400202060113030021030O
214332113144423444334442344702479050l0 0 0 0 0 0 0 0 0 0 0 190 0 0 444
43380222207333344337033341611110020612025011111l
215332113144444333334444444653897031l0 0 0 0 0 0 0 0 0 0 0 0 0 0 534
33360323211344433547532441400110001013030022040O
216332113133221112223333 34350439104080 0 0 0 0 0 0 0 0 0 0 0 0 0 444
32250122207 3332234503 341612101000413020022
21733211314432  233 4242 4450437905070 0 0 0 0 0 0 0 0 0 0 0 0 0 334
22220122105333333225031141400202100413025021050O
2183321131323332233 434443370132802100 0 0 0 0 0 0 0 0 170 150 0 0 333
32380122201344444448032341400105000113050021030O
```

219332113143453444444443344803297050 30 0 0 0 0 0 0 0 0 0 0 0 0 0 0 334
22240223208423344225033341401104001213030 0
22033211313233213232333333334062291003110 0 150 0 0 0 0 171515110 0 131
122601222071222311140511418202010212120300210600
22133211314452443443444444280 7 3 07130 0 0 0 0 15180 0 0 0 190 0 0 444
33370524209434333348022241300107021115015011100 0
22233211313342342233444224355589 0807170 0 110 0 0 0 0 151919180 0 44
34470224203123323224023241500113061014050011050 0
223332113144 3 243223334224470347905081700 0 0 0 0 180 0 181919180 0 444
11110224206414133228032210300113070811015 0
22433211315344342344534333360721103041100 110 0 0 0 0 0 150 190 0 0 232
211202231023223 1140121414001090003140300210500
22533211313 333214224 3233380795603130 0 0 0 0 170 0 0 110 150 0 0 443
22270123207333344447032341402100041012030021090 0
22633211312322123333223223340015 0208110 0 110 0 0 0 0 0 1 1 0 0 0 33
32245222103322333235333441612105000212030021030 0
22733211314442344233444334460489 07 0 0 0 0 0 0 1 0 0 1 0 1 0 0 0 333
22370322208223333236022441300108001115 112000
22833211314342233333424 2337055 08050 0 0 0 0 0 0 0 0 171 1 0 0 0 444
12240322205322233226031141500109000714 111000
22933211313344441122535434470782913150 0 0 110 11110 15151919110 0 333
13140122105232323336031241411100031312020011010 0
23033211315552442133555234280741 0713180 0 0 0 1 0 0 0 0 0 0 0 0 0 533
23270222209424 44224032 41500201051013030021060 0
23133211313242442222434244470482 0712110 0 0 0 110 0 15150 150 0 0 444
24270523208423333436034441400114000814 210400
23233211313242234333324223460 41 07020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 552
33380323208 133231345422416111110000415 110408
23333211314344445555435245580247907031100 0 110 11110 0 0 0 15190 0 444
45280222209433323427023341500110000113035011100 0
23433211313342345544544224470431907090 0 0 0 0 0 110 12120 0 0 0 0 423
23370223205423333235034241400114000414030011040 0
2354242212444334 32 444244473341 05160 0 0 0 0 0 0 0 0 0 0 0 0 0 0 414
43469222102434455449133421300202030613020022010 0
23642422122222231 34 44333425013870205 0 0 0 0 0 0 0 0 0 150 0 0 0 444
23260323103434344558034421200109080713 0
23742422123124422 4 44445450149802050 0 0 0 0 0 0 0 0 0 150 150 0 0 444
32380223207444244559044421200101030611015 0
23842422122313 1323 33133336068 1112110 0 0 0 0 0 0 0 0 190 190 0 0 444
44490223103433344449033321400100040112040021040 2
23942422124423415 5 45434450372005040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
44480224209434444448044421200200061112030032020 8
24042422123432241 1 42442247074 07120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 332
54380212103344444559544521420201000901018021000 8
2414242212232 22233 333 23240371 05110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 234
31240222103444344559023421200202000813020022020 0
24242422123342111 1133421114047 07120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 533
4448022411 42435555803332141110400051202001206 00
24342422124233333 3344444338034 05 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
44490425209424444449 0 5 21300105000812 221000
24442422122233 22 2 333333350748913020 0 0 0 0 0 0 0 0 170 170 0 0 343
21250224207424244558044421300202001113015012020 0
245424221244444333 34444433908 1215110 0 0 0 0 0 0 191919190 0 0 444
33390223101323333447033321200103100115080021040 3

24642422125345333 4 434533480324911050 0 0 0 0 1 0 0 0 0 15150 100 435
3235032421242442233703342150010110111 3
247424221223322422134332124401 43 04121 0 0 0 0 1 1 0 0 0 1 1 1 0 0 424
22240323208434444448033421420101010612015022010 0
24842422121133 11 1 2233 1140169810020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 321
1133012131021114433402132120010003101102 00
24942422123323341 1 333333345173502130 0 0 0 0 0 0 0 0 0 0 0 0 0 0 432
3125021410242224444702342141110200051303002104 00
25042422124322331 3 441333350179 02050 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
42270222208422244548052221200201021011020 0 0
251424221233343 3 1 3333 3360124 04020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
43380223103444344449034521402200091013029021070 0
252424221243211313 3 431113150456 07080 0 0 0 0 0 0 0 0 171515110 0 444
52160323103534433558034421200100060511020 0 0
25342422123412314 4 2244444450379 05080 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
44370322101333344448055521420200070112015021020 3
254424221222323324242232422201 96 12140 0 0 0 0 0 0 110 0 0 0 15180 0 333
3335021310332332444 50 221420103000512045021020 0
255424221233322324224443332802767041 30 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
43385214104444444449024521400107000613030 0 0
256424221232342213 4 2244 2353721413110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 442
42480213210434453558044521301101071113019021030 5
257424221233223324 4 333333445329807050 0 0 0 0 0 0 0 0 0 0 0 0 0 0 334
44460223101555544559553321411203051212035021040 0
258424221233322313 3 42533428037 04050 0 0 0 0 0 0 0 0 0 0 0 0 0 0 334
44490222102444433449033421301101000412025011060 0
259424221233223314 4 443333360139805020 0 0 0 0 0 0 0 180 150 110 444
43370222208444245549543321200100070411015 00 0
2604242231233 344443344 4470368 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
33250333103424444448034541400106040203 110700
26142422314453 343445454 448048 07090 0 0 0 0 0 0 0 0 0 0 0 0 0 0 443
3327043310343334444703 4120010906020503001110 00
26242422313441244333444433380465207021200 0 0 0 0 180 191919190 0 0 555
44490334103434444449053441500105000103030021040 6
26342422313432233333233233360641911050 0 0 0 0 0 0 0 0 0 0 0 0 0 0 323
42465533207333322224032241400105040203030021030 0
26442422312353334343444444490139702120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 443
55290132103322255559033 413103000202020200
26542422313333223333333222380365 05110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
44490133103423333447033341502204010503050 0 0
26642422313422231442544444460433 05140 0 0 0 0 0 0 0 0 0 0 0 0 180 555
434703332065555423260 540600107000202 111500
26742422314442343444444444460439202050 0 0 0 0 0 0 0 0 0 15150 0 0 555
43370232102444224428042241410103070502025 0 0
26842422314444122354535223355 32 04030 0 0 0 0 0 0 0 0 0 0 0 0 0 0 245
53170233206544432117523441400100110603100 0 0
26942422313222222354544444470 90 05070 0 0 0 0 0 0 0 0 170 150 0 0 444
32360332208555532237033440620103000302015 0 0
27042422312322223233333322370 26 04110 0 0 0 0 0 0 0 0 0 0 190 0 0 443
33380233101433333448033331700105030204090 0 0
27142422312342 23233334 235 64 07110 110 0 0 0 0 0 0 0 0 0 0 0 0 0 333
33380333102423334448033331500107060203060031040 2
27242422313331233333333323350416204071100 110 110 0 0 0 0 0 0 0 0 443
33250233201422233447034341500201050103030021100 0

```
2734242231434224222343432334049  14070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 433
3335013410342333 4445333416022020405020300110703
2744242231444335334444444470081612070 0 0 0 0 0 0 0 0 0 0 150 0 0 323
1335023310132334444803334140010800040303001116 00
2754242231444443334444444335016  02130 0 0 0 0 0 0 0 0 1 191 0 1 0 444
4449923210344444444993234140010303040304001115 00
2764242231234133343423322334015970207 0 0 110 0 0 0 0 0 0 0 0 0 0 333
2324023410242212233603444140010900010402001110 00
2774242231233223322333432335035  0208110 0 0 0 0 0 0 0 1815150 0 0 433
3326053210333333322503444141111000050204 00
2784242231444223423344422346045  07080 0 0 0 0 0 0 0 15150 190 0 0 332
3224523310332323322452334140010604040 3    210204
2794242231455234444244432426048060212 0 0 0 0 0 0 110 0 1516190 0 0 554
2323023310141333232502124161310804020205002100 03
2804242231244314444455532557015  09020 0 0 0 0 0 0 0 0 0 0 1 0 0 0 233
3336013310343333355803434120010900050401701115 00
2814242231333 22233243442226034780507 0 0 0 0 180 0 0 1715150 0 0 344
3347023310244423355704444140010900020303 50
2824242231445444343443433347052190408110 0 0 0 0 110 0 0 19190 100 435
2324023210242324346022231401100080403030021020 6
283424223143 22333434444434403572050 90 0 0 0 0 0 0 0 0 0 0 0 0 0 434
4436023310244433344604444140120200040305001120 00
2844242231434212435353442428048760703 0 0 0 0 0 0 0 0 0 0 0 0 0 0 244
3336033210342234455804244150010009020302502105 00
2855232222323443344444344446032  05030 0 0 0 0 0 0 0 0 0 0 0 0 0 0 223
3234022320534434444804233141110206111 2    220600
2865232222224222242244433335016  02110 0 0 0 0 0 0 0 0 0 0 190 0 0 334
4435052310134443344503443140010606161303002105 02
2875232222343342123244444436072  03130 0 0 0 0 0 150 0 190 15180 0 334
4426052210352422355804223140010704041302002106 00
2885232222322333443333433343435321905030 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
4335022320943443434554343130110606071203002101 00
2895232222224431555533443254926730311 0 0 0 0 0 0 0 0 0 0 0 0 0 0 244
1124922310133334455804343140110700111 2    210500
2905232222222333433344342242036671104 0 0 0 0 0 0 0 0 0 0 0 0 0 0 334
4115042121024554443703123150010607061301502203 00
29152322222 22 22 3 33 3 3 30310805110 0 0 0 0 0 110 0 0 0 0 0 0 0 333
3135032320544442333402433140210100101 2    210600
2925232222332122333333222234034920511 0 0 0 0 0 0 0 0 0 0 0 0 0 0 33
3335022210231113333403333042020106101204002104 00
2935232222424334545555423357042790711 0 0 0 0 0 0 0 0 0 0 0 0 0 0 354
4246522110342234211805453140010006021304002115 01
2945232222434 444344434 4449024  03130 0 0 0 0 0 0 0 0 0 0 0 0 0 0 334
4449022410344444444905553140010600141302002105 00
2955232222233333333333333333350167 0611110 0 0 0 0 0 0 0 0 0 0 0 0 0 344
4447022221044444444804443140210005171202502104 00
2965232222222443222344444447034  05110 0 0 0 0 11110 0 0 15160 0 0 334
4148032310344444444855533130010004211303002108 00
2975232222233342222 423332270312411120 0 0 0 0 0 0 0 0 0 151 1 0 0 444
2224022242055554444804553140010001231102201108 00
2985232222334452444423 44 2445267903110 0 0 0 0 110 0 0 180 150 0 0 233
3125012310344442344903443140110606021303502100 00
2995232222344444444453444448031790511 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
5459822320634443344904543140010605081303002202 08
```

```
3005232222222112223344433234054970509O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
32150224208544444447055531411201061212030021020O
3015232222233332332333342235513930607O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 244
32350423213444322337034331402106051713025021040S
30252322222222222 2243222224034  04050 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 232
532402221034444334480433314001050005l3    210300
3035232222333242443444444447064  04110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 242
42460222104242433448033231420200060312    220200
3045232222223322333333333233401679021011O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 244
21270123102444433448045531420104000412045O
3055232222333333333333333335014  0211110 0 0 0 110 0 0 0 15150 0 0 233
433502231034333444460322314111090010120200210200
3065232222224433324222443224017860207180 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
32350323210343323225023231400203072013015021020O
3075232222442444242244444  603 1     0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 244
44480524212444444449034431400106081714030011150O
3085232222223323444444444  709   16040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
42390222206244444559023331400107000613030021060O
3095232222223 32423344444347048390204O 0 0 0 0 0 0 0 0 1 1 1 0 1 1 235
45590523101444423448043431120102050312050022010O
3105232223254454544354 4 33490318 05031 0 0 0 0 0 0 0 0 0 0 0 0 0 0   5
   80323102433433339044431400102030313040011050S
31152322322332233 441 222324013  02120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
11130323105333333333O3  412001060806150300112007
31252322324322223 43434324440569 05080 0 0 0 0 0 0 0 0 0 0 0 0 0 0 434
41130121103322322113021141600106050514030O
3135232232332333434453443338034905120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 545
3 48052520355555559935541
31452322324234343 4 42344438023  12030 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
22260123103333332240 33241401100070613050021060O
3155232232334344332 444444475369205101 0 0 0 0 0 0 0 0 150 190 0 0 555
33265422103444444559042341500106080511040011090O
31652322324342 223  4333 226523  0413110 0 110 0 0 0 0 0 0 0 0 0 0 444
22349121104454433337031241620104030313040023010O
3175232232221111331111111340649 11070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 555
21170421203555544559034340 003000504132000111100
3185232232434224444 434323360429707050 0 0 0 0 0 0 0 0 0 0 1 0 100 443
11130321104233322234041141400106080713050021100O
3195232232433343545433 3345539  06140 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
33360223103444444458532241402106000813100021080O
320523223222344 3 5423445447041971207180 0 0 0 0 110 0 0 0 150 0 0 553
34490323102344433439042241500106070213035011050O
3215232232444244413343444447042907031l0 0 0 0 110 0 0 0 19190 0 0 544
43150223205334412235034241402107000412030021030O
3225232232233334233322 4446014970205110 0 0 0 11180 0 0 0 0 0 0 0 444
11170223210244444448043241400106050813030021020O
3235232232443334425443333349023970512110 0 0 0 0 0 0 0 0 0 0 0 0 0 445
44490124102444444449032341400106000213040021050O
32452322323323 3323 33433347042  0507150 0 0 0 0 0 0 0 0 0 1 0 0 0 544
53390323102555544559955541501107000213    210200
3255232232553225525355455438035905080 0 0 0 0 0 0 0 0 0 0 15150 0 0 555
53595323211555555559533341400107061113040011050O
3265232232333333334433444345886 03050 0 0 0 0 0 0 0 0 0 0 1518180 333
31260223103333322336043341400106001013025024080O
```

327523223222424444444444444485241003070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
22240222207344433449043241400106050713030021 1000
32852322323332233 2244444436548960712 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 334
23260223208322233336033241401106070213020021 0700
32952322323332333333433333380435907060 0 0 0 0 180 0 0 0 0 0 0 0 0 444
43380122104444423228033341401103010313020021 0306
33052322324321333233433444375 48 0701110 0 0 0 110 0 0 0 0 150 0 0 444
3 952232064443444903334140210104061201302204 00
33152322322332313333 5 3542370429 0704170 0 0 0 0 0 0 0 150 0 180 0 555
22250323107455543 5 954444151210605071202502107 00
33252322322241332 3 32323334042950703 0 0 180 110 0 0 0 0 0 0 0 0 443
22240121101133323226011141402200060612030012000 8
33352322323322 3424 444434460359 05120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
32259223103444444225933331402202110612030021011 1
33452322323231232 3243322336043 07050 0 0 0 0 0 0 0 0 0 0 0 0 0 0 443
12250223207444433447033341400205050413030021050 0
33552322324444444445555555904 1 0702110 0 0 0 0 0 0 0 0 0 160 0 0 444
33260222205444444449033341521101040612 210300
33652322325315521135543542565379606131 0 160 0 1 1 0 0 0 1 1 1 0 0 532
52350221205555533559 9 141400107000914 211200
33752322323233444132323344450 28 03120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
22165223102334332336011141400205060313030021020 0
33852322324413333333441333340362 0514170 0 0 0 0 0 0 0 0 19190 0 0 333
44280124206344422338033341301100020612015021010 6
33952322123322343 4 3444444480 05040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 244
23260222 444414448043521420100090112025022010 0
34052322125555522555555555595671211040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 555
55599424401555555559955521401102000113100021020 0
34152322321121111111222222220920709031 50 0 0 0 0 0 0 0 0 0 0 0 0 0 334
33250524101244324447032321301106050113017012010 6
34252322122344222331444324240 19 14040 0 0 0 0 0 0 0 0 0 150 100 243
45160424101545544559555521301105040112 21
34352322123344424 3 344444249013 11020 0 0 0 0 0 0 0 0 0 0 0 1 0 0 44
33380222101344444449 0 5 31401101000112040011050 0
34452322124444444334 4 5444480328905110 0 0 0 0 0 0 0 0 10190 0 0 0 333
34 80324101433344448033321401106060113020012061 0
34552322122222222 42222224023 05070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 233
42452122101223332445235521200205000115035021170 0
34663322114 2 3 23323 3 3345241 03 0 0 0 0 0 0 0 0 0 0 0 0 0 0 432
42440232210333 3 44552443130010300040 5 111700
34763322113444443333443 4 80 05 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
42480433101 4490234312001010002 05 111000
34863322113323344454433332370321 05100 0 0 0 0 0 0 0 0 1 0 1 0 1 0 434
13250234101355544337022231411103060113020012080 0
34963322113223322344322232250362905070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 322
1111023210133333 2240451314102020002020200120200
35063322113314324 4 4 442432270319 05100 0 0 0 0 0 0 0 0 0 0 0 0 0 444
12149232209211134325524331310101000102 220100
35163322112222233333333223355341905070 0 0 0 0 0 0 0 0 0 0 0 0 0 433
43355533103332322445033331401104090302010012100 5
35263322113223323323332332340363311040 0 0 0 0 180 0 0 0 0 150 0 0 333
32350333103433323334533531500104020403015012190 0
35363322114322234344334333370 32 05030 0 0 0 0 0 0 0 0 0 0 0 0 0 55
54370334102333333337033331200103000303015011250 0

```
3546332211323123323343223334043190705O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 233
22240233215322322234021131310201000302    210300
35563322114423      433 53580329705030 0 0 0 0 0 0 0 0 0 0 150 0 0 434
43280233210444433227043431420201100202020021060O
3566332211444444444444444444480284903050 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
22249233205444422326031231420100030502015012040O
3576332211433334444444444444480327 05070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
43370232103444443334033331420201030302016032020O
35863322112122 2444 4344 354032  05110 0 0 0 0 0 0 0 0 0 0 0 0 0 0 443
31340132207431334555034431400103090403010021020 4
3596332211435 23545544344335026  09070 0 0 0 0 0 0 0 0 110 150 0 0 543
43350513105355433455022331500103070403020012080 3
36063322113322222444444 2 7034  05  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 443
22260332103444444448033331402103090302010012050O
36163322113221111344322222440431907051 0 0 0 0 0 0 0 0 1 0 0 1 0 0 333
22230232205333333446034431400201030103015021050O
36263322113333114444444 4446035  05080 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
31380533103444443448033221411101050202020021030 8
36363322113333323333333333360367 05100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
33350133206333333225033331200101000402020022020O
3646332211222232 223443332 6032  03050 0 0 0 0 0 0 0 0 0 0 0 0 0 0 334
22140335210444233336022331400103090203013021100O
365633221133 232343244424338049  05070 0 0 0 0 180 0 0 0 0 0 1 0 0 444
33360333105              31402103090502012012091 1
36663322113232332 4  444333370249 03070 0 0 110 0 0 0 0 0 0 0 0 0 0 43
32260333207443332337023231401103090203    210800
36763322113222223344223333360l2  02030 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
24180534103444444559534431400103070403020012020O
36863322114223223533534443370369105101l0 0 0 0 110 0 0 0 0 0 110 0 334
25265133103354423437553431300200060303020021060 8
3696332211434234444 444444470459707030 0 0 0 0 0 0 0 0 0 0 0 0 0 0 445
53480333101344334447033331310100070201010021010 2
37063322114322334454544333480349 05080 0 0 0 0 0 0 0 0 0 0 0 0 0 0 554
55590234102444334337044431420101020202035021020 6
3716332222342223245 332223250379 05130 0 0 0 0 0 0 0 0 0 0 0 0 0 0 132
   50315205344322226033231400103000512018012040O
3726332222343334334 43322435031  0508110 0 0 0 0 1 0 0 0 0 0 0 0 0 0 333
443804232  45543333805 53140210300141202001209 0
37363322223332 2232233222225034  05070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 222
33350223206444433225033531400103002713025021080 0
37463322223432 4325 4444442703029151611O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 242
52590115210555555559955531401103010813045031080 0
37563322223333333333345434455239805070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
33350523212433433335232231600103001213
37663322224432122 4 434213248571 04160 0 0 0 0 0 0 0 150 0 0 0 0 0 231
43250113205444443227034431402100061512020044100O
37763322225222 32234444333450349 07  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 222
42240222102444444446033431400103000412    210500
3786332222333234343 443334360349105120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 232
13140213103233333224811131400100091113016021100O
37963322223241441351423245440790 1514110 0 1 0 1 1 0 0 0 0 1 1 0 0 555
53360223212355533335035331401103001112020021050O
380633222233111313  323113150472605070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 133
44450322103444444337044431400102 0  120200111000
```

```
3816332222121332155 323231240263505070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 121
44555211102555444559043231500200050213040021041O
3826332222334424443 444432449315605020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 243
22240224102444444336013331310202091812020021050 6
38363322223 2 24244 4 4224245372505150 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 231
32240524104353221114524331401103011912020041030 0
3846332222544334433343332337024  07130 0 0 0 0 0 0 0 0 0 0 0 1 0 0 23
42370323103444433446025431400103002213020021030 0
3856332222233244234244444445527 5 13030 0 0 0 0 0 0 0 0 0 0 0 0 0 0 243
44470314209444444447045531411103012612015011060 0
3866332222333223333 4444444602 6 02070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 332
34360313210444443446034431411202060312025022000 6
3876332222525 3 555552531356034  16120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 454
414653  208344 5135601 53140110300251301501205O0
3886332222433434134 544 35240781613120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 244
43445323210344434324844431411203001112018022050 0
3896332222443223334144444448047120715O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 233
22260524210444434338033331411103011812015032050 0
3906332222234434234 434 34380749 13040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 344
23270224105444425338044331520200102012050032010 5
3916332222443242245 33432437079  13150 0 0 0 0 0 0 0 0 0 0 0 0 0 0 423
23360213102444432348034431402103001312020022030 0
3926332222423223332 43322334845  0309150 0 0 0 0 0 0 0 0 0 0 180 0 333
42350214105444434447O  53141010300281102501127O0
3936332222222223323344244435234670507O 0 0 0 0 0 0 0 11110 150 0 0 244
44280323318455534448043431521102052312025021030 0
3946332222332123134 423124150479104050 0 0 0 0 0 0 0 0 0 0 0 0 0 0 233
42260212209434334438032231402202001813025022
3956332222424433322 424222450249 03090 0 0 0 0 0 0 0 0 0 150 0 0 0 134
42460213207245435338022231611103002112017011060 4
3966332222443224144 44332414534  07130 0 0 0 0 0 0 0 0 0 0 0 0 0 0 143
13150213102444434215021131420101062112015022010O
3976332222334433332333443336032  05  0 0 0 0 0 0 0 0 0 0 151 0 0 0 222
32240113215443333336033331400200082112020021050O
3986332222323223133133332324074107150 0 0 0 0 0 0 0 0 0 0 0 0 0 0 233
33350522103344433226014431512103102412020031030O
3996332231444 554554444 54390327 04060 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
41470223208555544449035441400103070813025021100 5
4006332231515555224455555558027203130 0 0 0 0 0 0 0 0 0 0 0 0 0 0 544
11370223210355533249033441200103100914020O
4016332231333424444444442337095114080 0 0 0 0 0 0 0 0 1519190 0 0 332
35570222205254432558032241310100100411    210200
4026332231332 34131233333325037160514O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
33470222207333333447044441200101040514020O
4036332231442554342133333457032410503O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 344
43270223205544421338043341401103070413030021040 2
404633223155 5 55 5555   55803   03  110 0 1 0 0 0 0 0 0 0 0 0 0 0 54
   80224208444443448023231400104001014020011130O
4056332231333222233323322335 23   02040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
33350222102344432225044441610302061311030022020O
4066332231314444233332 11250725903130 0 0 0 0 0 0 0 0 0 19190 0 0 333
32350325 05444433346024341602103000915    211000
4076332231333334333223333338019  02  0 0 0 0 0 0 110 0 0 0 1 1 1 0 0 444
32370223208333322237033341300105060514035021050 2
```

40863322313322234324444334255436907051l0 0 110 110 0 0 0 0 150 0 0 544
323502252072232433350 3 4160010307061303002108O0
40963322313232 434334454 5465321405090 0 0 0 0 0 0 0 0 0 0 0 0 0 0 555
443801222 4444444480334414012010612130450110500
41063322313333322332434333270 72 13140 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
43480222103 455224360332416001030504130200111510
41163322315233344444433333370325905100 0 0 0 0 0 0 0 0 0 0 150 0 0 444
212301212121333234 452114130010008111S 211300
41263322314332242344434333370385005040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 435
33360322209423333446532241500102060713 120100
41363322313224433424422222255 3 4 03 0 0 0 110 0 0 0 0 0 0 0 0 0 0 424
14155122 10444 32449051141200102011215018521050O
41463322313444444443444444901 2 02100 0 0 0 0 0 0 0 150 0 0 0 0 0 444
53570222103333344338021341500103090514 120206
41563322314345443333433444360294 05150 0 0 0 0 0 0 0 0 0 0 1 0 0 0 443
44450224 023333333360334412001000208150200210900
41663322314434423323444444706 3 05100 0 0 0 0 0 0 0 0 1715150 0 0 444
213402222072233443350222414001 1213 21
41763322312444433433444443340321605030 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
21355223210422344445544541501201001113030021050O
41863322313334334233444434455342 05070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
33355224206423333234132241510104100812035O
41963322314434433342444444151269705030 0 0 0 0 0 0 0 0 0 0 0 0 0 0 123
11210223102322355425111141300104010212030031100O
42063322314234424423 4444 4470267803040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 344
21250121105533344436024541600103070311030O
42163322314435444444444443803 05150 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
24250222205555455559022341400103000714 11
42263322313335441322333433250713305130 0 0 0 0 180 0 0 0 0 0 0 0 0 442
34349222207434433335232341630101020612040021020O
42363322313344344433433443470761605 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 434
33355222103433334448032241300103090613020021040Z
42463322312232333133333223350124303090 0 0 0 0 0 0 0 0 0 0 0 0 0 0 334
12130222208322342113034441521201110212025022010O
425633223152 555345444444449029 03140 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
455903222103555 448055541400103061014040011070O
4266332231545 544344545554590 14120 0 0 0 0 0 0 0 0 0 0 150 0 0 554
42370323209424444337045531300103080913 121001
42763322314344224444444444480296 03 0 0 0 0 0 0 0 0 0 0 0 0 0 0 344
212403221043254 34803334150010305141301502103OO
4287321113324233234 324233 75162 02100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 434
23270213103433343226033331200201040812014O
4297321113334434 4 434444 851 3 02030 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
44390214210444344337533431200101051015007012300O
43073211134333221 4 443322160281 07120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
43370414205433344448034231411101050512015014060O
43173211133232 2 3 333233 8528 03120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 434
12395524206333332338042331310201060611015O
432732111333322412 233224160472607130 0 0 0 0 0 0 0 110 0 1 0 0 0 41
12240312206333344448033331420201040411010022020O
4337321113242334 5 2322 4 30241303150 0 0 0 0 0 0 0 0 0 0 0 0 0 0 442
25410213103223334447011131400101051113 220200
43473211134343 44 4 4443 4 90249 0607170 0 0 0 0 0 0 0 0 0 0 140 0 444
23240414207434333337033431300101050913020021050O

435732111333322322 4443243703240030511 0 0 0 0 0 0 0 0 0 0 0 0 0 0 443
3138031220622313344803 3150010207061402004203 00
43673211132111 3 4 33 113 5024 02070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 321
213602122074243552270343313001010610150100210700
4377321113222334 4 323 24 60312 05020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 411
211302141053244232230322312002010010130120310400
4387321113423222 4 444222 702 03050 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 441
11130314103331 44327034331401101060813012022080 0
439732111341413345 354 23 803 05040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 451
2114031 208534433318035331400101060813011021120 0
44073211135355552 5 555335 80249603070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 532
44260214103424443225023331402101050212015032020 4
44173211134231334144424443350 42 08030 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 333
31340221207433333447023431200201041511020 0
44273211132131341131 3 2333170270 03130 0 0 0 0 0 0 0 0 0 0 0 1 0 0 434
33370334208434334558025431500101050813015012020 0
44373211133223 3 4 4332 3 60316505020 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 424
23260314212322233224031231310202001411015021010 0
4447321113322232 3 432223340328905021 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 433
31250213210413333224011331420201050612010022020 0
44573211133331 41 1 33 1 414048 05120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 331
33340212207322233334032331520401040712020021040 0
4467321113425232113 3233 2 80629 09100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 444
43380514103333344226045531420101000511020021000 6
44773211133131 3 4 4331 4 50270 03130 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 432
21250314207424433116012131400101060813015021100 0
44873211214243334423234 2 1350241903070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 234
11140223101111133222031131411201091112020021010 0
44973211215343 444 4444 4449048190712110 0 110 0 0 0 0 0 0 150 0 0 344
22260223204334444448034331402101051012030022020 0
45073211214242232333424433370 24 03070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 344
11130123102111 34113011131411200040112018022001 1
4517321121444 343444434434480241 03120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 343
32240122211333 4450 23140020102091302002110 00
45273211214443334444444433347032 05070 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 332
32270223103323333337034431402101040912020024050 0
45373211212222233 33332 2 50132 02060 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 543
42250112101323344447034431620101040411050022020 2
45473211213243233333424333350269 07051 0 0 1 0 1 0 0 0 0 0 0 1 0 0 334
34250222101344434223012231901201050211 220200
45673211213344343333434444383 2 3 03040 0 110 0 0 0 0 0 0 0 0 0 0 0 434
33375223205334334337033331600101050411040021060 2
45773211213243333333333333380219 03050 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 334
232702232073233 22703223140020106031302002103 00
458732112143443343434344334803297051011111618161818181515161618 0 0 343
43380224103333343336024431410101000712025022020 4
45973211214333323333433333360 05160 0 0 0 0 0 0 0 0 0 1 1 0 100 334
322601212062231232 60332312001010512120150 0
46073211214153343 2 343444448024 03040 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 332
22380222206322233113021131511101060612045014080 0
46173211215444423 34 5444444855271031 40 0 0 0 0 0 0 0 0 0 0 0 0 0 0 442
42360224208424333225023331420101060512020021030 6
46273211213343224333434 32360659710081 0 0 0 0 0 0 0 0 0 1 1 1 0 0 444
44280123103333322224033231400101060113020021081 1

```
46373211215455 34 444444 447062  04100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 332
3238032210333333322603333182010207031103 00
4647321121445444234333433328 07   02101 0 0 0 0 0 0 0 0 0 1 0 0 0 0 334
3328022321533343333903433130120006151303502202 00
4657321121424334233244 4 4470247903120 0 0 130 110 0 180 0 15180 0 444
2137012420423334433703333161010103091202003203 00
4677321121545543444454554349026970310 0 0 0 0 0 0 0 0 0 0 0 0 0 0 555
3439022320532223333503223140110105101303002111 00
4687321121335554544444444449021  03131 0 0 1 0 0 0 0 0 1 0 0 0 0 0 555
4338021320943333333852553140110105071302002112 10
4697321121524243444444444449024  03070 0 0 110 0 0 0 0 0 0 0 0 180 234
1111022320711222422102113141110105071203002108 00
4703221121424 33233343323326024  04070 0 0 0 0 0 0 0 0 0 16160 0 0 333
2324542320833333333703433150010610061 3   111100
47121211225323 4444 5552444852 2 11  0 0 0 0 0 0 0 0 0 150 190 0 0 555
5258511421055544433903453120020500111405002110 00
4725222232544345334455555547048 9 01  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 555
4448022310155555555 95   4140010600041402502111 00
;
data osk1; set osk;if site=5 and aptsize=1 then delete;
proc means data=osk1;
run;
```

VITA

Sekyung Oh was born in Seoul, Korea on April 4, 1962. He is the son of Sookja Lee and Joong-Hwan Oh. In 1984, he earned a B.S. in Architectural Engineering at Sung Kyung Kwan University, Seoul, Korea. In 1988, he got a Mater of Regional planning in City and Regional Planning at the University of North Carolina at Chapel Hill, NC and a Ph.D in Urban Design and Planning in 1999 at the University of Washington, Seattle, Washington. He published a department paper, "A Study on Environmental Carrying capacity and Perceptual Carrying Capacity," for the degree of Master of Regional Planning in 1987.