

**AN APPROACH TO THE DETERMINATION OF
ADAPTABLE SPATIAL DESIGN CONCEPT IN
HOUSING PRODUCTION BY USING
PREFABRICATED BUILDING ELEMENTS**

77242

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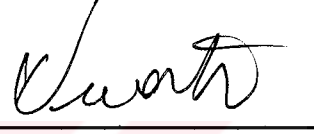
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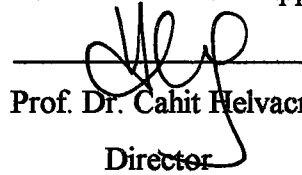


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ABSTRACT

- Subject of the study** : Adaptable design housing
- Content of the study** : Concepts of adaptability, variability and flexibility in multi-storey housings produced by pre-fabricated building elements.
- Aim of the study** : A proposal for approach to solve dwelling problem for both quantitative and qualitative perspective in Turkey using the concept of flexibility, variability and adaptability with the production of multi-storey buildings made by prefabricated building elements.

In this study, has been aimed that bringing a solution to the Turkey's dwelling problem, in respect of both qualitative and quantitative aspects with the mediation of adaptability concept in multi-storey dwelling production by prefabricated building elements.

The study which purposes a model for using to solve problem , consist of five main chapter.

Contents', proposals' and methods of study are possessed in it's first chapter. In the content of study, first of all for the subject , which is going to inquire suppose that it is not only valid for mass-housing projects which are going to apply on new residential areas but also applicable for present residential areas too. It has been decided that inquiring the subject not in the content of mass-housing although, in multi-storey dwelling content while it is generalising.

In the second part of the thesis, first of all, evaluation of different opinions has been done by the aim of bring clarifications about such concepts like flexibility, variability, adaptability. Flexibility, variability and adaptability purposed studies have been classified as they analyse. According to these, it has been decided that inquiring of user structure and their requirements with dwelling interaction and flexibility, variability and adaptability purposed approaches. Concept of adaptability has been defined and it's principles have been determined by the inquiring of these flexibility, variability and adaptability purposed approaches.

Again, projects which applied in Turkey, especially in İzmir, and presents alternatives to the varied household sizes, have been chosen in this section. Analysing of these example, have seen necessary, in respect of such concepts like flexibility and variability at the levels of both building and dwelling units. This necessity is serving to determinate the quantitative presence of housing problem, at the same time. In the third chapter of thesis, emphasised on dwelling construction systems. Necessity of making an analyse through choosing the material, structural system and construction system which are also going to be the best supplement for the decisions of flexibility, variability, adaptability on programming phase, has been appeared in this section.

In dwelling model, which is going to propose for this aim, for carry out a qualitative solution to dwelling problem also necessity of inquiry of industrialized construction systems has been appeared too, because of their providing the fast production among construction system.

By this purpose, some firms, which are still have production or had production in Turkey, have been chosen because of determined affects or their dwelling construction systems to the dwelling space have been decided to inquire.

Second limitation as addition to this, has been done at the case that keeping partly industrialized systems out of inquiry, because of their not providing any possibility to variability at using phase instead of their providing design flexibility at the beginning. By

these limitations, it has been decided that analysing of whole industrialized construction system. It has been appeared that the necessity of determining as analyse criteria of technical approaches which require for adaptability concept, possessed on second chapter. Fully industrialized systems have been inquired comparatively under these criteria.

Fourth chapter of thesis, the chapter where the model propose has been done through realization of adaptable designed dwelling. Precedence has been given to the inquiring of decisions which are affective on the realization of this proposal.

These data decisions are environmental conditions and programming decisions. Environmental conditions are; mass-housing policies and other related politics, management, building land, layout/infrastructure, users' participation and spreading of adaptability knowledge, law and rules, material sources and technological opportunities with income and economic sources. Even if programming decisions are; function and decisions which related with spatial area and necessity of spatial area and decisions which related through building elements choosing and through the modular coordination. Model proposed in this chapter has been evaluated in three levels as; wholeness of building, among dwelling units and in the dwelling units. At the end this section, node of joint solutions and the adaptable design housing model's applicability has been presented. Results of these evaluations have been taken place at fifth chapter in thesis which is also been result chapter of it.

ÖZET

- Çalışmanın konusu** : Uyabilir tasarımlı konut
- Çalışmanın kapsamı** : Hazır yapı elemanları ile çok katlı konut üretiminde esneklik, değişkenlik, ve uyabilirlik kavramı
- Çalışmanın amacı** : Türkiye’de hazır yapı elemanları ile çok katlı konut üretiminde esneklik, değişebilirlik ve uyabilirlik kavramları ile niceliksel ve niteliksel açıdan konut sorununun çözümü için bir yaklaşım önerilmesi

Bu çalışmada, hazır yapı elemanları ile çok katlı konut üretiminde uyabilirlik kavramı aracılığıyla niceliksel ve niteliksel açıdan Türkiye’nin konut sorununa bir çözüm getirilmesi amaçlanmaktadır.

Sorunun çözümünde kullanılabilecek bir modelin önerildiği çalışma beş ana bölümden oluşmaktadır.

Çalışmanın birinci bölümünde çalışmanın konusu, kapsamı, amacı ve yöntemi ele alınmıştır. Çalışmanın kapsamında ilk olarak incelenecek olan konunun yalnızca yeni yerleşim alanlarında uygulanacak olan toplu konut projeleri için geçerli olmadığı, aynı zamanda mevcut yerleşim alanlarında da gerçekleştirilebileceği varsayılmaktadır. Bu nedenle konunun toplu konut kapsamında değil, genelleme yaparak çok katlı konut kapsamında incelenmesine karar verilmiştir.

Tezin ikinci bölümünde, öncelikle esneklik, değişebilirlik ve uyabilirlik kavramlarına açıklık getirmek amacıyla bu kavramlar hakkında farklı görüşler ortaya konarak, bu görüşlerin değerlendirilmesi yapılmıştır.

Esneklik, deęişebilirlik ve uyabilirlik amaçlı alıřmalar incelenerek gruplandırılmıřtır. Buna gre; kullanıcı yapısı ve gereksinimleri ile uyabilir konut etkileřimi ve esneklik, deęişebilirlik ve uyabilirlik amaçlı yaklařımların incelenmesine karar verilmiřtir. Bu esneklik, deęişebilirlik ve uyabilirlik amaçlı yaklařımların incelenmesiyle uyabilirlik kavramının tanımı yapılıp, ilkeleri saptanmaya alıřılmıřtır.

Yine bu blmde Trkiye’de zellikle İzmir kentinde uygulanmıř farklı hane byklklerine alternatif sunan rnek projeler seilmiřtir. Anket ve alan alıřmalarıyla bu rneklerin; esneklik ve deęişebilirlik aılarından bina btnnde ve konut birimleri iersinde mekansal analizlerinin yapılması gerekli grlmřtr. Bu zorunluluk aynı zamanda, konut sorununun niteliksel aıdan varlıęını belirleme amacınada hizmet eder.

Tezin nc blmnde konut yapım sistemleri zerinde durulmuřtur. Tasarım ve programlama ařamasında alınacak esneklik ve deęişebilirlik kararlarına en iyi řekilde karřılık verecek malzeme, tařıyıcı sistem yapım sistemi seimine ynelik bir analiz yapılması gereklilięi ortaya ıkmıřtır.

Bu amaçla nerilecek uyabilir konut modelinde, konut sorununa niceliksel aıdan da bir zm getirmek amalandıęından yapım sistemleri arasında hızlı retime olanak saęlaması nedeniyle endstrileřmiř yapım sistemlerinin inceleme kapsamına alınması gereklilięi ortaya ıkmıřtır.

Bu amaçla Trkiye’de gnmzde retimi olan ve gemiřte retimi olmuř (ancak gnmzde retimi olmayan) bazı firmalar seilerek, bu firmalara ait konut yapım sistemlerinin konut mekanını belirleyici etkilerinin incelenmesine karar verilmiřtir.

Buna ek olarak, ikinci bir sınırlama, kısmen endstrileřmiř sistemlerin bařlangıta tasarım esneklięi saęlamalarına raęmen kullanım ařamasında deęişebilirlięe olanak tanımadıkları iin bu inceleme dıřında tutulmaları konusunda yapılmıřtır. Bu sınırlamalar kapsamında tam endstrileřmiř yapım sistemlerinin analizinin yapılmasına karar verilmiřtir. Hangi prefabrike sistemin olası deęiřimlere izin verebileceęi arařtırıldıęından,

ikinci bölümde elde edilen uyabilirlik kavramı için gerekli olan teknik yaklaşımların analiz kriteri olarak belirlenmesi gerekliliği ortaya çıkmaktadır. Tam endüstrileşmiş yapıım sistemleri bu kriterler kapsamında karşılaştırmalı olarak incelenmiştir.

Tezin dördüncü bölümünde ise, uyabilir tasarımlı konutun gerçekleşmesine yönelik model önerisinin yapıldığı bölümdür. Öncelikle bu önerinin gerçekleşmesinde etkili olan veri kararlarının incelenmesine karar verilmiştir. Bu veri kararları çevre koşulları ve programlama kararlarıdır. Çevre koşulları; toplu konut politikaları ve ilgili politikalar, yönetim, arsa ve altyapı, kullanıcı katılımı ve uyabilirlik bilgisinin yayılması, yasa ve yönetmelikler, malzeme kaynakları ve teknolojik olanaklar ile gelir ve parasal kaynaklardır. Programlama kararları ise; fonksiyon, mekan ve alan ihtiyacına ilişkin, modüler koordinasyona ilişkin ve yapı elemanları seçimine ilişkin kararlardır. Bu bölümde önerilen model, programlama aşamasında verilen kararlar ile bina bütününde, konut birimleri arasında ve konut birimleri içersinde olmak üzere üç düzeyde irdelenmiştir. Bu bölümün sonunda düğüm noktası çözümleri ile uyabilir tasarımlı konut modelinin uygulanabilirliği ortaya konmuştur. Bu irdelenmenin sonuçları tezin beşinci bölümü olan sonuç bölümünde yer almaktadır.

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CHAPTER ONE

INTRODUCTION

1. SUBJECT, CONTENT, PURPOSE AND METHODOLOGY OF THE STUDY

1.1. SUBJECT

The solution to the problem of constructing housing which would answer potential changes in household structure within the process of time has been searched for on one hand in the concepts of core dwelling and related growth, and on the other hand in the concepts of flexibility and separability. Since appropriate rental organizations have yet to be widened in Turkey.

Possession of a housing tends to be a social security in view of economic demands of households. Therefore, a tendency to have a large houses as possible has long been a determinant factor, which can well provide individuals or households with a sufficient rental income, and possible growth of households is considered while planning the housing construction.

However, due to the current dimensions that the housing problem has reached, there can be a number of studies in which one discusses the possibilities that the present dwelling-residence- should be utilised more efficiently or a relatively larger house be separated into individual flats in order to gain rental incomes , when the household decreases as other household members have moved away.

The social structure of housing is changing in Turkey today. There are a variety of household types as well as core household structure. As ways of living have been greatly individualised, different types of social groups are simultaneously living together. Housing has become very important in daily life of people, for people tend to spend much of their daily time at home for various purposes such as resting, studying, education etc.

Spatial diversity and its associated housing preference have been described as the household mobility in an around the house depending on the demands of changing time and conditions (Rossi, P., 1955) In the light of above said explanation, the concept of housing should be clarified more evidently: Housing can be described as a site which is covered by the lateral walls, in which windows and doors are jagged, thatched with a roof unit, where people live in individuals, groups or households and which leads out to a street, corridor or to a general space. (DIE, 1966-1969) In addition, however, the above mentioned description can be extended in such a way to include the minimal needs such as cooking, bath, etc. It is clear from above that despite the main condition that the housing unit be independent perse, its independency from other external units should be put forward as an preliminary conditions. On the other hand the housing should also be recognised as a residence. The social dimension of the housing phenomenon, however, tends to be identified with being completely economical both in the current mass-housing act and in the quality classification tables in the Ministry of Construction and Housing, Turkey. The condition of being economical can be separated into four major factors as follows;

- . Site of utilisation
- . Quality of the utilised materials
- . Togetherness of building units in an their shared -common circulating locations (such as corridors, entrance halls, etc.).
- . Costs

The housing is a factor which is interrelated with its natural physical and social environment. It has protected human beings from negative results of natural and physical surroundings, has become a private residence in which individual and household live on,

and at the same time has assumed important functions in their social relationships to the community in which they live (Kemahlioğlu, E., 1991).

Historically, the housing has constituted, develop and modified depending on its natural aspects, the social livelihood and related interactions, the household structure, income dispersal, property concept, levels of development increase of population types and rates of urbanisation in other words, on the needs and demands of social life (Adam, M.,1977).

The housing problem which was felt in 1950's when urbanisation and industrialisation began to develop in Turkey has been increasingly involved in our lives. Today it is observed that Turkey has experienced rapid architectural activities within the context of various sectors and there are many mass-housing processes especially in great cities based on the magnitude of the housing problem among such activities.

Considering the present mass-housing processes as a whole, housing sizes and types are observed to exhibit a great diversity. However, such a diversity is not the results of scientific assessments of the users' needs but rather is caused by direct effects of supply and demand rules in the related market, and of the housing speculators' decisions. Ignoring the users and social cultural factors in the face of economy-based programming constructing and mass-housing on the basis of type project can be regarded as negative factors in the urbanisation process. Such types of housing that can by no means approach to instinctive housing richness of the squatter settlements are considered the lack of demand by those who have just moved to cities from the country and who tried to continue rural culture (Onat, N., Kaya, İ.,& Gökmen, H.,1996).

It is known that equal-size- housing unit are constructed for different households without considering their features and numbers of people, in cooperative mass-housing, and in build-and-sell system in particular. Accordingly, a housing unit compatible with the needs of household cannot suffice for demands of another household. Groupings of the

dwellings as well as their individual localisation's result in negative appearances in living surroundings which emerge in urbanisation process.

The fact that they can not be constructed by being programmed and projected with their own surroundings, and unhealthy concrete masses are combined without considering any intermediate spaces suggests such negative aspects as well. It is observed that although there are legal limitations concerning the housing sizes in the practices of project supported by mass-housing loans, relationship between the housing sizes and numbers of household members and users' necessities is not taken into account.

It is a known fact that while post-inhabitancy evaluation works are insufficient in Turkey, economic condition of the users determining the preference for housing size. In particular, as the income level of the households decrease, correlation of housing dimensions with number of household members will be replaced by purchasing power factor.

Although, one aims to have low and medium income households possess dwellings by means of construction of mass-housing supported by cooperative or individual loans, low-income and crowded households are economically compelled to reside in the houses which aren't compatible with their own requirements. Under the present circumstances in Turkey, whereas households are logically apt to move to another house due to their growth or decrease in number, this can hardly come true excluding compulsory rental movements.

Because of the elongated use of housing, as with mass-housing practices in particular, it can be said that one of its significant features is its ability to respond both to the demands of different users and to the necessities changing in time. Therefore flexibility in the housing, in other words, its compatibility with various arrangement and changes in the housing organization proves to be important factor with which people are pleased in view of potential inhabitancies.

However, it is difficult to claim that in the housing organizations the main issue considered is based on scientific assessments. Despite the fact that theoretical studies regarding various characteristics of the universal housing phenomenon tend to be greatly emphasised, this subject matter is of particular importance in nations which have been in the process of rapid transition, such as occurs in Turkey.

1.2. THE CONTENT OF THE STUDY

The concepts of flexibility, compatibility and variability in the construction of multi-storey housing with prefabricated building elements. First of all, it is essential to discuss the question where the multi-storey housing with an adaptable design would be realized.

Adaptable housing can be implemented on two different sites;

- . In the present settlements,
- . Newly-formed settlements

Adaptable designed housing is an approach which can be applied in and around urban areas. Thus, it seems essential not to consider this within the context of mass-housing only in newly formed settlements. Accordingly, the issue will be discussed within the framework of multi-storey housing.

On the other hand, adaptable design housing can be implemented in four phases;

- . Programming and planning
- . Construction
- . Inhabitancy
- . Renewal

These above said phases are those which can be experienced in any construction types.

In addition, it seems necessary to determine the principles of the adaptable designed housing. In doing so possible modifications would be as follows;

- . Those to be likely to emerge in housing units

- . Those to be likely to appear among housing units
- . Those to be likely to exist in the junctions between external and internal elements.

1.3. THE PURPOSE OF THE STUDY

The study recommends an approach to the solution for housing problem in view of quantity and quality by means of concepts of flexibility, variability and adaptability in multi-storey housing construction with using prefabricated building elements in Turkey.

In Turkey there is no practice of adaptable multi-storey housing. Therefore the project of adaptable design multi-storey housing constructed in Europe have been pre-studied (Beisi, J., 1993). As the result of such pre-studies, some of these examples have been found to be unsuccessful outcomes. The reasons for these fails are as follows;

- . Failure to inform new users on the possibility of variability-compatibility- aspect during the inhabitancy phase by new comers to the housing. The concept of housing adaptability within the housing market is not well known yet, because adaptable housing is a new way of using space.

- . Insufficiency of management during inhabitancy phase of the housing. Inability to control the new users related to changes to be made and to make common decisions among the present users.

Based on such observations, the following aims should be established;

- . The initial aim is to determine the principles of adaptable design housing since such a practice has yet to be implemented.

- . The second aim is to examine mass-housing project in the phase of design which can provide different household groups with available adaptable multi-storey alternatives, study potential desires of households to change the housing and related possibilities, and briefly demonstrate the presence of the problem in question although Turkey never contains any adaptable designed multi-storey constructions.

- . The third aim is to examine to look for most existing constructional and bearing systems in the phase of realisation of adaptable design multi-storey dwellings.

. The fourth aim is to establish present and potential influences of a number of factors on realisation of the adaptable designed multi-storey dwellings such as environmental conditions mass-housing policies management, land, laws, and regulations programming and planning which all can determine adaptable designed multi-storey housing construction in developing countries.

. The fifth aim is to determine approach to realisation of adaptable designed multi-storey housing concept for the above mentioned purposes-aims-, and introduce unavailable housing construction model accordingly.

1.4. METHODOLOGY

Analyses have been made for the purpose of establishing data related to established aims in the study. First one of these analyses is associated with survey method and field studies. A number of mass housing projects which were and have been realized in İzmir by various institutions and cooperatives have been selected for the field study. The housing projects included in the study are ‘Evka 2’ and ‘Evka 3’ constructed by İzmir Metropolitan Municipality; ‘Gaziemir’, ‘Atakent’, ‘Mavişehir’ settlements by Emlak Bank; ‘Mim kent’ cooperative constructions by ‘Demirer Cons. Co.’, Terraced Flats at Hatay by İş Bank and Oyak settlements.

However, three different examples have also been included in the analysis. In doing so the following criteria have been considered;

- . Similarity in storey plans and in neighbourhoods in which the buildings are located.
- . The fact that they were constructed by various cooperatives and institutions.
- . The fact that they are in the phase of inhabitancy and their inhabitancy periods should be considered.

It is necessary to analyse these examples in the block criteria and housing unit criterion by comparing the housing organizations. The correlation between the number household members, dwelling size and the number of dwellings should be established as the degree to which households are pleased with the concerned inhabitancies.

The second analysis is related to establishing most available construction and load bearing system in the realisation of adaptable design, multi-storey dwellings. Depending on the importance of time and speed factor in mass housing production, the necessity for industrialized construction systems has been recognised in a variety of studies. For this purpose, industrialized construction systems which were and have been implemented in Turkey are selected and their impact on housing standards will be studied. Following general conclusion, it proved necessary to examine technical approaches to be used in creation of adaptability of skeleton , panels, and cell systems, which are included in fully industrialized systems by comparing them in view of possible physical changes.



CHAPTER TWO

**FLEXIBILITY, VARIABILITY AND
ADAPTABILITY INTENDED APPROACH
CHOICES ON MULTI-STOREY HOUSING
PRODUCTION**

2. DEFINITIONS

Dictionary Meanings

Flexibility (Lat. Flexibilis)

Redhouse: Elasticity

Webster's II New Riverside University Dictionary: Capable of being bent or flexed: Pliable. Susceptible to influence or persuasion: Tractable. Responsive to change: Adaptable

The Random House Dictionary: Capable of being bent; easily bent. Susceptible of modification or adaptation; adaptable: a flexible system; a flexible schedule; a flexible mind. Synonym flexible refers to that which is capable of being bent and adds sometimes the idea of compressibility or expandability.

Variability (Lat.: Variare):

Redhouse: Changeable. Variable

Webster's II New Riverside University Dictionary: Tending or apt to vary.

The Random House Dictionary: variety -the state of being varied or diversified. Difference. A number of different types of things, especially ones in the same general category.

Adaptability

Redhouse: Efficiency of being adaptable to conditions and environment.

Webster's II New Riverside University Dictionary: Adapt; To adjust to a specified use or situation. Adaptable; Able to adapt or to be adapted. Adaptation; The state of being adapted. The act or process of adapting. Something that undergoes change to fit a new or special use or situation. An often hereditary alteration or adjustment by which a species or individual improves its condition in relationship to its environment.

Alter: To make different. To adjust for a better fit.

The Random House Dictionary: Adapt; To make suitable to requirements or conditions; adjust or modify fittingly. Adaptable; Capable of being adapted. Able to adjust oneself readily to different conditions. Adaptation; the act of adapting. The state of being adapted. Adaptive; Serving or able to adapt. Showing or contributing to adaptation.

Changeability

Redhouse: Changeable; changeable, hesitated, impotent. Changeability; able to change.

Webster's II New Riverside University Dictionary: Changeable; Apt to change. Able to undergo alteration.

Growth

Redhouse: Growing, increasing.

Webster's II New Riverside University Dictionary: The process of growing. A stage in the process of growing; Size. Full development; Maturity. Development from a lower or simpler to a higher or more complex form; Evolution. An increase, as in size, number, value, or strength; Expansion.

Neutrality

Redhouse: Objective, impartial, one has no particular significance.

Webster's II New Riverside University Dictionary: The state or policy of being neutral.

The Random House Dictionary: The state of being neutral.

Movability

Redhouse: One has able to move, carry out and transport.

Webster's II New Riverside University Dictionary: Capable of being moved.

2.1. DEFINITIONS OF THE CONCEPTS

In this chapter; concepts of 'flexibility, variability, and adaptability' inquire as they statement of satisfaction of the users about their dwellings also the searching of relationship of these concepts with the spatial organization and also the dwellings' enlargement.

Concepts of flexibility and variability evaluate together with the concepts of adaptability and growth and they define as they relate with the physical significance of space such as dimension and size.

In this study, it has been aimed that the definitions, which found before, evaluate for clarify to concepts.

As one can see, in dictionary, these definitions have no direct implications on architecture. Flexibility is the capability of bending to the original shape, variability is liability to change or not being constant, and adaptability is capability of adjusting to conditions. These different and contradictory definitions make it hard to interpret these concepts in architecture. The architectural meaning of these concepts are not clear. Therefore, the definitions brought by involved theoretician in this field, is the best source.

Norberg Schulz defines flexibility at these two meanings;

- 1) Buildings' getting bigger or either smaller by the way of adding or removing some new elements but without loose it's original wholeness.
- 2) Changing of elements and their relations (Schulz, N., 1963).

Adaptability states directly the adaptation but not the any changing itself.

ETA (Swiss High Institute for Architecture) defines flexibility in a general system theory. For *ETA* flexibility is the adaptation of the system to the different expectation without change that system itself or its elements (Quoted in Altaş, N.E, & Özsoy, A., 1993).

Building system has been defined as union of sub-systems which carried to the every functional elements and structure of building. Meaning of the flexibility of the space or building is that serving to the different expectations or functions without any changing on its own system. Flexibility, evaluates in a two different ways according to spaces' serving to the endless and specific functions.

Mete Tapan explains flexibility as the possibility of getting advantage from the same space for more than one function or other way to say that same designs' answering capability of different users necessities without making any changes on structural system (Tapan, M., 1972).

Flexibility has been defined as both making some reductions or expansions with the partitions on spaces and making some additions in a vertical or horizontal way on dwellings, by *F. Nesil Baytin*. In addition, she defines flexibility as re-establishing the some parts of building during renewing phase (Baytin, N., 1985).

For *Soner* and *Umur*, definition of flexibility is that qualification of the solution which has able to manage with all the necessities, without done any changing on itself. However, adaptability is the specialization of the solution which can manage with the varied necessities, in general terms (Quoted in Altaş, N.E, & Özsoy, A., 1993). Any modifications in space or components are not dealt with the concept of adaptability.

In *Rabaneck*, *Sheppard*, and *Town*, flexibility is achieving changes by way of interchangeable parts. Adaptability is achieving usability without doing change to anything (Rabaneck, A., Sheppard,D., Town,P., 1974).

Atasoy defines that, adaptability or capacity of adaptation as supplementary capacity of varied necessities with minimum effort (*Atasoy, A., & Erkman, U., 1976*).

R. M. Oxman defines adaptability as adaptation to the varied conditions (*Oxman, R. M. 1975*).

Even if *Dluhosch* says 'efficiency of changing conditions without modifying to the basic system' for the same concept (*Dluhosch, E., 1974, pp. 39-46*).

Turan explains environments flexibility that of multi-purposed using capacity supplementary, and expansion, general order of the structural components. (*Turan, M., 1973*).

In *Pena, Caudill* and *Focke* concept of flexibility has three diversities. These are characteristics of expandability, convertibility and versatility and they also have the meaning of structural difference (*Quoted in Altaş, N.E, & Özsoy, A., 1993*).

Yürekli is discussing the concept of variability, adaptability and growth in a detailed way both for dictionary meaning and different theoretical definitions from the area of architecture. He also underlines the term conflicts between some studies (*Yürekli, K.F., 1983*).

Sebestyen, inquires the problem at two different level (*Sebestyen, G., 1978*).

- 1) Pre-flexibility or variability: In the industrialized construction, building systems or their compounds are giving to architect a chance to create buildings in variety.
- 2) Continuous architectural flexibility or continuous functional flexibility: In the industrialized construction, giving an opportunity to the user to change equipment's, furniture, space of building without structural system.

For *Kızıltan*, flexibility is the ‘movement within space and changeability of interior spaces settlements’ (Kızıltan, A., 1967).

According to him, in a building there must be other three properties besides movement. These are capabilities of the enlargement, variability and improvement. As we understand *Kızıltan*, he considers capability of the enlargement, and variability, within flexibility. Improvement is variability in all partition walls without covering and structural system.

Cowan’s concept of variability is making the interior of building changeable, this means, about interior adaptability. On the other hand, growth is increasing by addition (Cowan, P., 1962-1963).

Türkçü explains, the concept of flexibility as ability to change the partition walls for necessities with keeping the building area constant. At the same time, variability is a design that enables changes in the building area according to the family size (Türkçü, Ç., 1979).

2.1.1. EVALUATION OF THE CONCEPTS

Definitions which made by variety of researchers seen that they have same conflicts with each other in above mentioned points.

In the first group of definitions (Oxman, Yürekli, Kızıltan) flexibility is the highest level concept and all others are defining as sub-concepts of it.

The second group accepts as an ‘adaptability’ top concept (Sommer, Umut, Netherlands Institute of Dwelling Researches, Cowan).

Third group (Tapan, Somer, Umur) definitions explains the concepts of ‘flexibility, variability, and adaptability’ with the making any variations on the building system itself at the meantime invariable situation on system defines as flexibility.

On the other hand as for some other groups seem that the concept of flexibility as variation capacity of interior partition walls when saving the stability of building walls or the building areas’ (Türkçü, Rabaneck, Sheppard, Town) and to variability as variation efficiency on building area based on the family enlargement (Türkçü) and last adaptability is the succeeding on using all these things without feeling for any necessity of modification sense (Rabanneck, Sheppard, Town).

Other definition sets up a relation between flexibility concept and user factor. Accordingly to this, one has been said that requirement of renewing the building may provide by the enlarging the rooms with demolishing the partition walls (Baytin).

Some sources are diversifying the variations on building as changing on interior partitions and load bearing system and when they account to first one in the flexibility concept, they define the second one which requires expert labor force, as adaptability (Netherlands Institute of Dwelling Researches, Rabaneck, Sheppard, Town).

It might be said that, these differences of commentary on architectural area are the result of the different approaches to the subject. For example *Yürekli* has inquired to these concepts before and after the design project and brought some definitions on diverse levels of process. At the same way *Tapan* inquires the subject through the changing dimensions which take place on building itself.

Netherlands’ Institute for Dwelling Research handles separately to supported structures with the physical elements of dwellings which they accept as self-mounted elements and may modify by user themselves. When they define first one as variability they accept the second situation as flexibility.

By the same way for the first situation means variability or so-called pre-flexibility of building production, *Sebestyen*, defends the idea that, which industrialized construction methods are valid, and modification may be realized by the architect himself.

However for the second situation means continued flexibility or he called continued functional flexibility, he defends the idea that, an industrialized construction method can give all possibilities to the users for modifying their own spaces themselves without demolishing the load-bearing system.

2.2. STUDIES ABOUT FLEXIBILITY ON DWELLING CASE

Flexibility and adaptability concepts are accepted as important significance's of dwelling usage satisfaction and multi-disciplinary studies have been done on this area.

A. Özsoy and *N. Altaş* have categorized these studies under the following titles in brief contents (*Altaş, N.E, & Özsoy, A., 1993*).

- 1) User structure; life-cycle, households, household structure and its changing also user activities.
- 2) Flexible dwelling design approaches; flexibility levels, users participation to the space formation, design models, strategies.
- 3) Activity support tools: technological developments, reflections of the new opportunities into the space, modular coordination, standardization.
- 4) Dwelling production problems; construction elements, prefabrication, mass-production, construction systems-flexibility relations.

In this chapter, using structure and flexible dwelling design approaches are emphasized although activity support tools and dwelling production are going to be evaluated on following chapters of this thesis.

2.2.1. USER STRUCTURE AND USER REQUIREMENTS

People requirements, for all environmental and social conditions, help them to continue their life physiologically, socially, and psychologically without any trouble. On the other hand, people requirements are the necessary conditions to perform the functions and actions in the society effectively. Requirements signify a necessity and an obligation. Requirements of people is a general concept. But the person in designs is a specific person that is 'user'. That's why, it is necessary to create suitable places to environmental conditions. In fact user requirement is an abstract concept. The fact view is the behaviour of people.

From this point of view, to understand the user requirements, the behaviours of people using the place and the reasons of these behaviours must be understood. And this is possible by examining the relations between people and their behaviours.

Yona Friedman, in his articles, called 'self planning', explains the relationship between people and their behaviour with this small example.

“ This is what happens in certain warm Climates, where-like in many places in India-shelters are built in order to protect material belongings of people (like granaries or stores), but as for people, they continue to live outside under the sky, and sleep outside. Beds are suspended on the walls in daytime, and people sleep before the house at night ” (Friedman, Y., 1974, pp.149-153).

For example; if we examine a living room, on each condition that is necessary to perform the actions like resting, watching television., chatting, reading book, etc. in this place as a requirement. In the house example; all possibilities and environmental conditions to provide the individuals of the family's physiological, and social comfort and high performance.

2.2.1.1. USER REQUIREMENTS AND THE CLASSIFICATION OF USER REQUIREMENTS

The user necessities may classify as;

- . Physical user need
- . Psycho-social need

a) Physical user necessities: The creation of proper physical conditions so that our activities would not be disturbed by the environment. The physical user necessities may be sub-categorized as:

- . Dimensional (Anthropometric) requirements
- . Necessities relate with the physical tools
- . Visual needs
- . Health and sanitary needs
- . Security needs
- . Sheltering reasons
- . Thermal reasons
- . Humidity reasons
- . Weather quality

b) Psycho-social user needs: These are the conditions preventing the feeling of and psychological disturbance of activities. They are sub-categorized as:

- . Privacy needs
- . Behavioural needs
- . Aesthetic needs
- . Social needs

a) Physical User Requirements: These are necessary and suitable physical conditions required to be in comfort when we are in an action. They depend on the number of users, the property of actions and the equipment. These properties are the dimensions of the user (sensuous, and perceptual) of users, the equipment requirements comprise the

precautions against structural solidity, fire, natural victims, and thief related with the security.

It is possible to examine the physical user requirements under six sub-titles within itself (DIE, 1969);

- . Dimensional requirements: These are dimensions depending on the place which is necessary for the user to do an action himself or with a group easily.
- . Requirements related with physical setting: To perform the actions effectively, the climatic conditions that the environment should have.
- . Visual requirements: The conditions to provide a suitable light to see the objects easily and effectively.
- . Acoustic requirements: The conditions to provide understanding in talking and acoustic secrecy in living dimensions.
- . Health requirements: Comprise the conditions to get clean air, water and to remove dirty water that are directed to body health and cleanliness especially in house buildings.
- . Security requirements: the conditions including structural solidity, fire, natural victims, thief.

b) Psycho-social User Requirements: The necessary conditions not to be psychologically uncomfortable when an action is performed. These are acoustic and visual secrecy. The properties of human behaviours of the social environment and the aesthetics like form, colour, tissue of place. Psycho-social requirements vary that which are based on the user's culture group and environment.

It is also possible to examine the psycho-social user requirements under four sub-group within itself (DIE, 1969);

- . Security requirements: The conditions to provide acoustic, visual, and individual secrecy in nearby environment.

- . Behavioural requirements: The required distances between users are 45cm for individual limits, 45-120cm distance between individuals, 120-360cm for the distance in society and public distance greater than 360cm depending on visual relations.
- . Aesthetics requirements: The conditions to provide the user psychological satisfaction besides the functional requirements. These are related with the visual effects like dimensions, colour, tissue, etc.
- . Social requirements: The properties including the household structure of users, their life preferences, relations among them.

2.2.1.2. EFFECTS OF USER-REQUIREMENT RELATION TO THE PLANNING DURING THE PROCESS

Even the number of places in a building is enough, the demand of different requirements in the same place, causes some problems.

User requirements have changing structure in time. It is possible to summarize the reasons of change in requirements according to the user as follows;

- 1) Different life standards and life preferences of users
- 2) Differences in household compositions in the household life
- 3) The change in life understanding and the household economy related with the house

Before examining these reasons in detailed way, it is useful to define the concept of 'family' and 'household' to clarify the meaning of 'user'.

The definitions of 'family' and 'household' used in the census by the State of Statistics Institute of Turkey are as follows;

Family: The community of wife and husband or one of them of wife or husband with a child or children means single family.

Household: Society that have family connection or not, live in the same house or in some part of house, have common budget, and participate the expenses and administration.

- . The ones that have a household connection, but live in separate houses are not respected as households.
- . The ones that live in the same house and have a household connection, but do not have a common budget are not respect as households.
- . The ones that live in the same house, but do not have a household connection and a common a budget are respected as households (Arcan, E.F., & Evli, F., 1987).

For example, there is no household concept beyond household made by three brothers or sister according to these definitions. House has wide contains with the variety of requirements which related with the user, must be evaluated in the concept of household.

2.2.1.3. REQUIRABLE CHANGES WHICH APPEAR AS PARALLEL WITH THE HOUSEHOLD GROWTH

Since the household occurs from household units or comprises the household, it changes parallel with the household.

The following phases can be listed to show the development of household in general (Atasoy,.A, 1980, p.20);

- 1) Foundation phase of household: The first or second years of the marriage. The household is small and dynamic.
- 2) Expansion household phase : After the birth of the first child, the household becomes an expanding household. In an expanding household, all or most of the children are under 18 years old. At this phase requirements change and increase. It is not dynamic as the first phase.
- 3) Diminishing household phase: As the children leave paternal home the household get smaller. This phase lasts until the senility phase.

- 4) Senility phase: At this phase the children are left the paternal home. The household is small again as at the foundation phase.

It is possible to observe the phases explained above according to the reasons of changes in household requirements.

The Changes at Foundation and Expansion Phases:

- . Increase in the number of children
- . Because of the difference of sex, increase in the number of child's room.
- . Special place are required by the children's growth.
- . Increase at the requirements of place for store, hobby in time.
- . The mother or the father of husband or wife becomes a widow and move to home
- . A bride come to home

The Changes in Diminishing Phase:

- . The child or children is leaving home because of -marriage or- their wishing to live as they separate from the parents.
- . One or a few of ancestors' passing away (grandmother, grandfather, mother or father).
- . The mother or the fathers' leaving home.

2.2.1.4. METHODS APPLIED BY HOUSEHOLDS TO MEET THEIR CHANGING REQUIREMENTS

There are three choices to overcome the changes in requirements that are parallel with the phases explained in previous section (Atasoy, A., 1980).

- 1) Household moves in another dwelling: The household changes the house depending on the house stock (the types of houses in the stock, selling and rent prices, etc.), social relations or household relations, accessions to the job and transportation expenditures.

- 2) The household can expand or diminish the house: This choice depends on the effects like the structural arrangement of the environment, the structure of the house, and the cost of changes.
- 3) The household can apply these changes as much as the plan tolerates: In this option, the dwelling which the household lives in, must have the flexibility to handle with this changes.

Since the first two choices depend on the factors that are difficult to solve in our conditions, the user is led to the third choice, that is different new solutions in house. But, how come the house can reply the requirements, of course, this is related with the planning. Designers must care about the flexibility in house planning and different type of user groups. Thereby, it will be easy for the user to meet with these changes.

2.2.1.5. THE CHANGES ON DWELLINGS, DONE FOR AIMING TO PROVIDE THE APPEARS OF REQUIREMENTS, DEPENDS ON THE HOUSEHOLD STRUCTURE

These are;

- 1) Because of the increase in the number of children:

- . The use of bunk bed in the same room.
- . Changing the room which was used as a daily living room before, to a child room.
- . Let one or a few of children to sleep in the child room or on the ground mattress in the living room (Beyer, H.G, n.d.).

- 2) Because of sex difference:

- . If there is an L-type living room, enclosing one part of it as a room.

- 3) Because of the requirement of a work place:

- . If there is a sitting room besides the living room, this room can be transformed to a study room.

4) Because of the increase in the size of hobby or stock:

- . Converting the WC to a hobby room (for example, to a dark room)
- . Joining the balcony to the room to get a multipurpose room.
- . Using the kitchen balcony as a storage or leave the balconies open but by means of cabinets or without cabinet to use them as a storage.
- . Putting shelves above the doors.
- . Pulling down the wall between two rooms and putting a cabinet instead that can be used from each side.

5) An adult moves home:

- . Depending on the sex of the adult, his/her bed is placed in the child's room, the living room.

6) A bride comes home:

- . If the room of married child is not big enough, they move to a larger room (for example, to the living room)
- . Expanding the room by adding the balcony or a part of the living room.

7) The child or the children leave(s) home:

- . Converting to the previous form if a change had been done because of increase in the number of children (for example, converting the child room to living room again or enclosing the room to the living room again, converting the extra room to kitchen, and the kitchen to storage room, using the extra room as a store).

8) The death of an adult or disjoining from home:

- . The changes in this situation is same as above

2.2.1.6. THE INTERACTION OF USER NEEDS AND ADAPTABLE HOUSING DESIGN

According to *Yona Friedman*; “Practically any building is adaptable as it can be used in many different ways. But who is he who should decide how it should be used?” (Friedman, Y., 1974, pp.149-153). For *Friedman*’s thought user is the one who’s going to decide at shaping of the dwelling.

Studies done through formations of dwelling have been declined power surroundings are the reason of environmental change. *Habraken* clarified the concept of power with these three significance;

- . A tendency through the enlargement of the settlement area
- . A tendency through the economization of laboring
- . A tendency reaching to the quality which the power wisher

Evaluation of the role of user on his/her own feeling is based on the opinion which evaluates the formation of dwelling as process. For *Habraken* user have to define and aware some of a power. He says that user may create the healthy and continually developing environments while they affect and controlled directly to the physical environment (Habraken, N. J., 1979).

For *Şener*, most important phase on shaping the architectural environment is seeing the process that where architecture has all authorisations. He defines the architecture at this process as different than craftsman, person who has special knowledge and practice. He defends the idea that architecture is the person who provides the variability on architectural environment. “Because of variety may be considered in accordance with their interpretation of human and public needs, their approach to the three basics of function, structure and aesthetics” (Şener, H., 1982, p.26).

Yürekli supports him as he says, architecture is a person who’s playing most important role in this process. According to *Yürekli*, architect is the authorized person to decide on

the properties of form, based on effects of different variables, and he is the processor of creating a form. Variables that are mentioned above are building necessity program, building land, environment, user, climate, quantitative aspects, and etc. The factors that direct these interpretations can be called the ideals of the architect (Yürekli, F., 1983). He says that there is an unmodified interaction between users and their buildings of after the construction process which organized by architecture himself. He emphasises the changing on ideals and responsibilities of architecture after the gaining confusion between environment and human being by new supposed concepts (Yürekli, F., 1979).

Friedman thinks that the most important would be to demonstrate the people that they are capable of inventing their own buildings and the way to use them.

Aim: is to eliminate the intermediaries-architects- between the client and his residence. A user must directly define his residence.

Tool: Is the scientific architecture which means to constitute a list of all possible alternatives. The role of architect for the use of residence offering by the list-repertoire- is to propose an immobile infrastructure, in which the residence can immediately be constructed. Once the choice is determined, it must be left open to change, which means that it must be transformable so that it can adapt to future changes; and the system must lie on city scale (Quoted in Eyüce, A., Bacak, Ö., 1973, pp.9-10).

For *Friedman*, industrialized building systems, beside their properties can not be repaired or either maintained in an easy and simple way. He relates whole post-construction process with the ‘not -so easy’, long and exhaustive way from the users’ side.

“... On the opposite , a building constructed in an ‘already known’ technique can be easily mended by the user himself. In many countries ‘modern’ buildings decay after a few winters but primitive buildings constructed by their users are immediately repaired after

heavy seasons and look new after a number of years” (Friedman, Y., 1974, pp. 149-151).⁽¹⁾

He notes that, the adaptability of a building is based on a new technical element which has to be invented; it is rather a question of the user’s mentality.

Lucien Kroll has long argued against unnecessary standardization and excessive discipline in Modern architecture (Ellis, C. 1988). His works are intended to allow individuals to express themselves, and as far as possible, to create environments suited to their particular personalities .

According to *Friedman*, we have to find a way, how to encourage the future user to dare to do this. He thinks, that the most important thing would be to demonstrate to people that they are capable of inventing their own buildings and the way of how to use them.

2.2.2. FLEXIBILITY, VARIABILITY AND ADAPTABILITY PURPOSED HOUSING DESIGN APPROACHES

Main problem area in the flexible dwelling design is the determination of flexibility level which expect from the dwelling, or other way to say how much flexibility level is enough and suitable for the using satisfaction on dwellings.

⁽¹⁾ *Friedman* proposes to set a very simple language (for architectural design) which is understandable by anybody, which language makes possible for the future user to formulate his problems to become aware of the possible solutions.

He exemplifies his personal opinion and compares the two different tendencies in today’s architecture with his whole frankness but also in a so naive and reductive perspective. He has been defining the further contradictions between flexible and mobile industrialized buildings experts-designers- and their users by ‘logic’ and ‘language’.

For *Altaş* and *Özsoy* two model of designing are valid for the level flexibility at dwelling a building typology (*Altaş, N.E., & Özsoy, A, 1993*). These are;

- 1) Efficiency of adaptability without done any physical change.
- 2) Making changes on interior spaces based on decisions which have been taken after local studies.

Adaptability efficiency without doing any physical change is a tendency which is much more suitable for dwelling design, because of its providing capacity of using the spaces for more than one purposes. *Rabaneck* underlines that variation possibility on dwelling may realize activities but much more in their occasions and their solutions (*Rabaneck, A., Sheppard, D., & Town, P., 1974*). He is defending that most of the design requirements can possess with the mountable and adaptable low-cost solutions. Designing of same sized spaces for serving to the more than one function have been evaluated as escaping from expertness.

Yürekli has been summarized the basic of adaptability purposed design tendency as avoiding from expertness and expanding to the tolerance points either on environment or on building system (*Yürekli, K. F, 1983*). Other way to say, spaces have similar dimensions may serve to the different utilities. In this approach, he has given his decisions as increasing the variety of spatial enlargement through their interaction and avoiding from expertness and statement of functions. But spatial enlargements are related with the activities and activity tools directly.

In the relation of dwelling and household, *Cook* emphasised that two conflicted situation such as dwellings' being too tight or being too big for the household. He underlines the importance of optimization as he indicates the profitable of large dwellings done by the private sector with same equipment. He states that main solution are the houses which have large floor areas but small living sections (*Cook, P., 1967*).

Price says that main modification are observed in the service areas such as bathroom, laundry room, kitchen, storage room, etc. by the some new tools like deepfreeze, drier,

dish washers involving into the daily life. He believes that reaching to the extreme flexibility level on this service areas may realize by the reconstruction of these services also getting smaller and mobilizing of these new equipment (Price, C., 1971).

Second model proposed the solution of which dwelling user may reach as they organizing the components accordingly his/her own desire, and also named flexible modular component architecture. *SAR-Dwelling* design methodology is the most important study on this area developed by research group of '*Stichting Architecten Research*' in Netherlands by the supervising of *Nikoloas J. Habraken* (Habraken, N.J., 1982). Methodology determinate the leading rules for the unmodified support structures and for designing of unites which mounted through the users' wishes based on the modular coordination principles. In final solution dwelling choices produced with the possible plan variations which determined to the activity areas and belonging zones organized in specific rules. Also, the possible organizations for activity zones made by added and mounted parts and which are going to take place in each areas, have been developed.

Pre-choices have been made by dwelling user according to his or her own necessities. In high level standardization at building elements and materials and also the dwelling furnishings based into the modular coordination are necessary for this system. *Yürekli* mentioned about flexibility purposed designing strategies which consist of structural change position and aimed to spatial organizations re-adjustment and renewal of mechanic equipment with the similar approach. The case has been handling and discussing with its decisively side -single space, spatial regions and approaches which made grating systems- and side of construction techniques and systems -element attachments, technological significance- by *Yürekli* (*Yürekli, K. F., 1983*).

If we examine to the flexibility, variability purposed tendencies in general we can see that designers count the case on two main titles as;

- 1) Designing
- 2) Construction systems, construction techniques

Declined designs are the successful synthesis of these two factor. We may classify to the flexibility purposed approaches in three main segments by these thoughts (Onat, N., 1992).

- 1) Beginning flexibility of the system: Static flexibility-limited variability
- 2) Organising flexibility of the system: Continuous flexibility-free variability
- 3) Systems flexibility of developing: Expandability, growth

2.2.2.1. BEGINNING FLEXIBILITY OF THE SYSTEM: STATIC FLEXIBILITY-LIMITED VARIABILITY

This one is a flexibility which has been provided by the planning quality on the design phase. For this reason the design phase;

- 1) Determination of installation and partition volumes establishment in an most appropriate way.

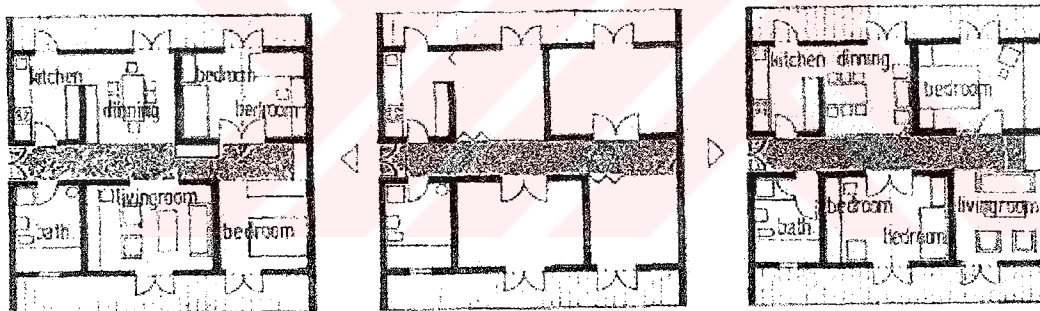


Figure 2.1 Static flexibility-limited variability, Architects: Rabaneck, Sheppard, Town (Architectural Design, 1974,February).

- 2) Handling with some of the volumes in flexible expand.
- 3) Volumes being convenient for different organising through the furnishing process.
- 4) Emphasizing that the some volumes' having separability capacity for different utilities (Figure 2.1).

2.2.2.2. SYSTEMS' ORGANISING FLEXIBILITY: CONTINUING FLEXIBILITY- FREE VARIABILITY

This one is the prudent flexibility for all the volumes places' according to preferences and wants. In this type of approach important thing is the dwellings' adapting to the changing which may happen during the inhabitancy phase. Living volumes or wet volumes may organize in determined areas with the limited freedom or in whole areas with the totally free way according to approaching type. Approaches which develop through this, may inquire under these three subtitle.

Approaches 1

Situation of being Stable of the Wet Volumes - Approaches which came into the Single Space: In this approach the purpose is the planning the locations of such permanent volumes like kitchen, bathroom, and toilets, as they providing the most consistent opportunities for the free variability of other living areas (Figure 2.2).

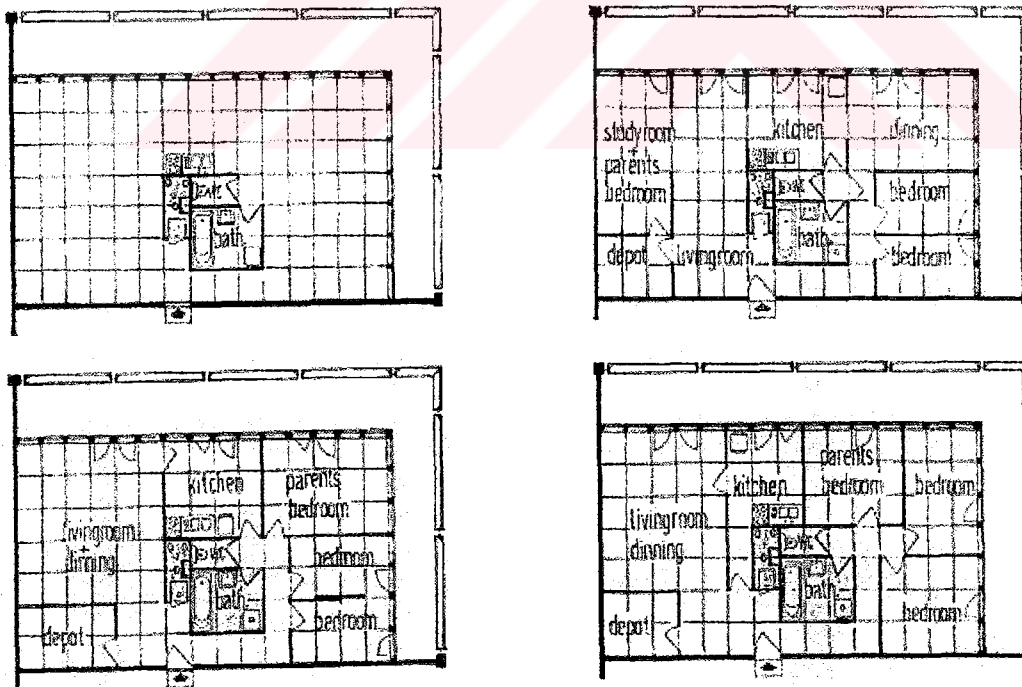


Figure 2.2 Situation of being stable of the wet volumes (Bouen und Wohnen 1970, Marz.)

Applying area of this approach is much more common than the others. This might seem that wet volumes planned together in general because of their installation attachments. For example other living volumes, out of the wet ones, may organize on a modular grid, whatever they want, according to the household types.

Approach 2

Realizing of Spatial Zones in the Support Structures: In this type of approach, support structure system and different using areas may be designed on dwelling zones and also the wet volume compositions and living sections may organize in varied qualities at the same areas.

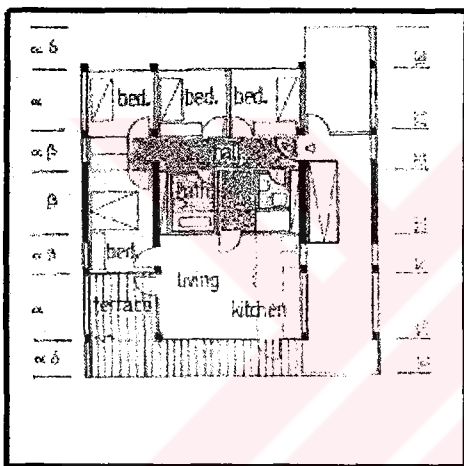


Figure 2.3 SAR diagram used in a mass-housing project in Amsterdam (Architectural Design, 1973, November)

This approach which specialised the spaces in a specific rate, consisted to the both disadvantage of distancing from total flexibility beside the advantage of reducing the first investment cost in same. Because, restriction on variability is going to bring the disposal of carrying the service distribution only into the related spaces with it too. This approach might be much more valid because of while preventing the causes of restriction of variability through the process of making strong data based space expertness. Circulation system and exterior attachments have gaining a special importance when the dwellings divide into the variety group of expertness for the systems functionality.

SAR method provides possibility to make harmonized organizations with their necessities to the user among fixed load-bearing elements when they stay in the zones which preserved for different dwelling areas and in these zones' flexibility shares (Figure 2.3).

System's purpose: Dwelling problem is either on the agenda of the countries which solved their dwelling shortage and other social requirements or problems with its' qualitative dimensions.

Missing point in whole system is the users' contribution. Programmed anonymity and pre-determined quantities of the mass-housing destroy to the human factor and his rights of modification, adaptation and control to his own physical environment. Problem origin is not only in the industrialized construction technology but beyond and in its' process of giving decision (Habraken, N. J., 1979).

In the production of dwelling, societies' and persons' expense and responsibility areas have been separated, and the industries' opportunity of movability through his own nature has been given and last the societies' being dwelling owner with artificial ways has been ended by Habrakens' method of approaching.

Approach 3

Flexible Space Organising: This one is a tendency towards totally free organising of the living places and wet volumes. Totally flexible arrangements may realize when creates the possibility of connection to the horizontal and vertical main installation system which has been made by combining with a specific structure system in any point (Figure 2.4). This approach has purpose from social, technological side.

Technological purposes;

- . Set up a program which consist of both structural system model and infrastructure equipment's together.
- . Providing the installment of these equipment according to some ones' wishes who are going to use them.
- . Realizing the practices with whole prefabricated materials.
- . Counting the assemblies on a modular system base.

Sociological Purposes;

- . Providing the users' participation to the design
- . Providing the opportunity for design flexibility which reply to varied organising -of dwelling units- through users' demands.

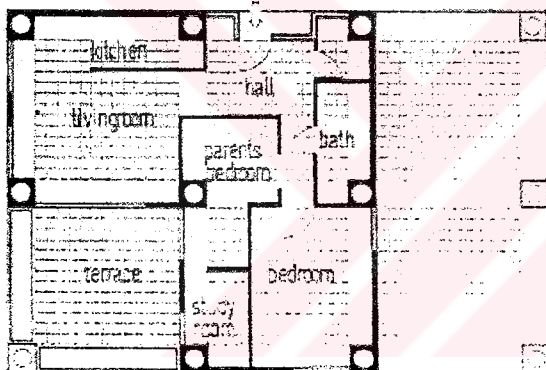
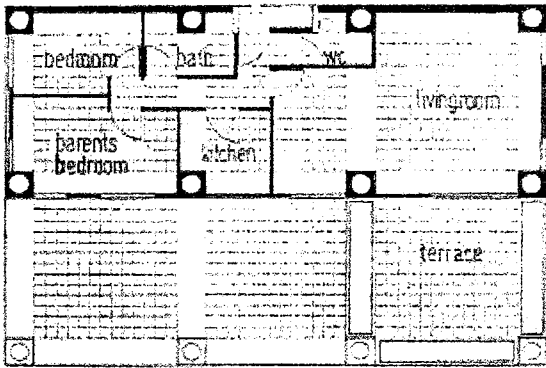


Figure 2.4 Flexible space organising, Marelles project plan examples (Entrentients Sur La Flexibilite Des logements).

- . Providing the opportunity for enlarging and reducing.
- . Realize all this thing without technical force.

Briefly the purpose is transferring the users structure to the planning, setting a planning hierarchy and also providing the coherent of this planning through the family members demands.

Also, determinate the factors which affect to the planning of their own dwelling units, while providing a specific freedom to the users.

2.2.2.3. SYSTEMS FLEXIBILITY OF DEVELOPING: EXPANDABILITY, GROWTH

This is a flexibility type which may happened on using and renewing phases of a building. And, it is a changing of the form of the building based on the changing on the dimensions of it. In a wider concept, it is a flexibility approach which consisting of the

'adding spaces' to the areas designed according to a specific approach and replying to the requirements of the organizations of varied sized spaces and areas (Figure 2.5).

Important problems on the expanding of the building is only have the spaces on shells of the buildings expanding opportunity and instead of this other spaces depriving of this because of the form differences.

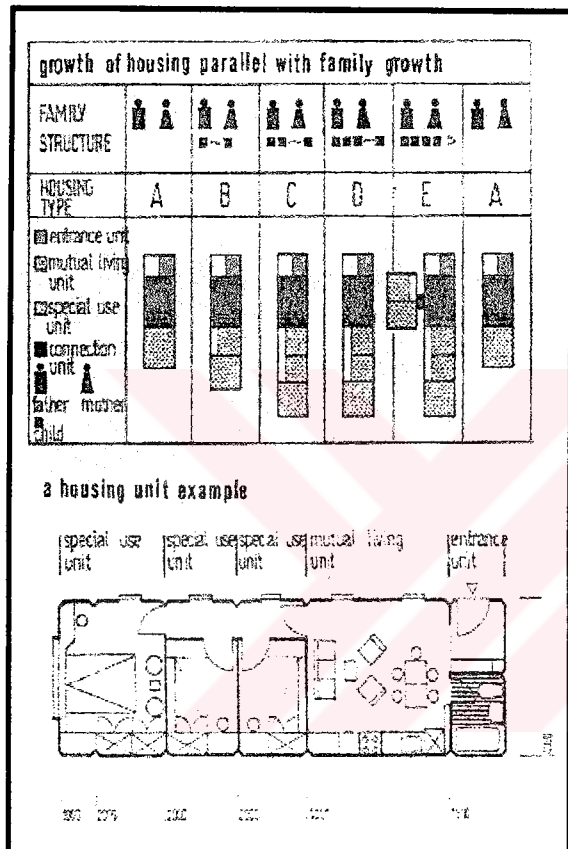


Figure 2.5 From Shinkenchiku competition housing design which can grow, Inagaki-Ueno proposal (JA, 1967, December).

with all these above mentioned phenomenons.

Designs through this approach, organising are mostly valid only for the other spaces which have wide variation capacity means in where the centered wet volumes circled around the core consist of vertical installation axes and with other vertical circulation elements.

Modular systems are providing much advantageous possibilities than amorphous systems to the adding new spaces.

When the expanding such as linear expanding, variation in the future, functional variation systems of relations limitations, expansions, ranks, are mentionable in a building group it related

2.3. ADAPTABLE DESIGN HOUSING

2.3.1. HISTORICAL DEVELOPMENT AND ADAPTABLE DESIGN EXAMPLES

Adaptable housing is not a new concept. At the end of 18th century, with advent of the 'industrial revolution', rapidly expanding cities and the integration of industrial productions with construction determined the way of 20th. Century's 'Modern Architectural Movement'. Those intentions are constructing suitable buildings and living centers for making, and also using recently found advanced substances in a proper way.

In 1920's, 'form follows function' or 'the fully adaptable functionalism' approaches have changed meaning as 'architectural approaches' or lost its expressive character. Today it is known that rationality in many building types is reached by flexibility and adaptability. Also variability is considered as an important part of the modern architecture.

It is also known that flexibility and adaptability are the characteristics of anonymous architecture. According to *Rapoport*, anonymous architecture with its extendible quality and free nature is open to changes and extensions without being harmed in the character or idea (Quoted in Şener, H., 1982). Indeed, the traditional 'Turkish House' with its various spaces are highly adaptable.

Today's architecture, competitive with its nature while various approaches, design strategies are still in use, new approaches and strategies are advanced.

The most important characteristic of these strategies named as 'architectural approaches' is the generality of their principles. Therefore, instead of following a special rule in modern architecture up to the problem, to the user, to the architect, or to the typology of the building, architect chooses flexibility and adaptable buildings.

Ludwig Mies Van der Rohe is one of the first followers of this kind of approach. He is thinking that the using of the building constantly changes and that it is not economic to knock down a building, because of it changes *Sullivan's* 'form follows function' approach. He says, that we should built functional, economical, and practical buildings (Quoted in Şener, H., 1982).

According to *Mies*, the most practical and economical way of constructing is to see the building as a whole and huge volume. He also accepts the technology and architecture as unified. For him, technology and architecture will develop together and one will be the expression of the other. The basis of formal elements which are adaptable to various conditions and psychological needs, as *Mies* call them obvious constructions.

We can summarize the reasons which leads by *Mies Van der Rohe*, to abstract the architecture, for practical, economical, construction of long-lasting buildings and let the people to live in their interior spaces as they want with using the technology in a best way and unifying it with an architecture.

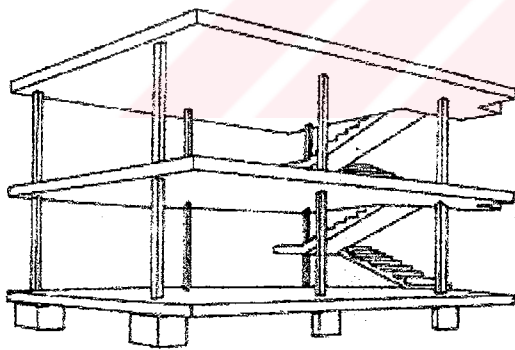


Figure 2.6 Structure of the Maison Dom-Ino project (Modern Architecture, 1992, p.153).

Mies's approach is connected with building typology. His counterpart *Corbusier*, worked on adaptability opportunities only from the view of housing. He was interested in the interchangeable house for day and night time usage.

At the beginning of modern architecture in *Maison Dom-Ino* (1915), by the architect *Le Corbusier*, consisting of concrete slabs and pillars in which a large number of floor plans, could be created as using the built-in packages (Figure 2.6).

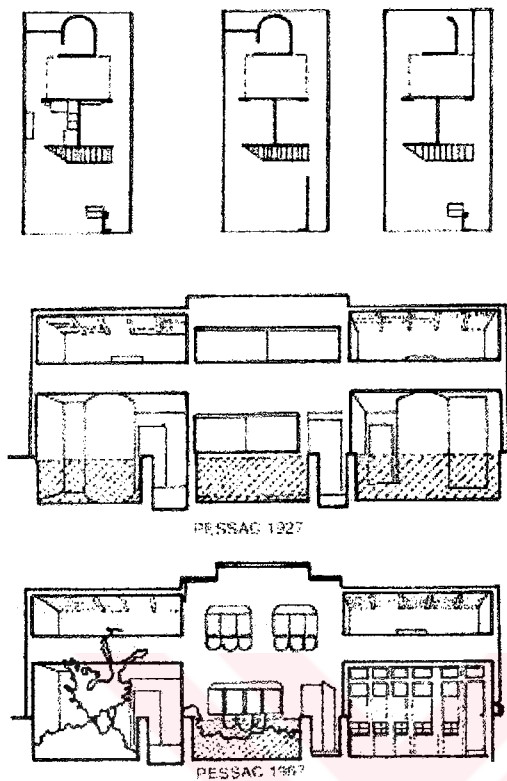


Figure 2.7 Pessac project (Yapı, 1991, September, pp.42-43)

However, *Pessac* (1927), mass-housing practice of *Le Corbusier*, is being a first successful example of flexibility decision in planning. At the housings of *Quartiers Modernes Fruges*, he designed in *Pessac*, 70 dwellings had so many varied changing by the appeared necessities of users after 40 years (Figure 2.7) (Quoted in Karaman, A., 1991).

Many experimental flexible dwellings, based on the same principles, were built during the 1960s in Europe. It was noted that their potential flexibility was not well utilized, but the actual user's reactions and what one could learn from the application of adaptability, was rarely proceeded.

In the last decade new housing projects, based on renewed concepts of adaptability, have been realized in Switzerland. Unfortunately, the experience of the architects, owners and inhabitants about the use of the adaptable provisions has remained as unknown. (Beisi, J., 1993).

2.3.2. THE DEFINITION OF ADAPTABILITY

Adaptability, is a way to fulfil a large variety of necessities and modification of necessities of house holds within the same building structure by using potential means of the construction techniques and means which management system have (Beisi, J., 1993). We may evaluate the concept of flexibility with this given definition.

First, adaptability seems as the possibility of usage. A potential physical adaptability and the possibility of using adaptability are two different things, but also they interact with each other. Physical adaptability may not be well utilized, although it is provided. In fact, housing adaptability is not only a physical factor but also a matter of knowledge and management. Therefore 'usable adaptability' is a better term to describe the whole picture of adaptable design-housing than 'physical adaptability' only.

Second, adaptability is seen as a process. A history of any kind of building like dwelling can be summarized into five phases. These are;

- . Programming
- . Design and planning
- . Construction
- . Inhabitancy
- . Renewal

A concept of adaptability appears during the programming phase and is applied and used during the following four phases. Providing adaptability is not a one-time strategy, but should guarantee the long-term possibilities of usage (Beisi, J., 1993).

2.3.3. THE POTENTIAL PHYSICAL ADAPTABILITY

Diversification of the potential physical adaptability are these;

- . Exchange of rooms: The housing unit can be enlarged by taking rooms from the neighbouring housing unit , or the housing unit can be reduced in size by giving rooms to the neighbouring housing unit.
- . Varying number of housing unit: The amount of housing units can change by changing the sizes of housing units within the building structure.
- . Multi-functional room: The room functions can change without changing the room dimension.
- . Change in room relationship: Rooms inside the each housing unit has several possible attachments among each other.

- . Change in room quantity and size: The room divisions can change by moving of the flexible or movable walls.
- . Change in accessories: Housing accessories may choose by households or they can replace easily.

The use of potential physical adaptability is a very complex process. It depends on many factors, both physical and social. Any of these special conditions, when they are not sufficiently apply, could make the adaptability features out of utilization.

2.3.4. PRINCIPLES OF ADAPTABLE DESIGN HOUSING

For these reasons, these things are necessary for establishing the adaptable designed dwelling.

Identification of Technical Approach for Creating Adaptability: Adaptable housing has some special physical solutions which adjust the varying of living requirements. These special physical solutions for adaptability, also have to be clarify.

Using of Adaptability: Adaptability can be implemented during any of the four phases -programming, design, construction, inhabitancy and renewal-. Inhabitancy phase is divided into such sub-categories ; inhabitancy phase I -change of household needs- and inhabitancy phase II -change of household. For this reason, analysis of relations among dwelling process are necessary.

Distribution of Knowledge on Adaptability. The concept of housing adaptability is not well known yet, because of adaptable design housing is a new way for using space. It is necessary to let households know the advantages of adaptable housing features and their methods of using.

Management for Adaptability: For example, it depends on how they manage them that efficiency of gaining advantages from adaptability at multi-storey housings.

Knowledge of adaptability and managing for adaptability issues are going to examine in a detailed way at following chapters.

2.3.4.1. THE TECHNICAL APPROACHES OF CREATING ADAPTABILITY

The technical methods are very important, because, they provide the potential possibilities for users to adapt their housings. The technical methods include spatial and functional arrangements, dimensions of space, materials and techniques for both the flexible and in-flexible components, colours and installation systems.

These technical approaches;

- 1) Changes to the size relationship between two housing units can be done using complicated methods as well as simple ones.
 - . Evaluation of technical details for the future changing.
 - . Movability of partition walls.
 - . Providing of the changing of electrification water and heating systems in a low-cost increasing.
 - . Using of movable, flexible walls between spaces.
- 2) The varying quantities of housing units require well designed space.
 - . Changing of the sizes of multi-storey building as they combined with a separate block.
- 3) If the building materials and colours are neutral and similar on the same floor, then the adjustment among housing unit sizes are much easily accomplished.
 - . Other wise adaptability is going to be difficult and also the cost is going to get increased.
- 4) A change of room functions and/or space relationship can be achieved by two totally different solutions; flexible or moveable walls and multi-functions rooms.
 - . Rooms have similar enlargement
 - . Changing of inner spaces' partition walls at any time.

The technical methods, which provide adaptability, also affect other qualities of housing. Decisions, taken at the beginning, affects the cost, for example using and changing or renewing of the panels which have no sound-isolation characteristic, are being a cost increased factor.

2.3.4.2. USING OF ADAPTABILITY: SEARCH FOR THE MEANS OF POSSIBILITIES OF FLEXIBILITY, VARIABILITY AND ADAPTABILITY IN MULTI-STOREY HOUSING

The Purposes of the Research and Research Method : It's not possible to analyse uses of adaptability because there are no multi-storey housing examples produced by adaptable concept in Turkey. Therefore the first purpose of the study is to collect data of the adaptable design housing approach.

The second purpose of the study is analysis of the interaction between the loading system preference and spatial characteristics by comparing the selected samples depending on physical aspects of the housing user's subjective assessments, and on user's qualities. This analysis aimed to develop post-usage assessment model. Accordingly the following are aimed;

Research for adaptation to demands and types of different households in the phases of designing and construction in the housing units. In addition; search for potential adaptation of the housing to changing demands of the household.

- 1) Search for possibilities of suitability to different uses of the spaces within housing units.
- 2) Search for possible physical modifications enlargement, room exchange etc. in the phases of designing construction inhabitancy and renovation among the units and within housing units.

Assumptions:

The study discusses the flexibility and concept which are important factors in measuring satisfaction of users with their dwellings. These concepts are discussed in association with;

- 1) Sizes of housing buildings and spaces
- 2) Spatial organizations
- 3) Spatial modifications and additions.

Research assumptions can be stated according to the above systematics.

Assumption 1; The spatial size is a variable determining the spatial shape, possible functions in it, the number of users, as well as dimensional characteristics such as width, length and height which loading system brings about itself. In other words, the housing size, is the function of household features and the dimensional variables defining the housing as a whole. The housing size can be discussed only within the frame work of relations of the two variable groups.

Assumption 2; Tendencies to adaptability such as exchangeability of rooms or additional blocks to the building in the relationship between internal and external spaces and housing units and within housing units are based on spatial organizations and load-bearing system features.

Assumption 3; Physical modifications which are created to obtain inhabitancy availability in the housing are associated with physical aspects of the interrelated spaces such as dimensions, modular coordination, structural system, installment and their functional appropriateness.

Variables:

There are three groups of variables studied for analyses pertaining to the above mentioned assumptions. These are as follows;

- . Those based on number of household members

- . Those related to housing include changes made in it. Correlation between the load-bearing system and potential spatial changes is established.
- . Those associated with spatial organizations and uses covers assessments of users related to the housing. These are assessments concerned with spatial sizes, positions of spaces in the housing unit, suitability of the spaces to the uses and with possibilities of flexible inhabitancy.

General Description of Three Mass-Housing Examples Applied in İzmir:

In order to collect data of adaptable design-housing approach, the projects were selected which is applied to the households different from multi-storey housing examples. In other words, the selected examples are the project which show diversities by distinct types of housing in the phases of programming and designing. The three selected examples were produced in different periods of time by different companies. These three examples are all those of mass housing process. But, serve different income groups of people. It is useful to inform on these examples briefly:

Mimkent:

Mimkent, which was produced by *Demirer İnşaat* a private project and construction company. This is one of the important examples in which partially industrialized construction system is used in mass-housing approaches in Turkey. This project utilized the tunnel formwork system which concerns to the middle and higher income groups.

The *Mimkent* blocks were constructed in three different phases namely I, II, III sections. The number of flats that *Mimkent* produced is 1118, which are located in *Esentepe* within the borders of İzmir Metropolitan Municipality.

The first section of *Mimkent* dwellings was started to be constructed in 1988 and completed in 1993. The first section blocks in the inhabitancy phase is included in the research study.

Two different housing phases were applied; two and three room flats in *Mimkent I*. Prefabricated reinforced concrete panels were used on the block facades. But they haven't been insulated yet, and insulation problems increased as junction details of the tunnel formwork with the panels used on the facade haven't been properly completed. *Mimkent II* and *Mimkent III* blocks are the same as *Mimkent I* in plan, whereas detail problems were tried to be solved better than every previous practice.

On-story *Mimkent I* blocks are located on the phase area with 8 stories being on the upper level and two stories under the slope. Every storey has two flats. Every blocks includes 16 flats. The first basement covers a porter's lodge and ware houses, the second basement having parking lots apartment gate shelter. Maximum distance which can be passed through by tunnel formwork method is about 4m. Living room dimensions are 4.07 by 7.50m. Housing units are vary from 86m² to 110m².

Evka-3:

Evka-3 is located in Erzene, Bornova on an area of some 30H that belongs to İzmir metropolitan municipality. This project is composed of 1428 housing unit which are aimed to serve low and stable income groups of people as homes.

In this project of home acquisition, briefly named *Evka*, minimum standards of an inhabitable housing unit were initially established. Low-cost dwellings without wall tiles, floor tiles, cupboards or even paint were planned to be constructed, and sold but to be later completed by the users.

However, regarding these uncompleted items, the price-discount that the contractors suggested for these items was unacceptably low. On the other hand, this incomplete project was given up for fear that enlargement of building models might spoil the site' homogeneity in time. Different size-projects of 50m², 61m², 81m² were developed on the basis of credit thresholds in the projection made.

Therefore, repayment schedules were presented which could facilitated users to acquire homes with their minimum savings. Management of the cooperative consist of the staff members from the municipal planning and architecture. Because the organizations of households are realized by municipality of similar local governments, all sorts of repayment are under strict control. The Evka-3 model proposes rapid construction in particular.

The tenders, which are conducted by turnkey fixed price for a limited time led the contractor companies to apply advanced technologies which accelerate and economize the construction projects.

Evka is a kind of heterogenous urban section that is composed of various income groups and different households in a quantities that various types of households can choose suitable projects which present various repayment plan and available m² choices according to their budgets and preferences. So far, 6 *Evka* projects have been realized in different parts of İzmir city. Table 2.1 illustrates types of housing.

Table 2.1 *Evka-3 Bornova Project*, breakdown and floor areas (m²) of housing types according to their quantities (İBŞB., Gecekondu ve sosyal konutlar müdürlüğü, İzmir, 1987).

Type	Unit Housing Floor (m ²)	Number of Unit Housing
K type duplex	115	288
L type duplex	110	260
M type duplex	75	760
N type duplex	55	120

Quantity of total housing units: 1428

Evka-3 settlements have been found to consist of four different types of block namely 5 storey-dwellings and every storey with two flats of 65m², those of five storeys and every floor with two 75m² flats; and point type blocks of dwellings having 8 floors with different size 4 flats each.

Construction systems used in *Evka* projects including conventional, prefabricated panel systems and tunnel formwork are one of the partially industrialized systems. Table 2.2 shows quantitative comparison of these construction systems for *Evka 1,2,3* project.

Table 2.2 Quantitative comparison of construction systems used in *Evka 1,2,3*, projects (İBŞB., Gecekondu ve sosyal konutlar müdürlüğü, İzmir, 1987).

Construction System Use	Ratio of Construction Used to Total Area
Conventional System	55.21%
Panel System	5.66%
Tunnel Formwork System	39.12%

Although, conventional construction system initially seemed the least costly in investment, it was found to be an unsuitable construction system or mass-housing production system because it involves an insufficiently rapid production, poor quality, and too great material loss. But, it was used because it favours distributing capital over time and machinery equipment inputs are very low.

Many cooperatives participated *Egekent* projects therefore dwelling productions contracted by small scaled companies. These companies preferred to use conventional construction system which requires low pre-investment and therefore were seen as the most suitable by them.

The Project for Gaziemir Emlak Bank Blocks:

Cooperative dwellings and mass-housing settlements are seen as *Gaziemir, Mavişehir, Oyak* and various private sector projects in and around İzmir. However, these groups of dwellings are programmed for middle and higher income groups of people (Türkçü, Ç, Onat, N.G, & et all, 1996).

Gaziemir Emlak Bank settlements are located on the main artery of transportation 15 minute away from the downtown, which enable people to commute to work easily. The construction of the buildings was started in 1993.

The 9 storey housings that were previously build by *Emlak Bank* are located here as well. Some of the former buildings were constructed by *Demirer İnşaat* and some built by *Tepe inşaat* based on tunnel formwork system. 85% of the second phase blocks started in 1993 are five-storey housings.

The rest of them are duplex buildings constructed with tunnel formwork system by four firms, namely *Sutek*, *Demirer İnşaat*, *Murat İnşaat* and *Otak İnşaat*. *Gaziemir Emlak Bank* housings include four different area m² types buildings A, B, C, D type.

Every floor of them includes two flats which are different in floor area m² for the purpose of satisfying demands of different sized household types on the same storey. Table 2.3 presents number of storeys and their area values.

Table 2.3 *Gaziemir EmlakBank* Housings; housing type, storey number and areas (m²)

Type of Housing	Storey Number	Area m ²	
		Flat 1	Flat 2
A Type Block	5	92.08	88.17
B ₁ Type Block	5	74.10	74.10
B ₂ Type Block	5	92.08	43.15
C Type Block	5	92.08	60.52
D Type Block	2-3	91.72	-

All companies utilized tunnel formwork construction system in *Emlak Bank Gaziemir* housings Table 2.4 shows the number of housing that this companies produced.

The plan types which were formed by tunnel formwork system applied in this housing resemble one another. Therefore uniform or monotonous surfaces were formed in such housing groups. In order to eliminate this monotony. The facades of the buildings were painted in different colours.

Maximum distance obtained by tunnel formwork method in these housings is 4.08m.

Table 2.4 The companies is participating in the production of *Gaziemir Emlak Bank* housing and their production quantities

Name of the Company	Quantity of Housing
Sutek Cons. Co.	624
Murat Cons. Co.	898
Demirer Cons. Co. and Otak Cons. Co.	626
Total housing quantity: 2184	

The Method of Analysis:

Field and survey studies were conducted on some examples of the mass-housings constructed in İzmir, which include *Evka-2*, *Evka-3*, *Oyak* housings, *Gaziemir Emlak Bank* housings, *Mavişehir Emlak Bank* housings, *Atakent Venedik* housings, *İzkent*, *Hatay* terrace houses and *Mimkent*. A total of 250 households were interviewed to form survey studies.

The questions in the survey were prepared in a way to establish the satisfaction of users with the housing (see Appendix 1) The questionnaire study has been realized on date of May 1998 in a random method..

The survey content covers the question about the ratio of household members to room number, spatial sizes, possible modifications which the user wishes to do etc. In addition, some questions are included regarding the levels of participation of the households in the phases of designing on constructing.

The model of analysis is based on comparing establishments related to physical spaces with subjective assessments of the households, spatial establishments consist of plan arrangements, plan organization changes and uses of spaces as a whole in the building.

In determination of the examples based on the model, selection of the examples which cover the inhabitancy periods to best reflect the post inhabitancy position, and of the projects to provide comparisons in view of plan organizations was the determinant factor.

Limits of the Research:

- 1) This research is an analytical study during which spatial and dimensional evaluations were applied in the dwellings in use in view of the criterion for housing design.
- 2) Assessments and analyses were discussed within the context of the previously defined flexibility and adaptability.
- 3) Block examples were discussed which are two flat solutions on every storey as the common characteristics of the selected examples.
- 4) Owner-occupied dwellings were analysed with the idea that tenant households are not likely to do the needed modifications in the rented dwellings.
- 5) The dwellings were selected which were in inhabitancy phase in order to reflect the change in the household structure and its influence on the modification in the housing spaces. Table 2.5 reflects the inhabitancy periods of households in the housing.

Table 2.5 Inhabitancy period of the households in the selected housing examples

Examples	1-3 Years	4-6 Years	7-10 Years	Longer than 10 Years	Total %
Gaziemir	20	5	-	-	25
Mimkent	10	15	-	-	25
Evka-3	13	10	2	-	25

The three plan examples were chosen which are different in nature considering spatial satisfaction and availability to modifications.

These characteristics include the differences of plan organizations, means of enlargements/separability in the living space, kitchen spaces possibilities, enlargement of rooms and wet floor spaces such as bathroom and WC. Table 2.6 covers the general aspects of the selected examples in plan.

Table 2.6 Planning aspects of the selecting examples.

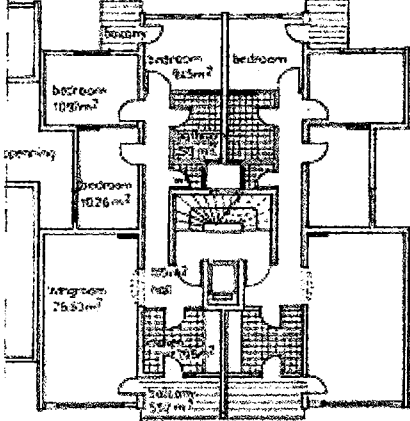
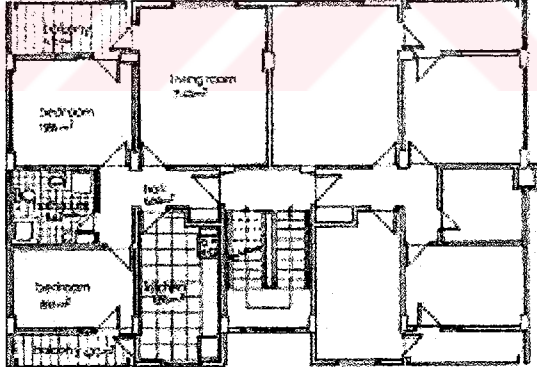
Table 2.6-1	
EXAMPLE	PLANNING ASPECT OF THE TYPE
<p>Mimkent I (86m²)</p>	 <p>The entrance hall way is associated with the kitchen living room and the corridor. Bedrooms, Wc and bathroom doors are opened to this corridor. There is a large balcony connected to the living room and the kitchen. There is another but smaller balcony attached to one of the bedrooms.</p>
<p>Evka-3 (80m²)</p>	 <p>It is possible to pass all the spaces including the flat door through a corridor in this example. There is no kind of entrance hall the living room and the kitchen are located in different parts of the housing and they are correlated with two different balconies.</p>

Table 2.6-2	
EXAMPLE	PLANNING ASPECT OF THE TYPE
<p>Gaziemir A type block (88m²)</p>	<div data-bbox="560 443 1107 808" data-label="Diagram"> <p>The diagram is a detailed floor plan of a housing unit. It features a central living room (30.2m²) with a fireplace and a balcony. To the left is a bedroom (18.2m²) and another bedroom (15.0m²). To the right is a kitchen (10.0m²) with a balcony, a bathroom (5.0m²), and a bedroom (10.0m²). A central hallway (5.0m²) provides access to the living room, kitchen, and bedrooms. There are also two additional bedrooms (15.0m² and 15.0m²) and a bathroom (5.0m²) at the bottom of the plan. The total area is 88m².</p> </div> <p>Passage to the kitchen, Wc, living room and corridor through the hall way. Passage to bedrooms and bathrooms through the corridor is possible. The walls between the bedrooms and the corridor walls are suitable to the use of cupboards. It's possible to pass to the balcony through the living room and kitchen. The second balcony is attached to one bedroom.</p>

The Findings of the Research

1) Block-scale analysis:

The studied mass-housing examples include two different arrangement on the block-scale, which are as follows;

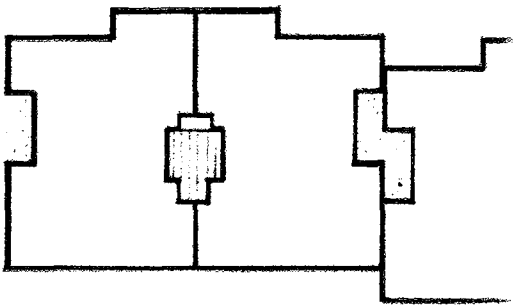
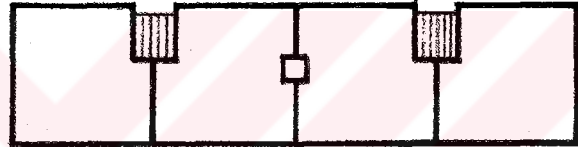
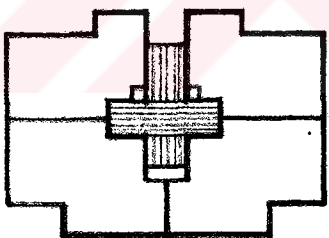




- . Sequential blocks which are composed of two housing units fed by a circulatory elements; the stairs and the elevators
- . Point blocks which are made up of two, three or four housing units fed by a circulatory elements; the stairs and the elevators.

In order to examine the influence of block dimension, form and organization on housing formation, the housing types used in three settlements were analysed on the block-scale. Based on the block form, position and vertical installment solution elements,

Table 2.7 shows how the housing type and shape, size, organization, circulation system, wet space-bathroom and WC- positions are determined in all types of housing.

Table 2.7 Analyses the selected examples on the block-scale

Table 2.7-1	TYPES OF BLOCK (linear, point block formations, number of flats, spaces of circulation and installment
EXAMPLES	
<p>Gaziemir Emlak Bank mass-housings</p>	<div data-bbox="667 671 1050 898" style="text-align: center;"> </div> <p data-bbox="544 932 1177 966" style="text-align: center;">Type A1 Point scheme- a two-flat apartment around a core</p> <div data-bbox="667 1090 1050 1317" style="text-align: center;"> </div> <p data-bbox="544 1367 1177 1401" style="text-align: center;">Type A2 Point scheme- a two-flat apartment around a core</p> <div data-bbox="667 1533 1050 1759" style="text-align: center;"> </div> <p data-bbox="544 1798 1177 1832" style="text-align: center;">Type B Point scheme- a two flat apartment around a core</p>

<p>Table 2.7-2</p> <p>EXAMPLES</p>	<p>TYPES OF BLOCK (linear, point block formations, number of flats, spaces of circulation and installment)</p>
<p>Mimkent mass-housings</p>	 <p>Combination of point scheme with another are to solve the problem of opening as the saved solution.</p>
<p>Evka-3 mass-housings</p>	 <p>Type 1,2,3 Linear scheme- a two flat apartment around a core</p>  <p>Type 4 Point scheme- a four flat apartment around a core</p>
	<ul style="list-style-type: none">  Vertical circulation; stairs and elevators  Horizontal circulation; entrance halls  Vertical installment solution  Openings

2) Analysis on Housing Unit Scale:

Spatial arrangement and organization schemes of all housing types were studied. Inhabitancy-based modifications and original housing plan of the selected housing types were comparatively studied based on the block scale analysis. The modifications which the users had done were established.

Evka-3 Mass-housing

Potential of Modification in the Type of Housing: The housing can be enlarged from 69.39 m² to 80m² by adding living room, kitchen and balconies to the inhabitancy area in the housing. Inter-spatial walls can be demolished to create a new arrangement thanks to the conventional construction system.

Assessment by Households: The survey made showed that difference sized of household can reside in the two room flats in other words five person households were found to live in the same flat as that in which two person households live. The survey found that it is the purchasing power which determines the home acquisition. 80% of Evka-3 households confessed that they failed to possess the types of housing and the room number they wanted to. It was founded that 20% of the households, initially owned their desired number of rooms and sizes of dwellings.

The survey to the respondents revealed that when asked if the spatial areas and sizes of the housing are sufficient are not 65% answered 'no' and 35% 'yes'. The households also complained that such spaces as larder, studying room and, guest bedroom are not present.

According to the knowledge of spatial organizations in the dwellings, long distance between the kitchen and living room, narrowness of the entrance hall and the smaller kitchen balcony shared with the bedroom were negative complaints stated by the households.

Modifications by Households: Survey to the respondents reveal that 72% did not do any alterations in their dwellings and 18% said that did so. The modifications done are as follows;

- . Addition of the balcony to the room as an enlargement
- . The wall between the room and the kitchen is demolished to obtain a larger kitchen
- . Type of kitchen counter type and cabinet are displaced.
- . Balconies are enclosed by shutters to create closed storage rooms.

Evaluation: Addition of the balconies to their bedrooms is a sort of modifications as an enlargement. The plan scheme does not allow creating a third room. In some examples, these balconies are utilized as storage spaces. In another example, the kitchen is enlarged as open kitchen space demolishing one separating wall and therefore living room is replaced by the bedroom.

Gaziemir Emlak Bank Mass-housing

Potential of Modification in the Type of Housing: It requires specialised labor skills, that partitive panel elements on the facade of the building constructed by tunnel formwork technology should be removed to enlarge the spaces but it is well possible to create such enlargement as follows; attachment of the balconies to the internal spaces can enlarge the total area to 88.17m² to 98.17m². The walls between the rooms are load-bearing factors because of the concerned production systems. Therefore, these load-bearing walls can not be demolished or moved, however, L-shape living room as such can be separated, thus an additional room being obtained.

Assessments by Households: The survey to the responded revealed that the households from two to five people can reside in three room dwellings. One of the reasons that the households prefer these dwellings is that they are located in the areas which are clean and quality air and away from urban pollution. The second governing factor is that the housing is large and therefore and internal spatial inhabitancy is more attractive to the users. Some of the households stated that preferred these dwellings in

view of easy commuting to work. The survey discovered that initially 84% of the household could have the number of rooms and the housing sizes which they had wished and 16% couldn't. The survey also revealed that when asked if the number of spaces was sufficient or not after the inhabitancy, 28% found it sufficient and 72% did not. Space sizes were found to be sufficient by 92% and insufficient by 8%.

Households expressed that what they needed badly was the guest room, which means that they needed a fourth room. Moreover, the necessity for larder and a second bathroom for adults was established. Based on the knowledge of the spatial organization in the dwellings, the households revealed that they would find it useful to provide living room-kitchen relation, kitchen-balcony attachment, and bathroom-bedrooms relations.

Modifications by Households : 76% of the survey explained that the households did modifications in their dwellings and 24% did not so. These modifications are as follows;

- . Balcony is closed to create a larger kitchen
- . Bedroom balcony is closed to enlarge the bedroom.
- . Balconies are closed with shutters to obtain a storage area.

Evaluation: The modification by which the balconies are closed to obtain larger living room, kitchen and bedroom creates a desired enlargement in the present housing, but living room separation was not attempted to obtain another room.

Mimkent Mass-dwellings

Potential of Modification in the Type of Housing: Addition of the kitchen and the bedroom increases the total inhabitancy spaces from 86m² to 94.58m². It is possible to obtain dwellings of different sizes and more rooms in the designing phase using tunnel formwork technology. Tunnel formwork was found to create flexibility, but it can not provide potential alterations during the inhabitancy phase.

Assessment by Households: The survey revealed that the households of two to five people can reside in the three-room dwellings. One of the main reasons that they preferred these dwellings is that they are the areas which have fresh air, and are away from the urban pollution and noise, as well as they have a nice scenery. On the other hand, some households said that they had already, owned their lands and thus could have dwellings there.

52% of households revealed that they could buy the dwellings of the sizes and room number that they had desired to, but 48% of them said they could not. The respondents to the survey explained that when asked if the number of spaces was sufficient or not. 20% answered no and 80% yes.

72% of them found the spatial sizes sufficient and 28% did not. The households in this settlement stated they needed extra bedroom, larder and hobby or studying room or like wise. They also explained that they wanted to enlarge or lessen their rooms but they could not do so since the walls form the load-bearing system. For example they wanted to enlarge the kitchen, demolishing the separating wall. Moreover almost all households were found to be pleased with the spatial organizations of their houses.

Modifications by Households : This research study established that 60% of the households made alterations in their dwellings and 40% did not. The alterations made by as follows;

- . The balcony is closed to enlarge the kitchen.
- . A cupboard is attached to living room, kitchen counter and cupboards are replaced.
- . Independent heating system is installed in the flat.
- . Balconies are shuttered.
- . Bathroom cabinets are installed.

Evaluation: The fact that the households failed to contribute to the formation of the dwellings during projecting and construction phases and therefore they have to acquire houses by their available savings creates the necessity and the desire to do alterations

under the changing conditions. This desire is especially reflected by the addition of balcony to the kitchen due to the insufficient kitchen capacity in volume and space.

2.3.5. DISCUSSION ON THE RESULTS OF THE CHAPTER

Although the number of spaces and sizes of the studied examples are sufficient for lesser households, crowded household can not be satisfied with such spaces. Generally the reason for home acquisition is changing economical circumstances and therefore the present spatial features are admitted by their users in other words it seems necessary for the users to adapt them selves to such stable space dwellings, whereas it seems in possible that such housing can be adapted to the changing demands of the users. The consequences obtained from comparative analyses of the three studied settlements are graphically explained as follows (Figure 2.8, Figure 2.9, Figure 2.10, Figure 2.11).

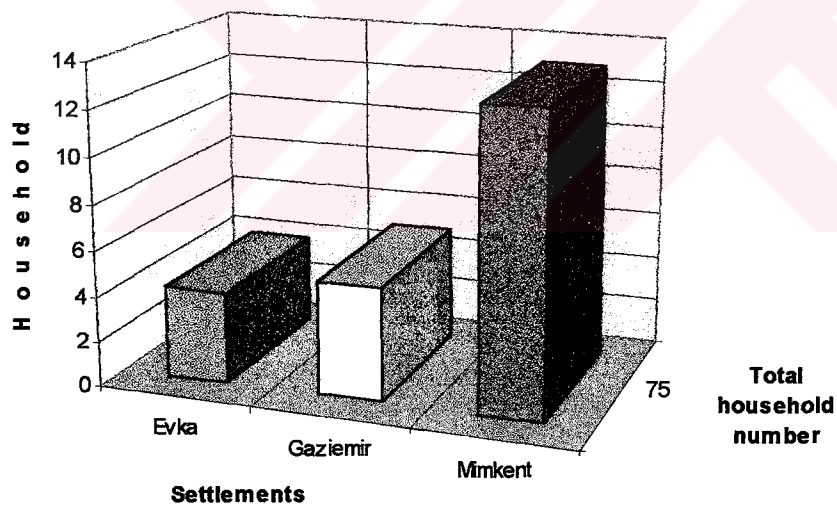


Figure 2.8 The number of the households who found the number of rooms and sizes of their dwellings sufficient in the buying phase.

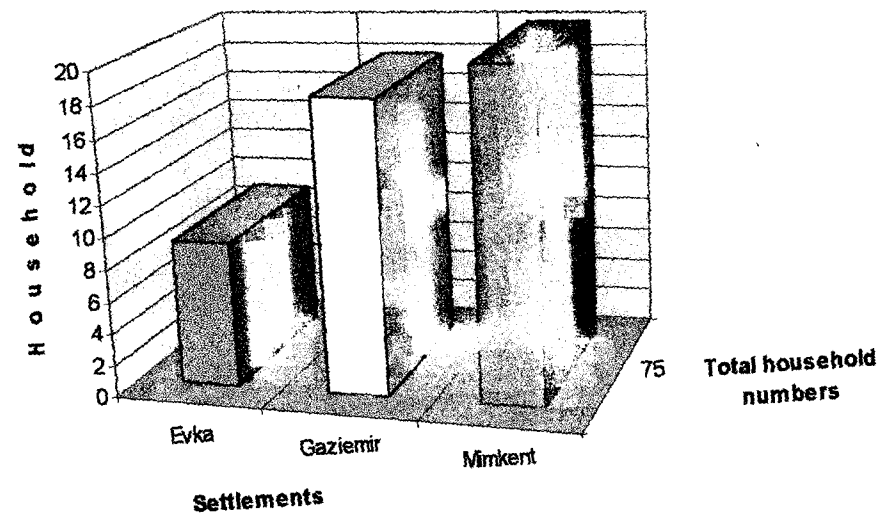


Figure 2.9 The number of the households who found the number of spaces in the housing sufficient in the phase of inhabitancy.

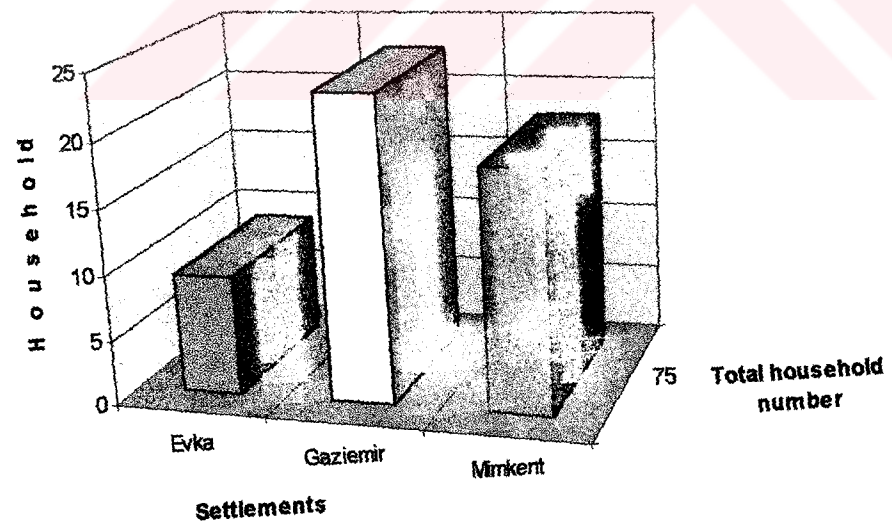


Figure 2.10 The number of the household who found the spatial dimensions of the housing sufficient in the phase of inhabitancy.

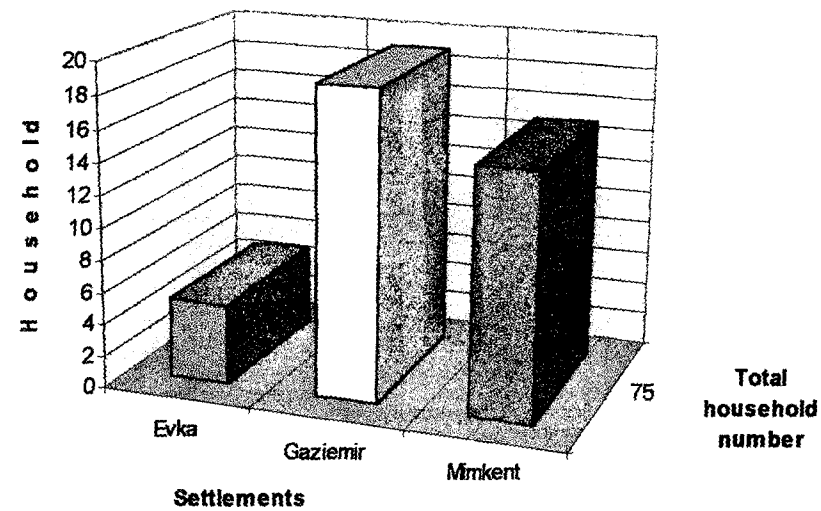


Figure 2.11 The number of the households who modify their dwellings in the phase of inhabitancy.

It is important that users should participate in the phases of design and construction in adaptable design-housing. The fact that users communicate with manufacturing firm and architects and are aware of the formation of their dwellings in the process of housing production is of great importance for their desired changes.

The survey related to those three housing examples asked the households if they communicated with manufacturing firm or associated institutions or not during the designing and construction phases. Members of interviews and meetings in which the households contacted with their producing firms or related institutions or architects regarding the information with their dwellings were determined.

Accordingly, 16% of the households in Evka-3 mass-dwellings told that they got in touch with their architect, producing firm and municipal officials, and 84% of them told that they did not. Interviews were performed at different times and in different numbers. 96% of the households in *Mimkent* dwellings did not communicate with the producing firm or architects, with only 4% stating that they did so seven times during the construction phase.

The households in *Gaziemir Emlak Bank* dwellings informed that they did not interviewed with contracting firm, architects or related institutions during the construction phase.

Again, it was questioned whether the households, participated in the phase of production of housing or not. In the consequence of the studies made, they stated that 92% did not participate in contribute to any procedures but 8% did so in Evka-3 mass-housing example. The ways that they participated in are as follows;

- . Selection of the type and materials of the kitchen counter.
- . Selection of wet floor materials such as floor and wall tiles in the kitchen, bathroom and WC.
- . Selection of the floor and wall covering materials in the living room and bedrooms.

Any of the households of *Mimkent* and *Gaziemir* dwellings did not participate in or contribute to the process of production. It was found that it was necessary to produce the dwellings for the purpose of flexibility and adaptability according to data of this study. Production of the dwellings adaptable to changing requirement of households will be able to solve quantitatively and qualitatively the housing problems of the developing countries such as Turkey. Participation of the users in production process of the dwellings will be able to favour the solutions suitable to the structures of the households.

In addition this study requires that the selection should be made of the production system and load-bearing system greatly compatible with adaptability solutions. Therefore the third chapter of the thesis clarified that it was essential to search for the most available construction and bearing systems in order to realize adaptable purpose multistorey dwellings. Based on this comparative analyses, one found that it is greatly likely to modify the internal spaces in the housing since the walls are not the bearing components unlike other examples and the bearing system of Evka-3 project is skeleton carcass.

CHAPTER THREE

ANALYSING ADAPTABLE DESIGN MULTI- STOREY HOUSING PRODUCTION BY USING PREFABRICATED BUILDING ELEMENTS

3. REHEARSAL FOR ANALYSIS

3.1. DETERMINATION OF ANALYSIS CONTENT

3.1.1. CHOICE OF CONSTRUCTION METHOD

One might seem that, using of varied construction methods from traditional systems to whole industrialized systems at dwelling production. In our country especially in recent years, industrialized construction systems are also begun to apply commonly for the building production in a short period and in a economic way because of the purpose of supplying the growth dwelling shortage.

“Question of weighing to the which construction method is became an important issue which is to be emphasise because of both its’ effects’ to the country’s economy and the fact of its’ reducing the expenditures of project-production by the appropriate election” (Türkçü, Ç., 1988, p.113). Determinations on measurements which elected to be proper for our country’s conditions, among construction methods and which also valid for the adaptable designed multi-storey building production are going to emphasizing in this volume.

These measurements are;

. Chosen system may adapt to the social requirements of the household (Türkçü, Ç., 1988). Paternal and conservative tendencies have shown by household structure in Turkey. Social common shares such as guess relations, overnight visiting are so common between households. Also Turkish household has strong loyalty to relationship among household members. For these reasons households have tendency to be an owner of large dwellings unless their efficiencies provide opportunities. This has been known that in Turkey, there are some other dwellings which consist of single parents, single adults-male or female- or parents have less children beside crowded households which rules by the structures of traditional patriarchal Turkish household.

. Chosen system has to get along into its own structure to the solutions which may adapt to different structures. Construction methods and load-bearing systems which may adapt to the different heightens have to research instead of systems which only appropriate for less or multi-storey buildings.

. Chosen system must be appropriate for the Turkey's own investment capacity and its' technological abilities.

Firms amount have been increased by the fewness of the capital which required to make investment for the system. Also the firms which have small capital are going to provide competition and assortment in the market while they are doing production with the labor and machine power insensitivity balanced systems instead of the major firms applying of capital intensive technologies (Türkçü, Ç., 1988, p.114).

. Chosen construction system has been easily understandable and applicable.

. Transportation type of the chosen construction system has been noticed.

. Chosen construction system has to be adaptable for the different climatologic conditions.

. Sensitive details shouldn't be necessary at attachment points of the system which chosen for Turkey, and they should be earth-quake resistant.

A construction systems' adaptability to the different desires when it's still at planing phase, may increase it's production amounts and also are going to save the industrialized building than being monotony, mentioned variability and flexibility are differing to provide using varied plans with adding or taking the specific elements in dwelling and also are going to bring assortment in plans and using materials. Choosing a system in a variability significance has reduced the number of elements while increase the amount of mass production. (Türkçü, Ç., 1988, p.115).

A beginning for a rapid mobilisation at dwelling production has become a necessary requirements because of increased expanding in dwelling shortage of our country. Dwelling requirements in Turkey, are trying to supply with the conventional construction techniques which apply since very beginning in a large and affected concept but enough speediness can not catch to handle with it. This process has been affected by advanced conventional methods of construction which applied through recent years in a positive way, although, lack of an industrial organization in dwelling business has seem as most significant obstacle that in front of the reaching enough speediness in production.

Concept of traditional construction methods have to be clarify for understanding of advanced traditional construction methods very well. First of all, production case states a process. Production process may state as line which the building elements are following, while they are establishing the building. However, the sameness of construction techniques and procession which continue for long time, have meant by the word traditional. For these reasons, traditional construction is the building production which establish according to above mentioned definitions (Şen, N., 1976). Under these circumstances, the methods which lean on special mould or construction techniques on building site, using small and mid ranged prefabricated elements and components also design and construction works are rationalized for reducing the cost and increasing the buildings' speed have been understand by the concept of advanced traditional construction methods.

As a result, weighing on industrialized construction techniques which are using industrialized production techniques, from the phases of realization of products to marketing of them through dwelling construction and instruction process design have seen that way to out especially when we concerned about the country's conditions (Sey, Y., & Tapan, M., 1987).

“For today, industrialized systems have not been preferred only for; materials, laboring or total cost but also for production speed which makes profitable to the building investment in a brief period and prevent the causalities which create by high inflation in our country” (Türkçü, Ç., 1988, pp.113-119).

3.1.2. EFFECTS OF THE INDUSTRIALIZED CONSTRUCTION METHODS, APPLY IN TURKEY TO THE DWELLING-SPACE STANDARDS

Aim of this comparative analyse is choosing the most appropriate prefabricated system in the production of adaptable designed multi-storey dwelling. Prefabrication has going to be a sub-division of industrialized construction system because of it's meaning the different system among them in a short it's significance of producing before and than mounting in building site' (Türkçü, Ç., 1979). For this reason, following chapters of this study have been affected by the choosing type of prefabrication.

Before, determining through the prefabrication type its going to be much more appropriate that emphasizing the effects of industrialized construction systems apply, to the space standardization, in Turkey. “Mass of a building, has been continue to its existence by the wholeness of place and structural system, and you may not differ to one from other” (Şen, N., 1993, p.1). With this approach, structural system may define as an organized system which has been established by the elements of which carry and transfer affecting exterior and interior physical loadings, for keeping limitless and statically to all quantitative and, qualitative functions of building on its all three dimensions and providing its stability while they send these loadings to the ground. Generally, a structural system is expected to (Monograph, 1981);

- . Carry dynamic and static vertical loads
- . Carry horizontal loads due to wind and earthquake effects
- . Resist stresses caused by temperature and shrinkage effects.
- . Resist external or internal blast and impact loads.

In addition, a structural system is usually subject to the following constraints (Monograph, 1981);

- . It should conform with the architectural requirements and those of the user or owner, or both.
- . It should provide the solution to the service systems, such as heating, ventilating, and air-conditioning, horizontal and vertical transport, and other electrical and mechanical systems.
- . It should facilitate simple and fast erection of the building.
- . It should be resistant to fire.
- . It should be able to enable the building, the foundation, and the ground to interact properly.
- . It should be economical.

Beside all these things, necessity of moving through some specific principles has been came into the agenda by designing of a building with industrialized construction systems. Other way to say, we have to accommodate ourselves in order to limitations on phases of production, transportation, and mounting etc. based on the specification of construction system which has been still on using. These rules have been effective through not only the application of structural system based on industrialized systems but at the same time determination of housing space standardization based on the systems. Effects of industrialized construction systems on to the housing space standardization have begun with the selecting of construction system.

Decisions taken on this phase consisting the system principles which related with each other on varied levels from general settlement level to element level and affect to the housing space standardization.

Significance of this system have been affected on dwelling standardization especially on the levels of where they are relating with each other, and as whole. These levels (Bulut, A., 1987);

- . Level of building wholeness
- . Level of floor Plan
- . Level of housing unit level
- . Level of Space unit
- . Level of component

Industrialized construction system' significance which shows up on any of these level, are related closely with the significance which are on other levels. And they carry a wholeness. For this reason, one has been suitable that evaluating of floor plans unit level with dwelling unit level as one level in this study.

On the Level of Building Wholeness: Firms, which produce commonly applied prefabricated elements at dwelling production in Turkey, are shown in Table 3.1.

When we look at this firms production for storey amount, these have been that; small prefabricated panels are using on single or double-storey dwellings, large panel and cell construction systems and also prefabricated reinforced concrete skeleton systems are using on 5-15 storey building and even if last, advanced traditional construction-tunnel formwork- are using on 6-18 storey buildings, rationally.

On the Level of Floor Plan and Housing Unit: Some differences have seen for planning module, maximum span, and maximum storey heights among structural system significance. As they shown by table 3.1, differences have seen on planning modules according to industrialized construction systems. When some of advanced traditional construction systems have planning module, however, designing necessity, based on using mould dimensions has appeared on some of them like 1400x4000, 1600x4000, 1800x4000, 2000x4000, 2200x4000, 2400x4000, 2600x4000, 2800x4000, 3000x4000, 3200x4000, 3400x4000, 3600x4000, 3800x4000, 4000x4000, 4200x4000, 4400x4000, 4600x4000, 4800x4000, 5000x4000, 5200x4000, 5400x4000, 5600x4000, 5800x4000, 6000x4000, 6200x4000, 6400x4000, 6600x4000, 6800x4000, 7000x4000, 7200x4000, 7400x4000, 7600x4000, 7800x4000, 8000x4000, 8200x4000, 8400x4000, 8600x4000, 8800x4000, 9000x4000, 9200x4000, 9400x4000, 9600x4000, 9800x4000, 10000x4000, 10200x4000, 10400x4000, 10600x4000, 10800x4000, 11000x4000, 11200x4000, 11400x4000, 11600x4000, 11800x4000, 12000x4000, 12200x4000, 12400x4000, 12600x4000, 12800x4000, 13000x4000, 13200x4000, 13400x4000, 13600x4000, 13800x4000, 14000x4000, 14200x4000, 14400x4000, 14600x4000, 14800x4000, 15000x4000, 15200x4000, 15400x4000, 15600x4000, 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175800x4000, 176000x4000, 176200x4000, 176400x4000, 176600x4000, 176800x4000, 177000x4000, 177200x4000, 177400x4000, 177600x4000, 177800x4000, 178000x4000, 178200x4000, 178400x4000, 178600x4000, 178800x4000, 179000x4000, 179200x4000, 179400x4000, 179600x4000, 179800x4000, 180000x4000, 180200x4000, 180400x4000, 180600x4000, 180800x4000, 181000x4000, 181200x4000, 181400x4000, 181600x4000, 181800x4000, 182000x4000, 182200x4000, 182400x4000, 182600x4000, 182800x4000, 183000x4000, 183200x4000, 183400x4000, 183600x4000, 183800x4000, 184000x4000, 184200x4000, 184400x4000, 184600x4000, 184800x4000, 185000x4000, 185200x4000, 185400x4000, 185600x4000, 185800x4000, 186000x4000, 186200x4000, 186400x4000, 186600x4000, 186800x4000, 187000x4000, 187200x4000, 187400x4000, 187600x4000, 187800x4000, 188000x4000, 188200x4000, 188400x4000, 188600x4000, 188800x4000, 189000x4000, 189200x4000, 189400x4000, 189600x4000, 189800x4000, 190000x4000, 190200x4000, 190400x40

Table 3.1 Effects of industrialised systems, which applied on dwelling production of Turkey, to the dwelling-space standardisation

Firms Identity	Level of Dwelling Unit				Level of Space			Level of Component								
	Level of Wholeness	Building	Max. floor amount	Max. spacings (m)	Max. height (m)	Planning module (m)	Affective component	Space geometry	Optimum Space Dimensions	Components materials	Components dimensions	Bearing Elements	Partition Wall	Bearing Elements	Partition Wall	Component weightiness
Betas	Advanced Traditional	6	6.00	2.70	0.60	Column	-	-	11.00-12.00	Precast concrete	10	-	-	1100	-	-
Betonсан	Prefab. big sized Panel	10	6.24	3.00	0.06	Panel	Rectangle	3.0x4.4 3.5x4.4	Precast concrete heat insulated	6.24x 2.70- 3.00x 2.84x 24	6.24x 2.54- 2.84x 12-15	-	-	-	-	-
D. Dönel	Prefab. Skeleton	6	6.50	-	-	Column	Rectangle, Square	2.75x4.1 2.75x3.3 3.5x3.5	Plaster Ytong, plaster	Column 30x35 Beam 25x40	According to project	4000 3000	1400 1800	-	-	-
Eska	Advanced Traditional	18	-	-	-	Wall	-	-	-	Precast concrete herapor, Plaster	min. 12	-	-	-	-	-
Eston	Prefab. Skeleton	5	10.00	3.20	0.60 and 1.20	Column-beam	Rectangle	3.75x4.4	Reinforced concrete	20	-	6000	-	-	-	-
Mesa	Advanced Traditional	15	6.50 (standard 2.10x 5.70)	3.00	In respect of Crane capacity 12.50 62.5,1.2 5,2.50 in other way 1.05- 0.30increasingly 2.85	size of formwork	Rectangle	-	Reinforced concrete	20	-	-	-	-	-	-

Table 3.1 Effects of industrialised systems, which applied on dwelling production of Turkey, to the dwelling-space standardisation

Firms Identity	Level of Building Wholeness					Level of Dwelling Unit					Level of Space					Level of Component				
	Syst. Type	Max. floor amount	Max. spacings (m)	Max. height (m)	Planning module (m)	Affective components	Space geometry	Optimum Space Dimensions	Components materials	Components dimensions	Bearing Elements	Partition Wall	Bearing Elements	Partition Wall	Component weightiness					
Oyak-Kutulus	Prefab. big sized panel	Variety	5.40	2.80	0.60	Panel	Rectangle	3.0x4.0 3.6x4.2	Reinforced concrete heat insulated, Wack-concrete	28	-	-	7000	-						
Tepe	Prefab. small sized panel	2	10.00	2.80	1.20	Panel	Rectangle	2.4x3.0 2.4x3.6 2.4x4.2 3.0x3.6	Reinforced concrete heat insulated Betopan	6,5-9	-	400	-							
Veziroğlu	Prefab. Skeleton	3	4.00	2.70	-	Column	Rectangle square	4.00x4.00	Reinforced concrete	12	-	2500	-							
Yapı Merkezi	Prefab Skeleton	5	12.00	2.57	1.20 (For wall and floor panels)	Column	Rectangle	3.6x3.6 3.6x3.8	Reinforced concrete	15	-	5000	-							
Ytong	Prefab. big sized panel	2	6.00	3.25	-	Panel	Rectangle	-	Ytong, Plaster	15, 20, 25, 30	-	2100	-							
Ytong	Prefab. small sized panel	3	6.00	3.00	0.60	Panel	Rectangle square	4.00x4.00 4.00x5.00 6.00x6.00	Ytong, heat insulation plate + exterior facade finishing	3.00, 4.00, 5.00x 7.5-30	3.00, 4.00, 5.00x 30	90	90							
Yıldırım	Prefab. reinforced concrete open cell	5	9.60	3.10	-	Cell	Rectangle	2.8x4.2 3.5x4.2	Reinforced concrete sandwich	-	-	30000	-							

Prefabricated reinforced concrete skeleton systems have no any specific planning module. Structural system spacing has been foregrounding by these system and differences has been came out from project to project.

Even if, in prefabricated small-sized panel systems planning module is approximately 1.20m in general. Planning modules have shown variability based on production type and mould dimensions which are using on production of components, in prefabricated big sized panel systems. However there is an additional planning module in prefabricated cell systems because of cell dimensions affect to the design.

When we compare with designing module plus maximum span of structural systems, which belongs to the industrialized systems, affect to the dwelling unit space standardization, one has been seem that maximum span *-YAPI MERKEZİ*, 12.00m- of prefabricated reinforced concrete skeleton systems are much more than other systems.

When we look through the floor height it has seen that the systems which produce same some prefabricated small panel has much more storey-height *-YTONG* small panel; 6.00m.

Dwelling-space standardization have been affected by the significance of partitive and load-bearing components of industrialized construction systems through the plan level. This effect has been done in two ways. First of them may define through the plans of dwelling units and second one also may determined with related the changing which they wish to realize on planning when the using phase of dwelling came up. For example on prefabricated reinforced concrete skeleton systems, there is a construction system which consist of column, beam and floors and there is a partition system which consist of non load-bearing walls. For this reason, flexible usage may have provided by modifications of the places of partition walls during the using phase of dwelling.

Although, on big sized prefabricated reinforced concrete panel systems even if most of the panels have both the significance's of being partitive and load-bearing panel

dimensions and their specializations are came into foreground with these systems at the level of design. Any modifications on the panels of these buildings which establish the spaces, wouldn't been done, because of the harmony of both structural and partitive systems.

Either, on small sized panel systems, specifications of the panel are still affecting the design. On the usage phase of buildings which made by the systems, itself that places of interior wall panels may change, means flexible using of building may have been realized at least with the condition of leaving the exterior wall panels and the roof of the building as they fixed.

On the Level of Space Unit: Some structural system specifications are providing only the designing of right angled spaces. As they seen on table 3.1, all the industrialized construction systems have same specifications in general. On the other hand at some advanced traditional systems with the prefabricated small sized panel systems, multi angular planned spaces may design too.

These systems' providing the spaces establish in a different geometric shape at the designing of the dwelling spaces may account as an advantage in respect of others. Differences have seen by the geometrical forms of different industrialized construction systems within these spaces' approximate dimensions. There is a close relation between increasing in industrialisation level of dwellings -rate of completeness- and changing in their spatial dimensions. Dimensions of the component which are also effective on changing of space dimensions, has determined by 'cm' at traditional system elements such as cement blocks, bricks, etc.

An industrialized construction system has been changing as it depends on its dimension, for example, between 60cm and 120cm. Planning module has been effective on changing of space dimensions at prefabricated big sized panel systems for example, *OYAK-KUTLUTAŞ*; 60cm. Either, in a tunnel formwork system- *MESA*- which is a

advanced traditional system, dimensions of using moulds have being reason for increasing of space dimensions, varied, both in two directions.

On the Level of Components: An industrialized construction system beside production style of components which establish structural systems, or finishing process or convenient specifications such as transportation, mounting and storing at construction site etc, also physical specifications of components have played role too, on changing of space signification.

Industrialisation level of industrialized constructions systems reflects on to the specifications of system element too. Some of systems' elements are producing in factory as wholly finished and only the mounting processes have been done in construction site - fully industrialized systems- for example prefabricated reinforced concrete big sized panel systems.

Interior spaces' dimensions spaces which determined during design phase have been stayed stable at mounting process too because of the insulated materials' taking place in the solidity of these components. Hence, on tunnel formwork system which is a advanced traditional system, production has realized with the moulds at its own place.

After the production of reinforced concrete curtain walls' heating insulation of some walls which come on to the exterior facade, has done from the inside of the space. For this reason, space dimensions which determined as they depends on mould dimensions, have decreased as much as the thickness of heating insulation material.

At the same time; standardization related with the physical environmental conditions in spaces, also affected by the materials of using system elements. Especially the materials of exterior facade elements have played role for providing the desired level of comfortableness at interior places.

Additional procedures have to be done at building side for some systems because of facade elements consisting of reinforced concrete and their lack of insulation material. Even if, this may prevent the production speediness which is expected from the industrialized construction systems and may be a reason for increasing of the cost.

Also, at some systems, it has been difficult that to obtain complete success on heating insulation procedures, and cold bridges might happen. Interior spaces' comfort conditions have been affected by these limpness which is seen at the component level. If, industrialized construction systems evaluate through this perspective, one has been seen that, the systems which consist of elements have desired comfort level insulation material and mounted of construction site when they wholly finished are much more advantaged.

Even if, differences are up to the systems which have seen at the weightiness of elements. There is an interrelation between mounting procedures and the element weightiness. Using of less capacity cranes during the mounting process of light-weighted element system are affecting the investment cost and this going to be the gained advantage for the systems.

However, mounting procedures of systems which consist of much bigger parted and heavy elements are easy because of they also have less attachment points. For this reason it should be consider that supplied possibilities and specifications of the system when determinate the which system has more advantages.

Whole buildings weight has affected by elements weights too. Earthquake weights which are coming through the building are increased by the increasing of building weight too. For this reason, weight of total building have to account for different systems and they have evaluate in respect of earth-quake factor.

Weight of the elements are playing role in both flexibility and variability of plan too

prefabricated skeleton systems and in prefabricated small sized panel systems which have plan flexibility and variability too, are providing an advantage to these systems.

Through out the illumination of these information, fully industrialized ones of industrialized construction systems are going to handle in this analyse. At partially industrialized construction systems for example on tunnel formwork system, either it has a planning flexibility from inside for necessity of planning in order to system when we consider the further changes on dwelling one has been seen that this technology is limiting the flexible organizations at planning.

Again, possibilities of establishing flexible organising are mentionable for interior spaces while using both lift-slab and Jack-block methods which belongs to the lifting methods of partially industrialized construction techniques.

But, they are going keep out of the contents of this study for now because of the such reasons like their requirements to expensive instruments and expert firms or their technological difficulties and their difficulties to apply them on high buildings and also their lack of common production system in Turkey.

Some of the examples which criticized in this study, are not also producing in Turkey too, such as prefabricated reinforced concrete cell system. ⁽¹⁾

⁽¹⁾ But, open cell system of 'Yübetaş co.' has taken place on Turkey's structural system catalogue established at 1987. Again, the skeleton system-consist of column, beam and floor- which taken to criticize in this study is belonging to the 'Veziroğlu' Company too. But this system is also out of production at present. The reason for choosing to this system is that providing some easiness of their example type project which produced by 'Veziroğlu Co.', when criticize the case. Specification which gives to system a square form of the skeleton system produced by this Co. is 4.00x4.00m axes system. This situation is providing the establishment of spaces by the same components also decreasing the detail varieties of spaces. Also this system is carrying the same specifications for each spaces on dwellings.

3.1.3. PREFABRICATED SYSTEMS WHICH ARE GOING TO BE INQUIRE, IN ANALYSE

Example 1:

Prefabricated reinforced concrete skeleton system (column-beam-floor) (Appendix 2)
(Table 3.2)

Table 3.2 Characteristics of the skeleton system (Sey, Y., Tapan, M., 1987, p. 357).

The types of Components	Column	Beam	Floor	External Partition Wall	Internal Partition Wall
Components and Production characteristics					
Dimensions of Components	axb=30x30 35x35, 35x50cm h=330, 990cm	axb=30x40, 30x50cm L=350, 375, 400cm	a=12, 16cm b=100cm L _{max} =600cm	a=12cm h _{max} =270cm L _{max} =600cm	a=8, 12cm h ^{max} =270cm L ^{max} =600cm
Max. Weights of Components	2000kg	1500kg	1500kg	2500kg	2500kg
Tolerances Belonging to Components	In all dimensions +20mm	In all dimensions +20mm	In all dimensions +20mm		

Example 2:

Prefabricated reinforced concrete big sized panel system (panel-panel) (Appendix 3)
(Table 3.3)

Table 3.3 Panel system (Sey, Y., Tapan, M., 1987, p. 357).

The types of Components	Floor	External Load-bearing Wall	Internal Load-bearing Wall	External Partition Wall	Internal Partition Wall
Components and Production characteristics					
Dimensions of Components	a=16cm b=270cm L=540cm	a=28cm h=277.5cm L=478cm	a=16cm h=268.5cm L=702cm	a=20cm h=277.5 L=598cm	a=8cm h=250cm L=702cm

Example 3:

Prefabricated open cell system (Appendix 3) (Table 3.4)

Table 3.4 Open cell system (Sey, Y., Tapan, M., 1987, pp. 357-361).

The types of Components	Open Cell
Components and Production characteristics	
Dimensions of Components	a x b =280x840,280x960cm h= 3.10 ⁵
Max. Weights of Components	21.000,30.000kg
Tolerances Belonging to Components	In all dimensions +5 - +10mm

3.2. DETERMINATION OF ANALYSIS CRITERIA

Necessity of the determinate to technical approaches as analyse criteria for creating adaptability which defined in second part of study has been appeared when choosing of most appropriate prefabricated system which may use at the production of adaptable designed dwelling, comes out to be in question.

These analyse criteria have modifications which may happen during the phase of designing, construction, inhabitancy and renewing. Adaptability mean is serving different possibilities at wholeness of building during the design phase.

On the other way to say, is providing dwelling types in different forms and sizes for adapting it to varied household types. We were separated this issue for inhabitancy phase as inhabitancy phase I -changing of household requirements- and inhabitancy phase II changing of household, means coming of new users, at the second part of study.

We may add to these changes that, adapting efficiency of dwelling and the last for renewing phase, taking efficiency if new equipment components to the systems own structure.

Some technical approaches have to be done together for making these modifications available or other way to say for the aim of providing adaptability at dwellings.

These technical approaches are;

1) Modification on flat size

- . Changing of rooms among flats
- . Supplying possibility for free plan organising.
- . Different wet space location solutions .

2) Multi-functional room

- . Rooms have similar dimensions.
- . Diversification on room locations.

3) Changing on room dimension and amount

- . Partitionment or attachment of rooms by using flexible-moveable walls.
- . Changing possibility to the details of attachment and materials of the components.

4) Modification in room relation

- . Changing of flexible wall locations.
- . Changing on the partition wall spacings.

5) Enlargement capacity of multi-storey dwelling; gradual construction possibilities

- . Ability of adding blocks
- . Adding to such components like balcony, exterior staircases etc.
- . Changing the exterior wall components
- . Systems' ability of taking new supplementary components into the its' own structure.

3.3. ANALYSIS OF PREFABRICATED SYSTEMS ACCORDING TO ADAPTABILITY CONCEPT (Table 3.5, Table 3.6, Table 3.7)

Table 3.5 The analysis of the prefabricated reinforced concrete skeleton system according to the adaptability concept.

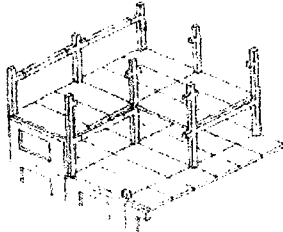
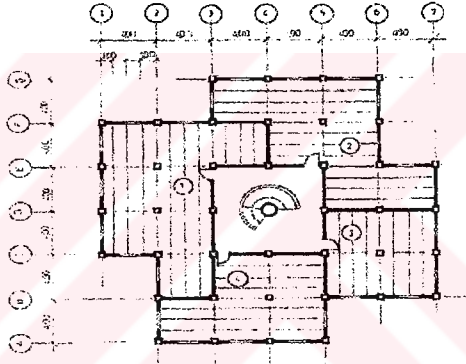
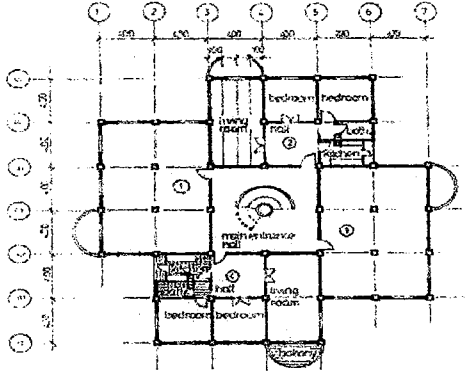
Table 3.5-1	THE ANALYSIS OF THE PREFABRICATED SYSTEM ACCORDING TO THE ADAPTABILITY CONCEPT	
STRUCTURAL SYSTEM ANALYSING CRITERIA	PREFABRICATED CONCRETE SKELETON SYSTEM REINFORCED SYSTEM (Column-Beam-floor) (Veziroğlu Cons. Co.)	
1 Modification on Flat Size	 <p data-bbox="483 1279 1321 1503">Modular system established by 4.00mx4.00m column axes -system axes- at the plan example which is obtained as it is choosing of 4.00m beam length. Original plan seen on 3 numbered flat as it shown at figure. 1 numbered flat may spread through 2 and 4 numbered flats. In a sum, room changing is possible among flats.</p>  <p data-bbox="523 1928 839 1957">The schema of Original plan</p>	
Changing of rooms among flats		

Table 3.5-2 THE ANALYSIS OF THE PREFABRICATED SYSTEM ACCORDING TO THE ADAPTABILITY CONCEPT

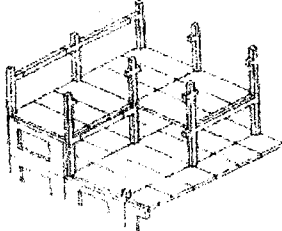
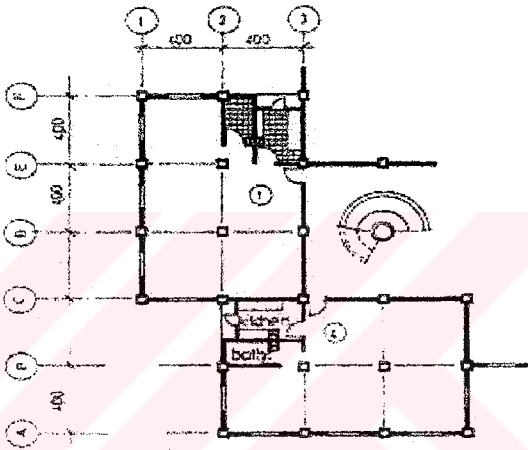
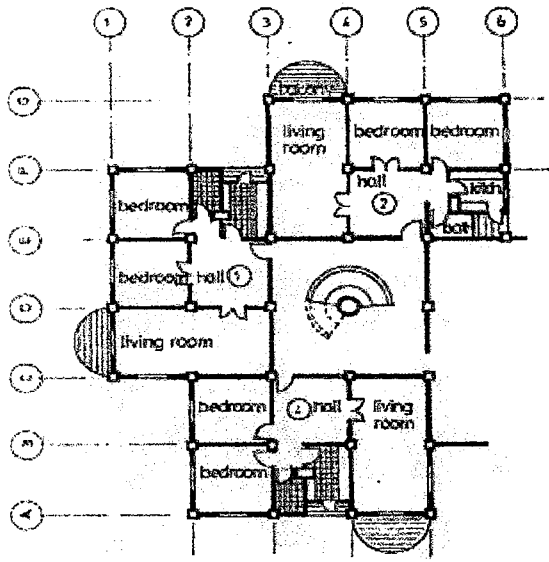
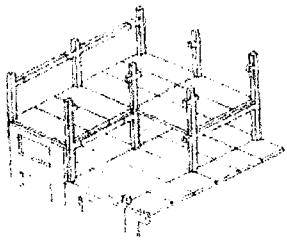
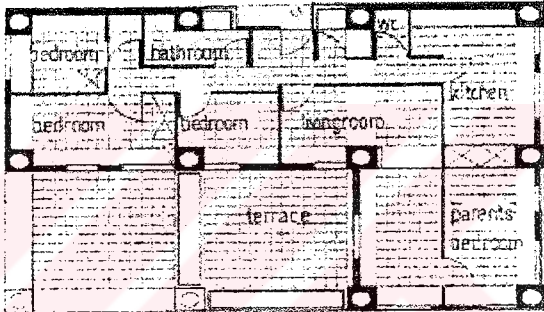
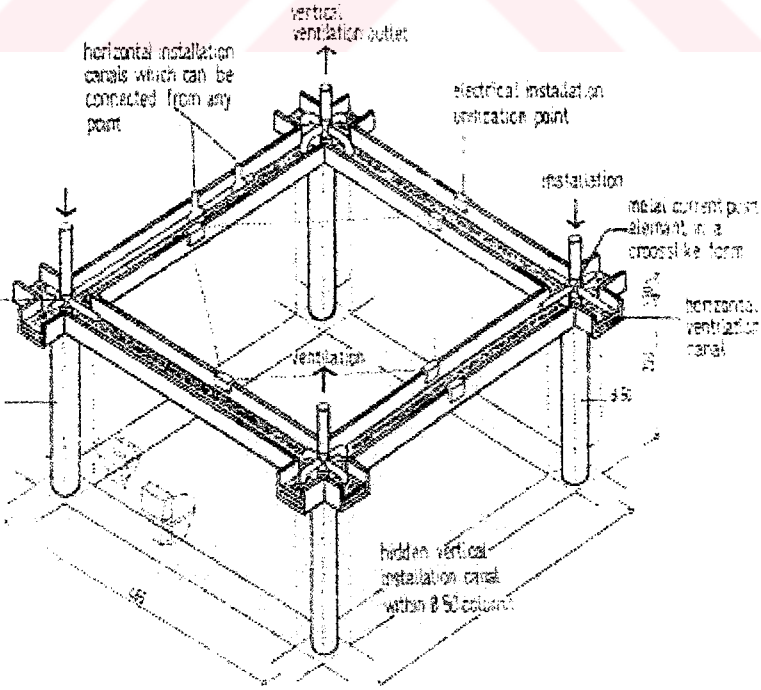
<p>STRUCTURAL SYSTEM</p> <p>ANALYSING CRITERIA</p>	<p>PREFABRICATED REINFORCED CONCRETE SKELETON SYSTEM (Column-Beam-floor) (Veziroğlu Cons. Co.)</p>	
<p>1 Modification on Flat Size</p> <p>Supplying possibility for free plan organizing</p>	<p>Other places may separated by flexible-movable walls on desiring organizations after the result of collecting in an area or planning like an area of the wet spaces.</p> 	
<p>Different wet space location solutions</p>	<p>There might be different wet space locations at example plan scheme of chosen system. But, it is possible to realize that changing the wet space locations after with taking of some cautions.</p> 	

Table 3.5- 3 THE ANALYSIS OF THE PREFABRICATED SYSTEM ACCORDING TO THE ADAPTABILITY CONCEPT

<p>STRUCTURAL SYSTEM</p> <p>ANALYSING CRITERIA</p>	<p>PREFABRICATED REINFORCED CONCRETE SKELETON SYSTEM (Column-Beam-floor) (Veziroğlu Cons. Co.)</p>	
<p>1 Modification on flat sizes</p>	<p>It is possible to establishing wet spaces at every desired point with using column and beam elements which provide the installations' distribution in both vertical and horizontal way.</p>	
<p>Different wet space location solutions</p>	<p>We may show 'Maralles Project' as an example to this system.</p>  	

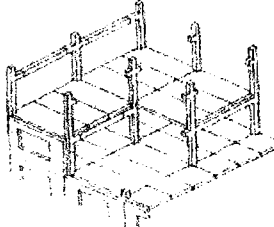
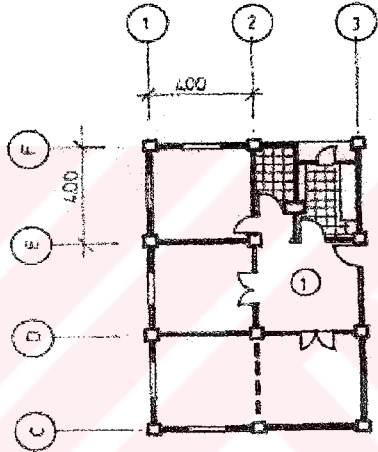
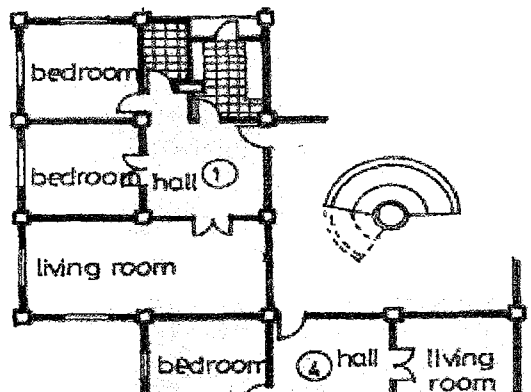
<p>Table 3.5-4</p>	<p>THE ANALYSIS OF THE PREFABRICATED SYSTEM ACCORDING TO THE ADAPTABILITY CONCEPT</p>	
<p>STRUCTURAL SYSTEM ANALYSING CRITERIA</p>	<p>PREFABRICATED REINFORCED CONCRETE SKELETON SYSTEM (Column-Beam-floor) (Veziroğlu Cons. Co.)</p>	
<p>2 Multi-Functional Room</p>	<p>At this chosen system room dimensions determined as 4.00mx4.00m. Living place has 8.00mx4.00m dimension after the connection of two rooms. Functions may change with the sameness of room dimensions in using process.</p>	
<p>Rooms have similar dimensions</p>		
<p>Diversification at room locations</p>	<p>In this system it is possible to establish rooms which face toward different ways. Also, the difference may appear for designing process after changing the functions of rooms.</p> 	

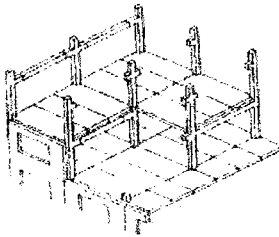

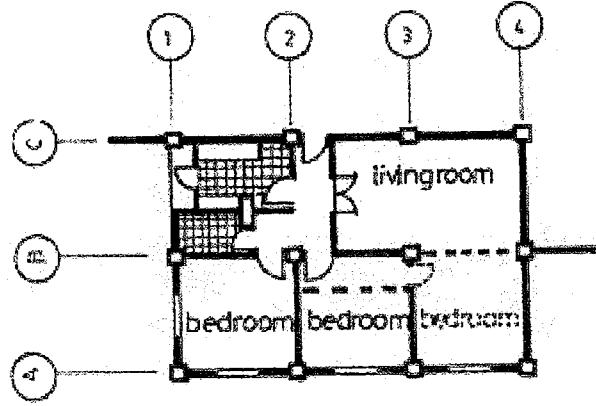
Table 3.5-5		THE ANALYSIS OF THE PREFABRICATED SYSTEM ACCORDING TO THE ADAPTABILITY CONCEPT	
STRUCTURAL SYSTEM	PREFABRICATED CONCRETE	REINFORCED SKELETON SYSTEM	
ANALYSING CRITERIA	(Column-Beam-floor) (Veziroğlu Cons. Co.)		
3 Changing on Room Dimensions and Amount	<p>Wall elements may consist of partitive components because of load-bearing system components are column-beam-floor elements. For this, it is possible to using that partitive components which have various quantities as wall element. And partitionment or attachment of rooms might be possible by assisting of these elements.</p>		
Partitionment or attachment of rooms by using flexible-moveable walls			
Changing possibility to the details of attachment and materials of the components	<p>Partitive components have possibility for changing details of attachment and materials while they depends on modular axes system of structural system.</p>		
4 Modification in Room Relation	<p>Living space may expand by taking movable walls off or one small and two larger rooms may posses by adding movable partition walls.</p>		
Changing of flexible wall locations			

Table 3.5-6 THE ANALYSIS OF THE PREFABRICATED SYSTEM ACCORDING TO THE ADAPTABILITY CONCEPT

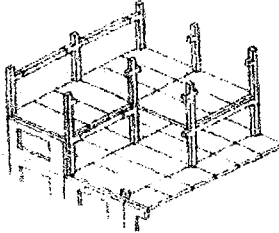
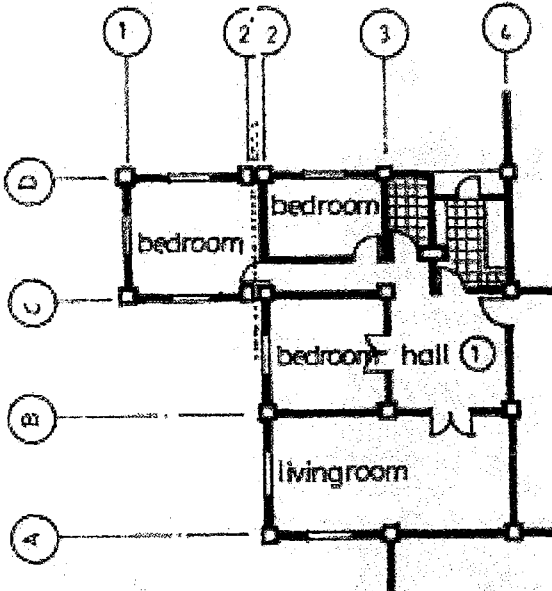
<p>STRUCTURAL SYSTEM</p> <p>ANALYSING CRITERIA</p>	<p>PREFABRICATED REINFORCED CONCRETE SKELETON SYSTEM (Column-Beam-floor) (Veziroğlu Cons. Co.)</p>	
<p>4 Modification in Room Relation</p> <p>Changing on the partition wall spacings.</p>	<p>In this chosen system, partitive interior wall which has spacing in it is not concluding of component production. For this, it is not known that their effects to the changing of room relations and the changing of spacing directions.</p>	
<p>5 Enlargement capacity of multi-storey dwelling; Gradual Construction Possibilities</p>	<p>It is possible to produce that, in a specific regional rate to dwelling unit and re-produce it again as apartment block and than attaching the new place to the main building when using requirements are increased and when new place necessities appeared. For this reason, it is possible to do that further blocks' foundation while main buildings' foundations has been made before.</p>	
<p>Ability of adding blocks</p>	<p>But this is going to be the reason for increase of investment cost. Because of this, it must go through the other solutions that, which required to go dilatation solutions between main building and block-if newly added blocks' foundations has made later-. Either, in both situation, changing of the place of exterior partition wall can be done in this chosen system.</p> 	

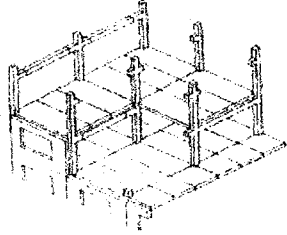
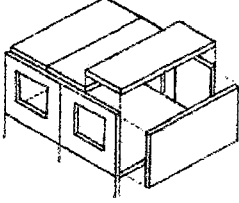
Table 3.5-7	THE ANALYSIS OF THE PREFABRICATED SYSTEM ACCORDING TO THE ADAPTABILITY CONCEPT	
STRUCTURAL SYSTEM ANALYSING CRITERIA	PREFABRICATED REINFORCED CONCRETE SKELETON SYSTEM (Column-Beam-floor) (Veziroğlu Cons. Co.)	
5 Enlargement capacity of multi-storey dwelling; Gradual Construction Possibilities		
Adding to such components like balcony, exterior staircases etc.	It hasn't being possible in this chosen system. Especially, the console work of floor components of such places like balcony etc. which can also be mounted the existing structure system later.	
Changing the exterior wall components	Changing may possible when exterior wall element of chosen system which also signifying as partition element, is in production.	
System's ability of taking new supplementary components	For example if it is going to pass through the different heating system, a place must be determined for this new system on the plan example.	

Table 3.6-2 THE ANALYSIS OF THE PREFABRICATED SYSTEM ACCORDING TO THE ADAPTABILITY CONCEPT

<p>STRUCTURAL SYSTEM</p> <p>ANALYSING CRITERIA</p>	<p>PREFABRICATED REINFORCED CONCRETE BIG-SIZED PANEL SYSTEM (Panel-Panel) (Oyak-Kutlutaş Cons. Co.)</p>	
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2 Multi-Functional Room

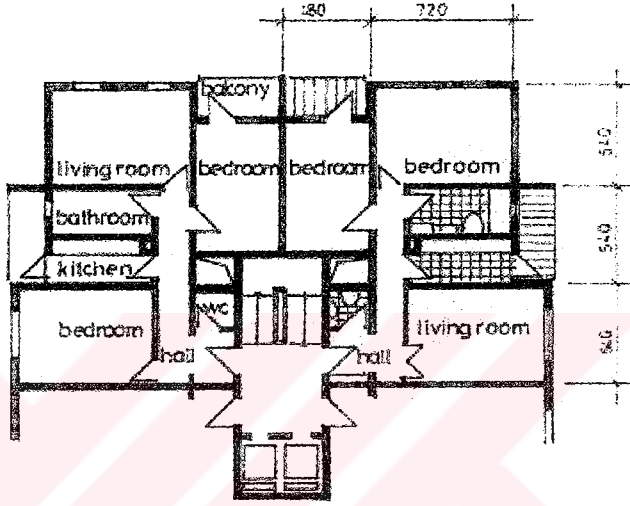
Rooms have similar dimensions

Diversification at room locations

3 Changing on Room Dimensions and Amount

Partitionment or attachment of rooms by using flexible-moveable walls

Designing the similar sized rooms may possible by this system.



Diversification on room locations can make at design process. By this, it might be possible to reverse that functions of a same sized living space and a bed room.

Partition of big volumed rooms may realize by flexible wall elements. Even if, their connecting is not possible at the situation of their limiting with the load-bearing walls. But in long wall panel system solutions, modifications on room numbers and sized may provide by using of flexible walls among spaces.

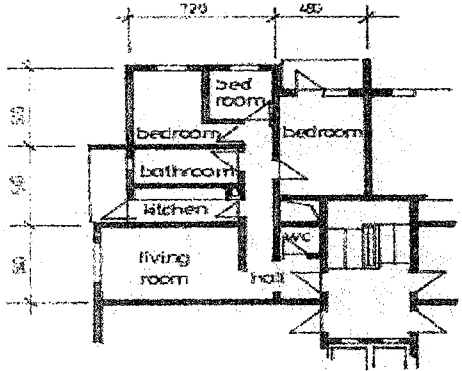


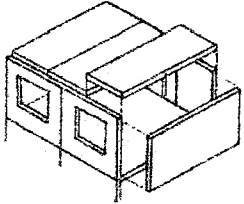
Table 3.6-3	THE ANALYSIS OF THE PREFABRICATED SYSTEM ACCORDING TO THE ADAPTABILITY CONCEPT	
STRUCTURAL SYSTEM ANALYSING CRITERIA	PREFABRICATED REINFORCED CONCRETE BIG-SIZED PANEL SYSTEM (Panel-Panel) (Oyak-Kutlutaş Cons. Co.)	
3 Changing on Room Dimensions and Amount Changing possibility to the details of attachment and materials of the components	<p>There are possibilities for changing to partition components' material for interior spaces and their attachment details. But there are less possibility for interior space walls which have also partition capacity too. As it is known that, big panel systems may classify as, long wall panel system, cross wall panel system and two way span systems. In the types of cross wall panel system (either if it is giving most flexible solutions for designing process) have to support by other long wall panel elements at floor plan level in respect of static process. For this reason using of partition element is not too much at long sized panel systems.</p>	
4 Modification in Room Relation Changing of flexible wall locations Changing on partition wall spacings	<p>Changing of locations and using of flexible walls have much more possibilities at long wall panel systems instead of cross wall panel systems .</p> <p>Either at least it can be possible that changing at locations of partition components. Any modifications on room relations are not applicable at cross wall panel systems. Because of it hasn't been so often that using of partitive components and also the changing possibility of these components locations' at these systems. In other words, partitive components have limited capacity of movability at floor plan level.</p> <p>Partitive wall panels, which are using in this system, have no spacing.</p>	

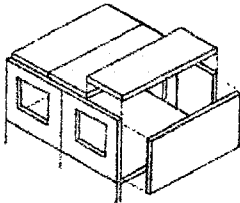
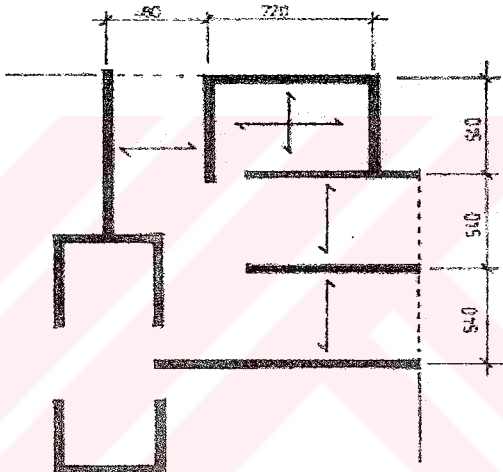
Table 3.6-4		THE ANALYSIS OF THE PREFABRICATED SYSTEM ACCORDING TO THE ADAPTABILITY CONCEPT	
STRUCTURAL SYSTEM	PREFABRICATED REINFORCED CONCRETE BIG-SIZED PANEL SYSTEM		
ANALYSING CRITERIA	(Panel-Panel) (Oyak-Kutlutaş Cons. Co.)		
5 Enlargement capacity of multi-storey dwelling; Gradual construction Possibilities	It might be add a separate block. In panel system, especially in cross wall panel systems it might be added that one more new block by taking non-load bearing exterior walls off. But, in skeleton system mentioned dilatation solutions have to search. By the way, it is difficult to provide that passing between spaces for designing at this system, when new block added.		
Ability of adding blocks			
Adding to such components like balcony, exterior staircases etc.	Non-applicable		
Changing the exterior wall components	Changing of partitive exterior wall components may possible		
Systems' ability of taking new supplementary components into the its' own structure	Non-applicable		

Table 3.7 The analysis of the prefabricated reinforced concrete cell system according to the adaptability concept.

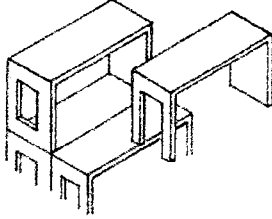
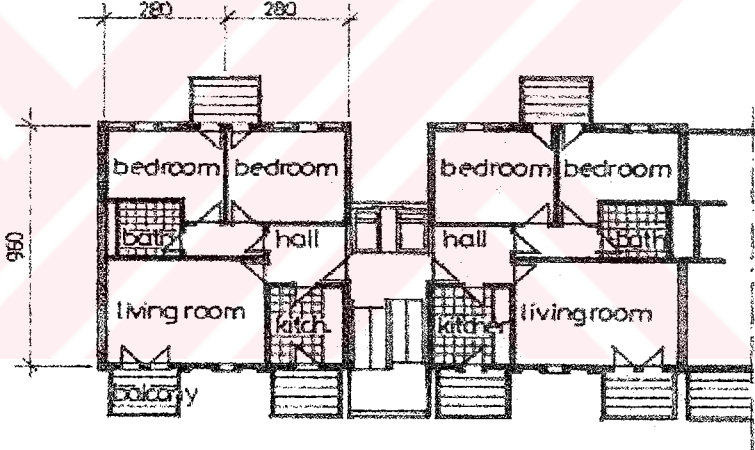
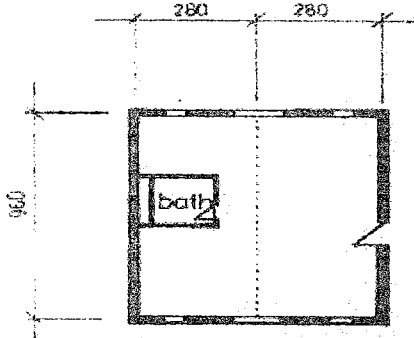
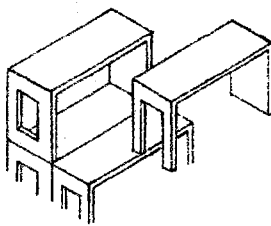
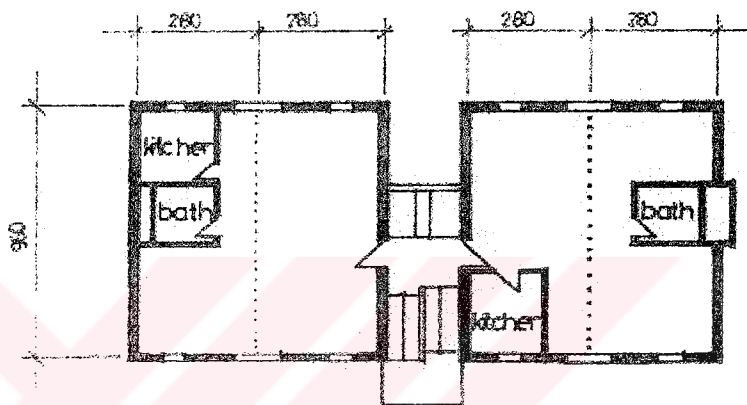
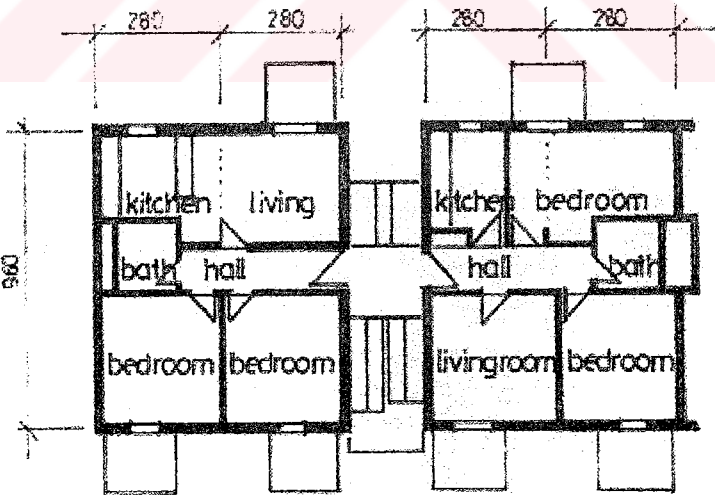
Table 3.7-1	THE ANALYSIS OF THE PREFABRICATED SYSTEM ACCORDING TO THE ADAPTABILITY CONCEPT	
<p>STRUCTURAL SYSTEM</p> <p>ANALYSING CRITERIA</p>	<p>PREFABRICATED REINFORCED CONCRETE CELL SYSTEM (Open Cell)</p> <p>(Yübetaş Cons. Co.)</p>	
<p>1 Modification on flat sizes</p> <p>Changing of rooms among flats</p> <p>Providing possibilities to the free plan organising</p>	<p>The cell has 9.60mx 2.80m production size and it has possibility for combining with other cell unit through the long wall. A 9.60m x5.60m sized and approximately 55 square meter unit have been established by combining of two half boxes. Box has been closed as like as on example type project.</p>  <p>Room changing is not possible because of exterior walls establish the main components of load-bearing systems. Wet places locations in cell, determined through out the production process. The area, surrounded to this place, also has possibility of free organising.</p> 	

Table 3.7-2		THE ANALYSIS OF THE PREFABRICATED SYSTEM ACCORDING TO THE ADAPTABILITY CONCEPT	
STRUCTURAL SYSTEM	PREFABRICATED REINFORCED CONCRETE CELL SYSTEM (Open Cell)		
ANALYSING CRITERIA	(Yübetaş Cons. Co.)		
1 Modification on flat sizes	Possible, even it is limited		
Different wet space location solutions			
2 Multi-Functional Room	Applicable		
Rooms have similar dimensions			
Diversification at room location	Applicable		

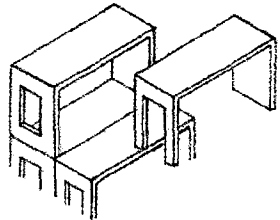
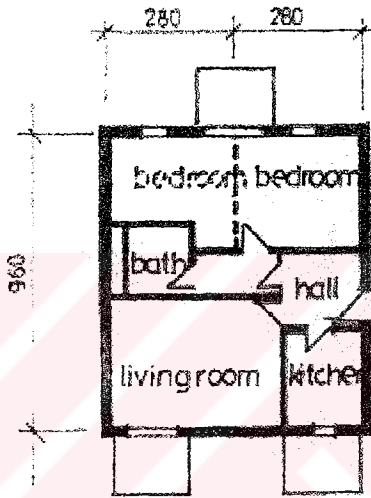
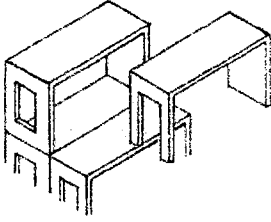
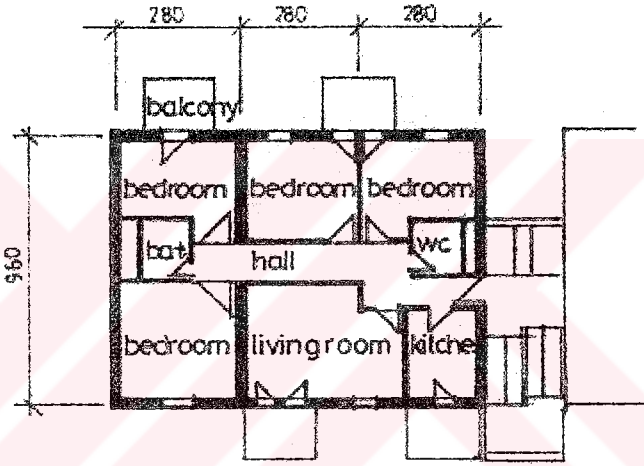
<p>Table 3.7-3 THE ANALYSIS OF THE PREFABRICATED SYSTEM ACCORDING TO THE ADAPTABILITY CONCEPT</p>	
<p>STRUCTURAL SYSTEM</p>	<p>PREFABRICATED REINFORCED CONCRETE CELL SYSTEM (Open Cell) (Yübetaş Cons. Co.)</p>
<p>ANALYSING CRITERIA</p>	
<p>3 Changing on Room Dimensions and Amount</p>	<p>Applicable</p>
<p>Partitionment or attachment of rooms by using flexible-moveable walls</p>	
<p>Changing possibility to the details of attachment and materials of the components</p>	<p>Applicable, unless on partitive components, which are taking place in the cell.</p>
<p>4 Modification in Room Relation</p>	<p>Applicable.</p>
<p>Changing of flexible wall locations</p>	<p>Applicable.</p>
<p>Changing on the partition wall spacings</p>	<p>Applicable with the condition of using varied partitive elements which take place out of the cell system.</p>

Table 3.7-4	THE ANALYSIS OF THE PREFABRICATED SYSTEM ACCORDING TO THE ADAPTABILITY CONCEPT	
STRUCTURAL SYSTEM ANALYSING CRITERIA	PREFABRICATED REINFORCED CONCRETE CELL SYSTEM (Open Cell) (Yübetaş Cons. Co.)	
5 Enlargement capacity of multi-storey dwelling; Gradual Construction Possibilities	<p>Adding block on vertical requires some changing on ceiling floor.</p> <p>Adding block on vertical and horizontal -enlarging there is possibility for gradual construction.</p>	
Ability of adding blocks Adding to such components like balcony, exterior staircases etc. Changing the exterior wall components Systems' ability of taking new supplementary components into the its' own structure	<div style="text-align: center;">  </div> <p style="text-align: center;">Non-applicable</p> <p style="text-align: center;">Non-applicable</p> <p style="text-align: center;">Non-applicable</p>	

3.4. MATERIAL, STRUCTURAL SYSTEM AND CONSTRUCTION METHODS CHOICES FOR ADAPTABLE DESIGN HOUSING

Industrialized construction systems are going to be useful for supplementing the dwelling shortage of Turkey because of its providing the dwelling production in a much shorter period and its creating possibility throughout a year and also its realizing the huge amount of productivity. It is a fact that, in present, arising of quality instead of conventional system either for without having any decrease in costs.

Proposals like ‘dwellings which created by industrialized systems do not have aesthetic value, or their creating the routine environments..’ bring out by most of the designers aren’t believable.

Considering the design possibilities which are going to use in environment, established by industrialized construction methods, new design approaches must be develop in respect of aims, which provide the flexibility through using side or physical richness, provide for environment by these systems.

At the well-known examples of fully or partially industrialized construction systems in the world are applying in our country too. Fully industrialized construction we meant that -all of the building is prefabricated- are in a rapid development in Turkey. This sector has begun forward on rapid movements by the recent developments in Turkey such as enlivenment of construction business with the financial credits provided by Mass-housing Act or taken precedence of choosing industrialized construction of mass-dwellings.

First decision is the level of material on multi-storey dwelling buildings. It has given through the concrete -reinforced concrete which is going to be load-bearing system material of building, among other main materials for its’ specifications like made by slightly low-cost raw material, its’ availability, its’ providing a good sound insulation, its’ resisting to fire, toughness to loads, its’ long-lasting capacity, its’ ability of easy shaping and its’ durability against the environmental conditions instead of its’ disadvantages such

as weightiness, least of it's thermal conductivity and being an able to breakable, and also it's being an non-easy shaping material etc.

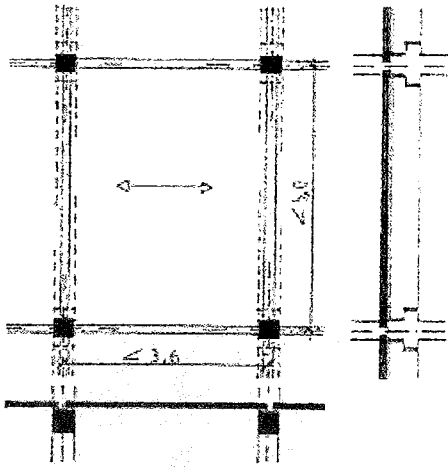


Figure 3.1 Columns, beams organized in a one way + floor slabs work through one way (Ayaydın, Y., 1988, p.79).

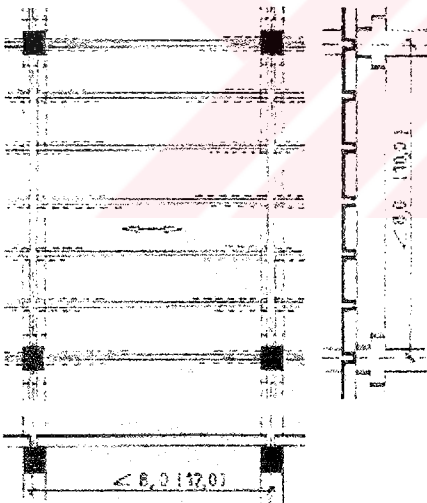


Figure 3.2 Columns + beams organized in one way + floor cusped systems work through one way (Ayaydın, Y., 1988, p.79)

Second decision is about the type of load-bearing system. It has decided that being skeleton system in respect of gaining precedence of such purposes like establishing the flexibility, variability and adaptability and also being bigger of their span.

Third decision is on the level of technology. It has been moved on to the prefabrication based technology result of the evaluation of the such purposes like increase the production speed, able to make a free of seasons production, able to realize to the quality control on top level and revision of laboring conditions. But, it has been gone through that a cost analyse while we make a comparison between these systems.

In a short, decisions which have taken, are being reinforced concrete, skeleton and prefabrication of adaptable designed multi-storey dwelling.

It is mentionable that prefabricated skeleton systems have too varied sub-system groups. The most appropriate sub-systems choosing has to be done for the adaptable design-housing production. And, before, some sub-purposes have to determinate. For

Ayaydın, weighing on to the purpose system of mounting, carrying and providing attachment easiness may possible by intervention of ‘columns + beams organized in a one way + floor slabs work through one way’ (Ayaydın, Y., 1988, p.79) (Figure 3.1).

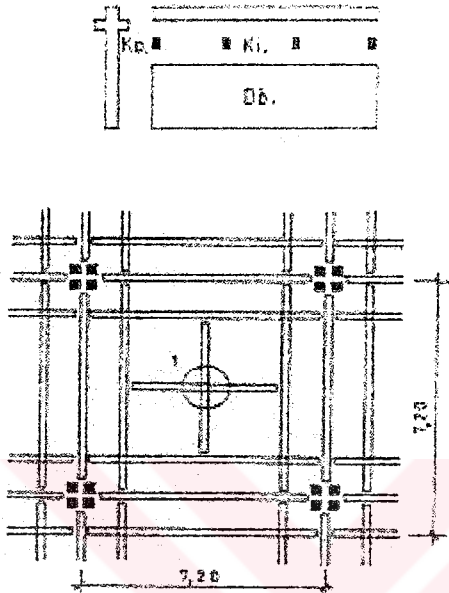


Figure 3.3 Two way organized subordinate beamed systems (Ayaydın, Y., 1988, p.79).

One before purpose system may have been chosen as ‘columns + beams organized in one way + floor cusped systems work through one way’ (Ayaydın, Y., 1988, p.79) (Figure 3.2).

While add the sub-purpose of crossing wide openings in both two way. Either if, it may have been tended to the choosing of two way organized subordinate beamed systems (Figure 3.3) with the sub-purpose of the “... providing the

same conditions for finishing processes of construction such as partition, facade wall, lining of the ceiling and installation both in two ways” (Ayaydın, Y., 1988, p.79)

CHAPTER FOUR

**ESTABLISHMENT OF THE APPROACH TO THE
FEASIBILITY OF ADAPTABLE DESIGNING OF
MULTI-STOREY HOUSING AND
RECOMMENDATION ON ITS RELATED MODEL**

As described in the introduction section, the purpose of the study was to introduce an applicable housing construction model with the aim of solving the housing problem in Turkey quantitatively and qualitatively by means of adaptability concept in multi-storey construction, using prefabrication elements.

Thus the second chapter of the thesis established the principles and technical approaches necessary to realize the adaptable design housing concept. The third chapter determined the most suitable material, bearing system, and way of construction in order to put these technical approaches into practice. The present chapter will propose the data decisions concerning the realization of the adaptable designing of multi-storey housing, using the chosen construction system to determine the way of approach. The data decisions to influence the establishment of this way of approach will be dealt with considering the model recommendation.

According to the result that we obtained in the second chapter in particular. Conclusion was made that flexibility and variability purpose-decisions to be made in programming and designing phases so as to realize adaptable design housing must be put into use in the phases of construction, inhabitancy and renewal of the building.

In this chapter, however, the proposed housing production model related to the adaptability concept should be established, and the data decisions needed to realize concerned model put forward.

For this purpose, the model proposal includes the design of the decisions of the adaptable housing. With the data decisions to be examined, however, environmental conditions affecting the housing production must be clearly determined. The influences of these conditions on the production of adaptable designing of multi-storey dwellings should be investigated.

In the phase of programming, the decisions related to functional housing field requirement, modular coordination and building elements pertaining to the realization of adaptable design housing should be made accordingly.

As seen clearly, this study describes the adaptable housing as a process which covers designing, programming, construction, inhabitancy and renewal phases and studies it in this respect.

4. ADAPTABLE DESIGNING OF MULTI-STOREY HOUSING MODEL

When adaptable housing examples constructed in Europe were previewed, it was found that the adaptability concept proves successful in the combination of flexibility and variability solutions more than one in the related housing units. Accordingly, possible adaptability purpose solutions in the adaptable designing of multi-storey housing can be studied in three groups;

a) In the housing units;

. Installation solutions combined with free plan arrangements.

Flexibility of inhabitancy thanks to similar -dimension-spaces- multiple relationships

- . Adaptable kitchens and bathrooms

b) Between- housing units;

- . Combinable building units - unstepped construction compatibility.

- . The rooms exchangeable between the housing units.

c) In the level of building wholeness - adaptability between internal and external aspects and the building units;

- . Expandable housing units - gradual construction capabilities.

a) In the housing units:

Installment solutions combined with free plan arrangements: This approach lies among those flexibility approaches discussed in the second chapter, namely organizational flexibility of the system, continuous flexibility, free variability solutions. Because of installment connections of the wet areas, it is well possible to organize the other spaces housing in different ways according to number of housing members and their necessities thanks to their planning together.

However, such arrangement on a modular axes system are necessary in view of using similar elements in different ways to create spatial diversity in the housing. Providing inhabitancy flexibility-flexibility in inhabitancy- by means of similar size rooms: It can well be possible that similar dimension -living spaces will be created during the designing and that household members therefore will change their functions for different purposes. In this respect, it seems necessary to keep or organize such spaces in a flexible design so that they can be modified when necessary, in other words, they should be designed in a way to provide different functions.

Multiple connections belong to the rooms by means of flexible-moveable- wall divisions and partitive elements: It is possible to separate some spaces in the housing, using prefabricated partitive elements for various functions. Moreover, it is possible that different arrangements can be created in the housing by means of such partitive elements

in the constructive phases. A number of arrangements and variations can also be created which are compatible with the necessities and desires of the households owing to the users' participation in the construction phase in particular.

Different passages can be formed between the rooms by closing or opening the present doorway openings on the partitive elements. Therefore different inter-spatial connections can be produced (can be in question).



Figure 4.1 Possible spatial requirements based on the number of households in the housing unit

Adaptable kitchen and adaptable bathroom: It can be necessary to enlarge or increase wet spaces or their numbers such as Wc and kitchen depending on the increased number of the households.

For example, the kitchen space can be modified (enlarged) so that dining requirements should be satisfied as well as cooking activities, as the number of household members increases.

Likewise, bathroom and Wc spaces must be able to be enlarged depending on the increased number of the household.

It is quite possible to obtain different size-houses which are compatible with the requirements and desires of the households in the phases of designing and construction by means of the above mentioned solutions within the context of adaptable designing of multi-storey housing model. Starting with too small or too large dwellings in the designing phase can produce different consequences. Figure 4.1 illustrates possible spatial requirements based on the number of households in the housing unit.

Different enlargement alternatives can create diversities in the sectional and facade levels in the building as a whole. Using similar components on the facades can produce different formations depending on similar dimensions. Adaptable design-housing can save prefabricated technology from the criticism that it creates monotony surroundings.

b) Among the housing units:

Combinable housing units -one-stepped construction capacity: The housing which are produced as small units in the initial phase can be combined into normal size housing units in the phase of inhabitancy.

The rooms exchangeable among the housing units: As a sub-choice, there can be room exchange only among the housing units. However, it is necessary that the minimised housing unit area should be kept in size in such a way to satisfy the needs of the decreased number of household members.

c) In the level of whole building- adaptability among the housing unit and between external and internal features:

Expandable housing units gradual constructional capabilities: The approaches developed in order to provide flexibility through efficiency of enlarging can be separated into two groups.

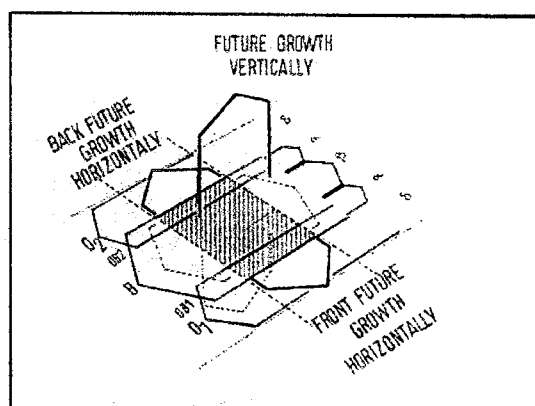


Figure 4.2 Application Tung-Song-Hong growth model diagram (Open house, 1981)

The first one is related to those approaches which can be implemented in mass-housing settlements that enable less-storey buildings to be constructed. In the order of flats which allows enlargement, for example, core housing settlements (Figure 4.2).

The second one are those futuristic projects which purposes utopian

approaches, start with componential level, develop with building level, and eventually constitute a megastructure (Figure 4.3).

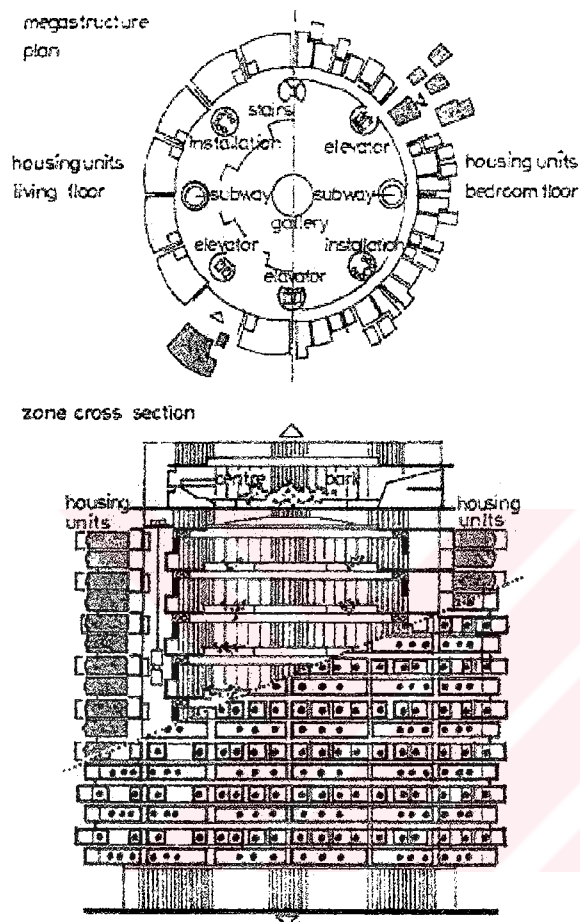


Figure 4.3 From Schinkenchiku competition an expandable housing design, Anzai-Otani proposal (JA, 1967)

The multi-storey housing concept with adaptable design studied in the thesis is similar to core housing projects and to futuristic projects in view of enlargement flexibility and of nature of multi-storey increase respectively.

Growth in the adaptable design-housing leads to the idea of multi-storey core housing which enables block addition or gradual construction capacities to be put into use.

Multi-storey housings which consist of core units which can be enlarged for the long run will be able to bring about new visions and possibilities in view of the discussions that small-scale housing

construction are valid in Turkey. A household who expect that they might have a larger housings can put up with living in narrow-volume house for a long time. The fact that majority of household members is young and growing up is another justification for such approach. The process of enlarging houses by means of producing multi-storey building block in two phase can be applied in two different ways.

Separate additional spaces are provided for the present housing units and for the second phase block to be made, or the new spaces to be added and the present space, combined together, can be considered as a new sharing between the units.

4.1. ENVIRONMENTAL CONDITIONS WHICH DETERMINE THE FEASIBILITY ADAPTABLE DESIGNING OF MULTI-STOREY HOUSING

4.1.1. MANAGEMENT

One of the important factors which multi-storey housing can bring about is that an absolute self control process can be created by focusing interests of many dwelling owners on a common parameter, their shared land, against potential speculative tendencies. The fact that land property is considered and maintained as a shared and whole possession is meant to ensure that individual attempts and therefore building up anarchy would be prevented. In addition, such a common purpose behaviour is of course to determine and influence final decisions in the eventual development of the growing urban environment.

Within the context of the industrialized building-up process in particular, multi-storey dwellings and their associated proximity (building factors, infrastructure, shared areas, landscape, arrangements) can be kept under control and maintenance of professional and organized boards. As for adaptable designing multi-storey building up alternatives. It is possible that the current investments can be maintained and new investments can be made efficiently and timely. Such present and potential investments are closely related to the interest of numerous households.

On the other hand, common decisions are greatly, likely to be made in such a way that uses of resources would be made more efficient and yielding. Despite the fact that adaptable designing of multi-storey dwellings can be initiated with low standards it is a

kind of building up process that paves the way for gradual developments without wasting potential and resources.

The concept of adaptability involves variations in a housing which would necessitate a unique management manner different from that of traditional housing units. This kind of management should include representation, counseling on potential changing in the building definition of limitations, financial management, utilizing and preparation and maintenance of technical personal materials.

Good management of adaptable design housing will allow utilizing adaptable aspects efficiently. Influences of management on feasibility or realization of adaptability are explained as follows;

1) Adaptability concept that involve physical changes necessities a new type of management as well. Managerial services provide great opportunities in the uses of adaptability. When users wish to express their approaches and to make alterations, it is the person or firm representative who undertakes the great part of the responsibilities. In the case that new tenants moves to housing unit for rent in particular (inhabitancy phase II), financial responsibilities between the owner and tenant must be clearly defined so as to prevent managerial problems likely to emerge because of new alterations to be made.

2) Suitable adaptability can be developed based on different ways of ownership and management, for example self management. In doing so, households can establish changes which they would plan on their own dwellings using a common decision mechanism. They can also benefit from technical assistance and counseling of the producing firm or architects on possible alterations during the production and inhabitancy phases of the housing. Through such assistance and counseling, households can create the changes that they wish to on their own buildings.

3) The manner of management must include the instructions on how to conduct the control of adaptability performance and how to utilize adaptability itself. For example, because flexible-mobile walls have to be modified by qualified professional workers in

view of their basic design, it will be harmful for users to do so on their own. Therefore it seems necessary to control users in order to prevent possible damages while creating modifications in the building. Furthermore, terms of adaptability for users for example the rules and ways in which the partitive walls can be modified are explained to the concerned to prevent potential harms.

4.1.2. PARTICIPATION OF USERS AND SPREAD OF ADAPTABILITY INFORMATION

In the suggestion of adaptable designing of multi-storey housing, there is no obstacle to any production way open to works which can be completed by households themselves after incomplete building units have been transferred to their owners.

P. Stringer discussed the relationships between the product and the process depending on the idea that the concept of participation can be interpreted in three different ways (Quoted in Atasoy, A., 1980). The first one relates to ownership on the product and on its being shared; the second one is that common processes can be conducted and the third one is being and feeling like the part of something. Of such above definitions, the second can be seen as the ability of user to decide on his or her own building in the phases of design or even production in a way to play a role in the designing process. However, potential users can not be predicted in research studies which are aimed to find out a numerical solutions to the shortage of housing, today.

It has been found that the problem of the need for quantitative dwellings, which has been planned to be solved by means of industrialized construction method in particular, turns out to be a problem of quality. This quality concept can be defined depending on regional differences, different user needs, the means of flexibility and adaptability in the completed dwellings, varying appearance, multi-purpose social facilities and services.

It is thus supposed that users would be able to create healthier surroundings thanks to environmental organization, therefore social control being provided through use of participation.

Accordingly, adaptable designing of multi-storey housing is the approach that emphasises participation of users. Qualitative and quantitative solutions to the problem of housing is closely associated with the participation of users. For example, on one hand it favors the quantitative solutions to the problem of housing through industrialized construction technology, and on the other hand it directly covers the solutions which can be changed based on the needs and desires of the users.

Participation of users in the designing process would be able to overcome problems such as monotony which industrialized production methods have inevitably brought about. More over it is clear that it is necessary to share information of how to create changes in the phases of designing, construction, inhabitancy or even modification of dwellings and how to use the potential flexibility among architects user and production firms.

Four apartment example have been examined which were produced for the purpose of adaptability in Switzerland by Jia Beisi in his article 'Adaptable Housing or Adaptable People?' (Beisi, J., 1993). The architects of these project prepared a booklet in order to encourage users to utilize adaptability potential of the dwellings in the phase of construction.

Additionally, the architects and manufacturers held interviews with users individually and in groups. Such attempts were successful for the first users. They enjoyed the opportunity that they could arrange their buildings with their own decisions. However, when the user of the building changes, since adaptability potential of the building could hardly be transferred to the new tenants by the manufacturer of the management, it couldn't be exploited. Thoroughly the main reason for this was the lack of communication and cooperation among architects, owners, and managers.

Adaptable design-housing can be utilized when architects, manufacturers and users share the knowledge of how to use the potential flexibility. Adaptable housing is a new concept. Since it is new, many users who have had no instruction, do not know what it is? All new products in our society need instruction when they are brought into the market place. Adaptable housing should also have its own instruction. These things have taken place at this definition;

1) The goals set for the building dominate the types of adaptability and its usage. Adaptability listed as main purpose for the different requirements and changing of future at building programming Other way to say physical adaptable solutions have related closely to the purposes which set up before the design.

2) The owner's identification and attitudes towards the necessities of adaptability play an important role in the types and uses of adaptability. Accept adaptability as a necessary significance for different peoples for example living of lonesome or disabled persons all together etc. Living of as they accompanied to the different household types with each other and also accept adaptability as concept in where each household has their own flat, for realizing their own individual needs.

3) Architects, construction firms and inhabitants need to communicate among each other, or the adaptability cannot be fully utilized. Ways of this communication;

- . Preparing a comprehensive guide book for users to understand the using of their own buildings and significance of it.
- . Demonstrating of plans, choosing materials and other accessories to the user. Establishing both meetings and personnel interviews.
- . Publishing bulletin during construction process-informative action.
- . Write of the changing principle of the moveable walls on the user/tenant contracts.

4.1.3. LAND AND INFRASTRUCTURE

T.Z., 1995). Because public lands do not have much great proportion in Turkey, land price and cost factor is known to influence the cost of housings to a great extent, especially in down towns. Supplying lands with infrastructure and road construction is under the responsibility of local administrations. Local governments are however affected by local politics and financial implementations.

Generally, since local governments do not afford to provide infrastructure expenditures like gas, water, electricity. For a new settlement area, they tend to prefer to supply to services and activities in the center and close proximity's of the city itself. When the necessity for new settlements and therefore building up housing caused by population increases, other infrastructure expenditures have impact upon the costs, whether the land factors affect them or not.

These activities are implemented in both processes in Turkey. As public land areas do not have a great proportion in the percentage of urban areas, land control has not been realized due to increased land sales over years. Therefore, land factor is apt to increase the value of land rent. Other additional expenditures based on the infrastructure and public processes in the periphery of cities can well increase the prices of buildings irrespective of lack of value in land factor.

It is possible to reduce the shares of land and infrastructure costs in their totals by means of high density building up process. In the example that Murat Balamir presented in his bulletin in the symposium on 'Housing for Low-Income Groups', it was emphasised that four or five storey building designs could create high densities of brute 90-100 flats/household net and of 140-180 flats/household net, and therefore the shares of unit housing production cost in the costs of total housing unit in lesser storey and multi-storey housings can be reduced to 8-10 % from 30-40 % depending on multi-storey project will be able to decrease the share of infrastructure in housing unit costs. Reduction of total

On the other hand, adaptable designing of multi-storey housing projects can decrease the land share for each housing unit since it is of high density. Therefore, this solution has the possibility that housing can be produced on the valuable lands which are within reach of city and infrastructure foci. Since adaptable designing of multi-storey projects are economical solutions infrastructure costs, they can be produced on the lands in suburbs. However, the maximum benefit that the adaptable designing of multi-storey project can be produce in and around the city is that middle income households will be able to channel their savings from commuting to work in the business areas into their housing.

The housing of minimum standards in the beginning were aimed to be able to be increased or completed under the 'Evka' project by İzmir Metropolitan Municipality, whereas it did not lead to the expected cost decreases different from those of other approaches therefore it was overlooked and given up. It was justified that adaptable and expandable housing units could some day disturb the wholeness of the present site.

It is essential to determine enlargement possibilities of the adaptable design housing at the beginning of the production process. Setting of the building on the land must be established in the phase of designing and programming. Initially, the amount of land necessary for these blocks to be attached to the main building should be kept empty. The distances of drawing which the regulations establish will be arranged considering the final position of the building, which may lead to the debate that the land area necessary for the blocks to be attached in future may be kept vacant for a long time.

This, however, also apply to lesser storey core housing examples that are supported by the related mass-housing act. It is clear that, the land areas reserved for enlargement of the adaptable design-housing will be negligible share in the percentage of the total land area.

4.1.4. ASSOCIATED ACTS AND REGULATIONS: FLAT PROPERTY

It will be useful to discuss the conditions of mass-housing which is widely used in the production of multi-storey dwellings regardless of social dimension of the housing concept while studying feasibility of adaptable designing of multi-storey building.

The concept of housing under the conditions of Turkey has been combined with the nature of being fully economical in the tables of quality classifications of Ministry of Reconstruction and in currently valid mass-housing acts. The condition of being economic is generally discussed in four dimensions, which are the area of inhabitancy, the quality of material used, wholeness of the internal and external housing unit in an around, the common distributor for spaces and costs.

The integrity of housing is the most determining factor in view of economics of the process. Combination of many housing units associates the economics of the structural system with that of partitive elements; common stairs, elevators, roof, installment etc. As clearly seen, this combination with vertical dimension in other words, being multi-storey especially tends to create conditions most available for economically using the land renting which is considerably high in urban areas.

Production and inhabitancy in multi-storey dwellings have created common and established habits in the society. This way of building up process seems to be compared to a detailed legal and administrative institution, that is, ownership of flat in an apartment. There has been flexibility of creating new instant combination among the housing unit thanks to recent measures added to the present Flat Property Act in 14.04.1983 which can provide significant security and economics in organizations and operations (see Appendix 5). 'In the section of independent spatial addition' of the flat property act, it is clearly explain that it is possible to be able to enlarge, spaces or areas to be created only

In addition, the same related act states that it is compulsory to establish the land shares of all flat owners with unanimously according to final setting of building as result of recent enlargements in the housing units or in any other new independent spaces. The same act includes the information of how the land shares their prices should be legalised considering enlarged or decreased sections and their related procedures. The organization framework which may be needed for adaptable designing of multi-storey practices is unprecedentedly present in Turkey.

Enlargement of adaptable designing of multi-storey housing block in two phases can also be realized in two different ways. The first one may be that partners share the block to be constructed in the second phase. The second one is that the present total area and the newly added areas (m²) should be subjected to a new sharing process. These two alternatives will create differences considering both physical aspects and coalescent contracts.

The coalescent contracts define the processes to be made in every phases of housing in such a way that owners or users and manufacturers should agree on the terms. Enlargement works can be established in the long term contract which is signed depending on predetermined payment schedules and building up plans. Upon completion of the enlargement, flat property system can apply to the concerned situation.

Within this process, households have the right to transfer values to anybody else under the current market circumstances, another alternative is that enlargement may not call for gradual building in which case the dwellings composed of small units in construction can be combined to obtain housing units with desired dimensions within the process. It is therefore essential that property transfer procedures should be performed in order to start the second phase of construction before beginning additional enlargement process.

Such an approach is true for the solution of multi-storey core housing that *Murat Balamir* mentioned about in the symposium on 'Housing for Low-Income Groups', he

stated in his bulletin that such kind of building process can be achieved by more than one method.

For example suppose that to core housing building which were produce in the first phase would be combined to form and normal desired housing unit. As with the construction by a public company such as a cooperation, the property rights of the first core building are transferred to the candidate low-income households while the second housing unit remain in the possession of the manufacturing public company as a stock likely to be rented for a given time. Following this period, the second core housing under the previous contract is transferred to the households with the right to pre-emption, or to other households if this right to use is not needed. The same procedure is likely to be found sufficiently attractive by private sector, in which case the households who are undertook the core houses in the first phase may be found to make in vestments considering potential profitableness prior to de-construction (Balamir, M. 1986, p.28)

Based on this knowledge, another secondary choice emerges. Housing units will have the possibility of room exchanges among them. If a household needs an additional space and neighbour wishes to lesser their own their flat, such exchange will apply, and thus the procedures of property transfer concerned will be put into practice.

4.1.5. POSITION OF INCOME LEVELS AND FINANCIAL RESOURCES

There is a close relationship between the cost of the housing and the level of income. Disassociation between the cost of housing and the level of income due to the sizes of the buildings constructed under the construction permission creates the problems associated with housing. In developing countries, the fact that one fails to provide the resources needed for housing requirements and besides the majority of urban population cannot possess housing buildings according to the expected standards tends to create this conflict. Another conflict on this matter is caused by the fact that the cost of the housings reaches up to the levels that most people fail to afford.

It is the low level of income that leads the housing policies to failure. Loan possibilities which are emphasised in the mass-housing act legislated under the state politics are inclined to encourage the construction of dwellings on small land areas (See Appendix 6)

In this respect, the idea is widely held that number of housing units can be increased due to this policy. Therefore, it is possible that adaptable designing of multi-storey housing, within the context of privileges given to smaller units under the precautions taken by mass-housing fund are greatly likely to find financial aids. For providing stable and medium income households with such housing units.

This kind of building up process which will enable masses of people to direct their precious savings for long terms is a sort mechanism which can allow households to transfer a great amount of capital flows to such projects.

Under the projects of 'Evka' by İzmir Metropolitan Municipality, households who wish to acquire homes can prefer anyone of the projects with the three rooms, two rooms or duplex, or of 55m² or 65m², 75m² and 85m². The municipality presents the opportunity that households can acquire homes under the available repayment schedules.

However, there are some undesirable failures. For example, initially, households prefer a housing with three rooms and of 80m² fail to repay for it and therefore find it affordable to have lesser project in m², which is possible only by choosing another convenient cooperative later on. As a result, the first choice, 80m² housing process remains without owner, which inevitably retards the housing production in economical sense as a whole.

The approach to adaptable designing of multi-storey housing can well solve this problem; the member of the household will be able to find the solution without leaving the cooperative for another. When the household can not afford to pay for the three-room unit, this unit can be modified into a two-room process. There will be numerous advantageous solutions thanks to the adaptable designing of multi-storey housing model.

4.1.6. MATERIAL RESOURCES AND TECHNOLOGICAL POSSIBILITIES

The designed structure which the housing units can bring about in wholeness directly governs the assembly and economics of the load-bearing system. Considering the housing specifications that blocking buildings should be limited to four-storeys, and that steel carcass systems are not used in Turkey, reinforced concrete-carcass systems are shown to be valid processes for longer times (Balamir, M. 1986).

Advanced construction technics in the load-bearing system are also encouraged in mass-housing act and it is emphasised that rapid and economical housing production is essential as a valid solution. This is one of the most imported encouraging factors in developing the related research and studies.

The design of smaller units and adaptable designing of multi-storey housing process can directly utilize industrialized technologies. Adaptable designing of multi-storey housing process combined with industrial construction can create a new market which will enable new building components to be designed and produced in great quantities. This approach can provide economical gains by reducing the production time, flexibility in the living of dwellings.

Designing partitive components in movable ways in the housing to be produce by prefabricated components will make it possible that households will be able to modify develop and innovate their homes according to any alternative order that they made wish. Households also will be able to utilize their own labor in production to greater extend thanks to the component to be designed. In other words households as the result of designing the components which they can easily modify with their manual affords with their labours.

4.1.7. MASS-HOUSING POLICIES

The general purpose of the housing policy is to satisfy the housing requirements of households by means of both resources of country and those of households at sufficient level what this sufficient level is relates to the present conditions and resources.

Housing policy is shaped and governed by not only social aims but economic based development purposes as well. The major problem emerging related to the establishment of the housing policy is accounted for by the complicated correlation among other related politics which govern the current housing market.

These related politics that determine the housing policy are financial politics industrial development politics, urban/regional development politics and income/price, cost politics. Although development plans of the developing countries currently include numerous housing policies, failures tend to continue. Some are related to investments necessary to meet the present and prospective housing deficiencies and some are not supported by other related politics (Özüekren, Ş., 1981, p.53).

Acceleration of urban population has increased demands to housing buildings. However, effective demand to housing has decreased due to the reduction of the real income levels, the real salaries and wages.

The tendency on housing sector in Turkey in 1980's was shifted to the construction of squatter settlements or to luxury dwellings, which inevitably affected the middle-income because of the lack of demands to dwellings. In addition to such demand lasses, fluctuations in costs of construction shifted the housing solutions towards squatter building up process, whereas luxury housing market was governed by private sector conditions.

Based on the idea that cities develop irregularly and unplannedly, and therefore insufficient infrastructure and settlement conditions affect low and middle income groups in particular, Mass-housing Acts of 1981 dated 2487 no was passed and was under operation until 1984.

Thus, the act aimed to support large scale attempts of mass-housing considered, that the present resources should be efficiently utilized. The 1984 dated 2985 no Mass-Housing Act, however, approaches to the problem with the idea that the basic problem has been financing the dwellings as a construction.

The target of this act is to propose that new material and production systems should be developed as well as creating the funds required to meet demands to dwellings. For all these purposes, the Mass-housing Fund was established since 1984 when the second Mass-Housing Act was introduced, and different operational regulations were prepared regarding this act.

The recently issued regulation (May 30th, 1989) is based on the financial aid which mass-housing management has provided for the housing sector. According to this recent regulation, the cooperative organizations were primarily provided with credits for mass-housing projects and dwellings with lesser areas.

Moreover, this regulation especially aims to supply households with no housing with homes preliminarily for the above mentioned purposes. It is possible that the housing with lesser land areas can benefit form utilize the related Mass-housing Fund.

In addition, it seems essential to adopt a policy that users should participate necessarily for the realization of the adaptable design housing process. For instance, in European countries, such as Denmark social housing planning and participation of users and management are encouraged and found necessary by their parliaments (Zahle, K., 1996).

4.2. PROGRAM DATA CONCERNING REALIZATION OF ADAPTABLE DESIGN MULTI-STOREY HOUSING.

4.2.1. DATA RELATED TO FUNCTION, SPACE AND AREA REQUIREMENTS

4.2.1.1. SPATIAL AREA REQUIREMENTS

The functions needed in a housing unit is clearly defined by 3194 No. Reconstruction Act and its related regulations. According to these regulations, the least requirements of spaces and their areas in each independent flat or house are shown in Table 4.1.

3194 Reconstruction Act Regulations suggest that bathroom and WC can be located together and the warehouse can be placed inside or outside the flat or somewhere else in the building.

Table 4.1 The least (minimum) requirements and spaces and their areas in each independent flat or house (3194 Reconstruction Act regulations)

The Types of Spatial Unit	The Least (minimum) Net Area of The Unit (m2)	Dimensions of the Spatial Unit
Room	11.20	Minimal width length 2.80xA
Bedroom	6.00	“ “ “ 2.10xA
Kitchen	3.00	“ “ “ 1.50x2.00
Bathroom	2.40	“ “ “ 1.20xA
Wc	1.08	“ “ “ 0.90x1.20
Internal passages	1.20	“ “ “ 1.00x1.20
Warehouse	1.50	“ “ “ 1.00x1.50

Assumption 1:

The following equation can be used in order to establish the number of spatial areas which the household will need in the housing unit, flat. (Şen, N., 1977, Research on limited area dwelling).

$$Y_n = \text{Total area} = A (n+1-f_1-f_2-\dots-f_n),$$

$y_n = \text{Spatial area per person} = A/n+1 (n+1-f_1-f_2-\dots-f_n),$

$f_n = \text{Reduction coefficient based on the increased number of the household} = n/n+1,$

where $n = \text{The number of people using the spatial areas, } A = \text{other spatial areas as well as absolutely necessary areas which a person can need.}$

Adoption;

Because the warehouse is considered to be built outside the flat or somewhere else in the building, it should be excluded from the calculations considering that the number of spatial areas which internal passages or circulatory spaces require will change based on the number of rooms and their associated connections.

Accordingly;

$A = 23.68\text{m}^2$ accepted-together with the least spatial area suggested by the related regulations:

Total spatial area for a 2 person household = 35.52m^2 about 36m^2

Total spatial area for a 3 person household = 55.41m^2 about 56m^2

Total spatial area for a 4 person household = 76.96m^2 about 77m^2

Total spatial area for a 5 person household = 99.45m^2 about 100m^2

4.2.1.2. THE NUMBER OF FLOOR

Reconstruction regulations require that the building of five storey or more should acquire elevator system ⁽¹⁾. Depending on increased number of floors and height of the buildings, dynamic loads increase which affect the building due to weight of construction and therefore structural system becomes cumbersome and heavy.

⁽¹⁾ This necessity is not often preferred considering increasing both the cost and planned area in the flat distribution core in the mass-housings, therefore the tendency to prefer five storey housings is emphasised.

Building foundations increase and become heavy due to the type of ground as well. Increases of forces in the joint parts in the buildings constructed with prefabricated skeleton systems tend to restrict the use of mobile system cranes in particular. Thus, this study considers five storeys at least as the number of floors.

4.2.1.3. HEIGHT OF STOREY

Internal net heights of the storeys are determined by certain conditions in the related Reconstruction Acts and Regulations. Such regulations limit floor-ceiling internal heights to net 2.45m. Floor to ceiling heights are limited to net 2.20m in the wet places, cellar, warehouse etc., except in corridor, kitchen, entrance hall.

Moreover, the least height conditions are strictly established in the 3030 no Reconstruction Act and the concerned Metropolitan Municipal Reconstruction regulations as well as in lesser administrative regulations such as local governments.

Considering that basement height ranges from +0.00 to +1.00m, the following table includes the related values accordingly (Table 4.2).

Table 4.2 Storey heights establish for administrative province and county 3030 no act table.

Number of Storeys	Height of stories for Administrative Province			Height of stories for County		
	Height (m)	Basement Height (+0.00)	Basement Height (+1.00)	Height (m)	Basement Height (+0.00)	Basement Height (+1.00)
1	3.80	3.80	2.80	3.50	3.50	2.50
2	6.80	3.40	2.90	6.50	3.25	2.75
3	9.80	3.27	2.93	9.50	3.17	2.83
4	12.80	3.20	2.95	12.50	3.13	2.88
5	15.80	3.16	2.96	15.50	3.10	2.90

Furthermore, in the same regulation, the height of internal doors is limited to 2.00m, and height of flat entrance doors limited to at least 2.10m, and the necessity for lintels to

be made over the doors can create structural problems, especially in prefabricated systems.

Therefore, its a positive approach to finish the beam lower height just on the upper door line. In this respect the height of the storey will be determined by the height of the door of $2.10\text{m} + \text{beam height}$ and the floor width to be added.

The fact that the height of storeys in the buildings should be established by the above mentioned values and restricted conditions seems to be valid and acceptable approach.

Accordingly; considering that given the floor width of 0.15m , the housing type to be designed would have at least five storeys, the least 3.01 ($3.16 - 0.15$) or about 3.00m storey height will be found.

4.2.2. THE DATA CONCERNING MODULAR COORDINATION

It is clear that formation of a modular coordination in the horizontal and vertical building levels will be of great uses in view of planning and building economy in the construction of multi-storey housings as well as other types of buildings. Modular coordination is generally described as a standardization method for the purpose of reducing the number of component types and forming the desire of construction with quantitative folds of certain module.

Especially since the prefabrication which is industrialized building system is based on the principle that the same element be manufactured in large quantities, modular coordination is of greater importance in such productions. It is always possible that vertical load-bearing should be produced in different dimensions in the prefabricated system consisting of bar elements. However, the principle is that all columns should be produced in the building unless extreme values of economy are regarded. It is an inevitable necessity to determine load-bearing system module in the buildings produced by prefabricated systems in particular.

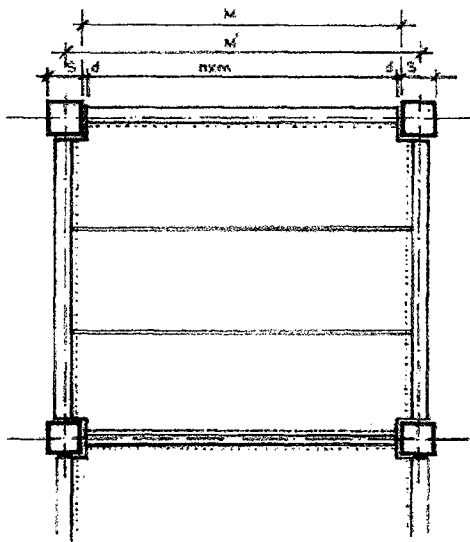


Figure 4.4 Determination of the module

The description of such module can be made as follows (Yesügey, C.,1993). (Figure 4.4).

$$M' = n \times M + 2 \times d \times S$$

M' = System module

M = Module

n = Module repetition

d = Tolerance

S = Column dimension

Studies have been made that so as to establish a standard module which will be universally valid for the purpose of achieving dimensional coordination. In related standards of all European countries such as BS 2900, DIN 18000, SAR, TS 2014-TS 2020, one agrees on the value for the main module -M- being 100mm for countries using the metric system or 4" for countries using imperial units.

By International Modular Group-IMG-, it is defined as the size which is selected to achieve dimensional coordination of building and of components with the maximum flexibility and convenience ⁽²⁾.

⁽²⁾ The means for modular coordination principle is a volumetric cage in which spans between planes are according to the main module or big module that is the multiple of the main module or a modular grid. The functions of volumetric cage and modular grid are to identify the dimensions of elements and volumes besides identification of elements' placement according to each other.

Modular coordination involves the coordination of the dimensions of components and of the building. If all the coordination dimensions are modular or multiples of the main module, and dimensions or

But, using the main module causes great differences in dimensions of components. In order to minimise this difference, big module is usually used as planning module that is multiple of the main module. The International Modular Group and the ISO recommend the big module to be used in building as 3M, 6M, 15M, 30M, 60M. Of these 3M and 6M modules are especially recommended for housings (Türkçü, Ç.,1988, 24; Tapan, M.,1973).

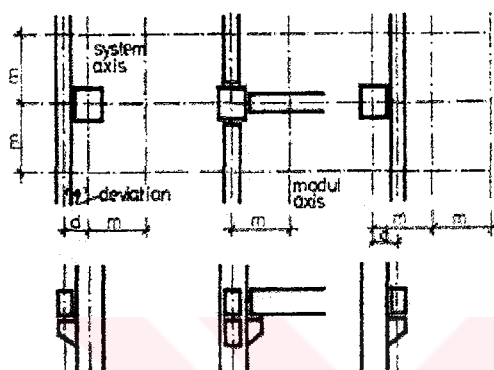


Figure 4.5 Placement of vertical and horizontal component on module and system axes in the skeleton system (Şen, N.,1990, p.23)

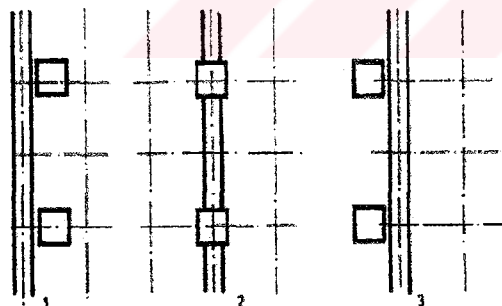


Figure 4.6 Situation of vertical components on the modular grid

The studies concluded so far suggested that such dimensions as 3.60, 5.40, 7.20 or 3.00, 6.00, 9.00 for load-bearing panel axes spans and as 2.40, 2.70, 3.00, 3.30 and 3.60 for storey heights should be used.

The above mentioned dimensions were obtained by assessing some criteria based on functional and statistical data, the means of transportation and preference or production technology of the related component (Tapan, M.,1973).

Placement of vertical and horizontal component on module and system axes in the skeleton system differs from that of panel system (Figure 4.5).

Bar components exhibit the nature of complete components, in other words they complement either a column or a beam. Therefore location of vertical components on the module grid can be defined according to their situations (Figure 4.6);

- 1) Vertical components can be placed inside the module grid of a direction.

- 2) On the point of junction of module grid in two direction.
- 3) Outside the module grid in a direction.

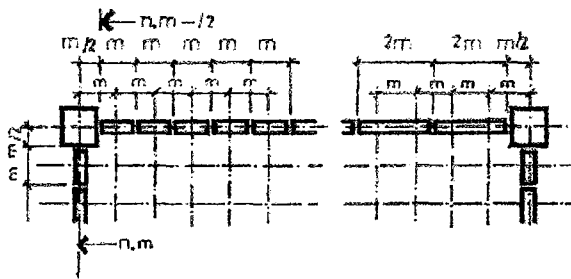


Figure 4.7 The placements of partition panel (Şen, N., 1990, p.24)

These sorts of placements are important in view of partitive panel definitions and of formations vertical at components and horizontal bar components, bar beam components on the junction (Figure 4.7)

In view of compatibility of vertical panel axes and lengths with system axes, they must be able to integrate with the width of vertical panels and with the order of vertical bar widths and lengths.

4.2.3. DIMENSIONAL LIMITATIONS OF STRUCTURAL ELEMENTS

4.2.3.1. DIMENSIONAL LIMITATIONS OF VERTICAL LOAD-BEARING COMPONENT: COLUMNS

Under TS 500 standard concerning the conditions on the statical calculations and projections, and the terms of regulations regarding the structures to be built in disasters areas, minimum column cross section is established by 25cmx25cm which is, however, the minimum condition and thus can be inevitably modified according to the number of storeys and related load conditions.

As with the prefabricated skeleton system, one of most important aspect to be established is the geometry of the column element. However, in the panel components to be used as separating internal and external walls, it is well possible that they can be produced as much thin and light as possible, thanks to some specific materials and technics on the basis of providing heat and sound insulation. It is therefore necessary for

the protrusions which the bearing elements create both on the external and internal surfaces of the building to be admitted as inevitable process.

In addition, when the user wishes to create any changes in the building during the phase of inhabitancy, such protrusions will enable the bearing components to be easily distinguished from the partitive ones. Based on the above explanations;

- . Designing columns as square sections favors advantages of symmetry under the condition of production and assembly during the production.
- . Square column will allow using equivalent and proportional modular axial system, on both horizontal dimensions.
- . Square column tends to minimise detail diversities in column, beam functions.
- . Rectangular column affects the main modular system of the structure and increases componential typology.

For the reasons mentioned above, this study assessed the square column type to establish its dimension as $3M = 30\text{cm}$. Yet this dimension will be apt for modification with relation to the viable distance.

4.2.3.2. DIMENSIONAL LIMITATIONS OF HORIZONTAL LOAD-BEARING COMPONENT: BEAM

Statical reinforced concrete accounting principles of prefabricated systems are designed based on the calculations and construction rules on which conventional systems depend since there is no particular specification unique to prefabricated buildings and therefore American or Germany specifications are necessarily referred to in some disagreed cases of constructions. Under the valid specifications in Turkey, reinforced concrete horizontal bearing, beam can be produced by dimensions of $20\text{cm} \times 30\text{cm}$. The width of beams in prefabricated reinforced concrete skeleton systems is of importance during the buttressing the junctional details and floors on the beams in the column-beam junctions considering solution of the details of the junctions with one another and with beams.

Because high quality concrete and ribbed steel are more feasible and easier to use under the factory conditions in view of beam heights it is able to pass through larger gaps by means of lesser sections considering accounting principles, which enables prefabricated systems to be more advantageous over conventional reinforced concrete systems.

4.2.3.3. DIMENSIONAL LIMITATIONS AND TYPOLOGY OF FLOOR ELEMENTS

Floor elements which are used as prefabricated in reinforced skeleton systems exhibit a greatest diversity. Floor elements are not only the load-bearing and transferring elements of the main building structure, but also directly affect design of the construction as the third dimensional elements suitable to the spatial design of it. Such a multi-functional feature causes these components to be in different forms and structure floors can be classified as follows;

- . Double T (TT) floor
- . Single T floor
- . Cassette floor
- . Precast hollow sections reinforced concrete floor

Precast can be applied on these component double-T and single-T flooring elements are of greatest flexibility in design. Their side by side alignment favors a great time advantage for assembly teams.

They are 1.20m to 2.50m are in width: 0.35m to 0.50m in thickness and 6.00m to 15.00m in spans between which they are located.

Limitations of cassette floors in width and height are completed in the phase of designing and they can therefore satisfy even much more difficult job requirements. The width of floor is kept limited to 1.20m owing to specific production of hollow sections concrete floors. Their lengths are designed without any limitations. Their thickness ranges from 0.12m to 0.24m and the spans between which they are located vary between 4.50m

and 13.00m (Set Betoja). It is double-T floorings which are widely use in industrial type-buildings.

The reason for this is that they can pass through vast spans when they are used as precast floorings and the forms that they have do not create or negative impact upon interior spatial wholeness of such buildings. Of the uses of such floorings in the housings, the flooring without suspended ceiling is not demanded due to traditional dwelling mentality in general.

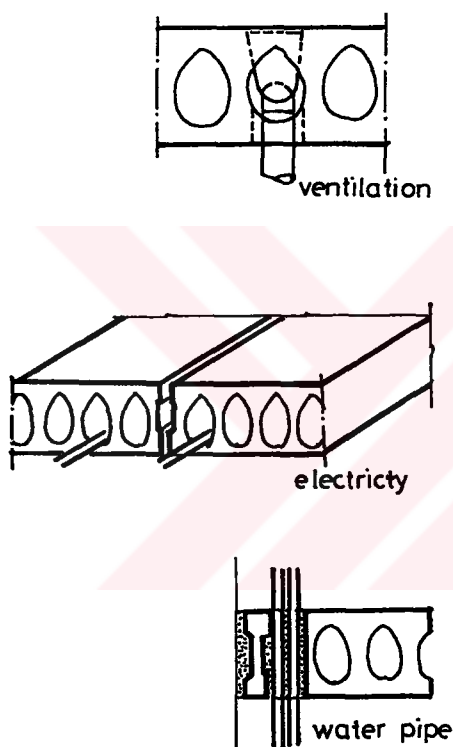


Figure 4.8 Different installation solutions with prefabricated hollow core slab

housing structures. Through these cavities in the slabs, the passage of the ventilation installation, electric installation, vertical and horizontal water pipes along with the descend of the rain pipe at the roof can be maintained (Figure 4.8).

In addition, in another factor in choosing the type of flooring, providing horizontal continuity of instalment connections, these flooring elements can be used. As such, it is the double-T and hollow sections concrete flooring which is the most suitable one among other comparable systems. The flooring elements according to the preferred module size can be double-T or hollow concrete flooring elements.

The prefabricated hollow core slabs offers the most prompt solution for housing structures. Through these cavities in the slabs, the passage of the ventilation installation, electric

4.2.3.4. CHARACTERISTICS OF PARTITIVE ELEMENTS AND THEIR RELATED LIMITATIONS IN SIZE

Panel components used in prefabricated reinforced concrete skeleton systems serve to function as only separating the housings. They are not only contained in facades but are also used as a separating the two closed spaces. They are produced as less equipped systems since they have no bearing factor generally in the forms of sandwich panels of heat and sound insulation. They are also manufactured in the forms of light reinforced concreted monolithic components. The panels can be exposed to deformations caused by temperature variations. If partition panels are placed between two beams in the skeleton buildings, the panel may under go deformation due to the beam in-setting. If this span is closed with more than one lesser panel, multi directional deformation can emerge.

In addition to the panels which contain built-in aspects such as aeration, smoke-chimney and garbage chute, those for specific purposes are produced as well.

The facade elements which are complement factor in the skeleton system are indeed sorts of curtain walls. Facade panels must include a variety of built-in features such as aesthetics, construction, minimum permeability of sound, vapour and temperature. Aesthetic features can be created by providing panel elements with color and ornaments, which are such examples as surface washing, brushing, acid etching, sticking broken stones to the surface areas which are all applied to mold surfaces.

Uniform insulating layers which are formed during the production on the facade panels have great advantages over individual panel layers considering temperature sound and vapour insulations. Water accumulations which are formed in internal and external structures disturb the physical balance of the condensation structure due to differences in temperature. Therefore, the panels which have low temperature permeability, which have low condensation temperature and which are insulated against water are to be used.

Although use of light concrete as partitive wall elements has been recently preferred, increasing their lightness limits and introducing them as industrial-product components are relatively new practices. The concretes whose unit range from 300kg/m^3 to 2000kg/m^3 are considered light concretes. While the light concretes of up to 300kg/m^3 assume limited load-bearing functions, they are generally used in the production of partitive and insulating building components. Light concretes are classified into two major groups; autoclaved aerated (AAC) and foam concretes and light aggregated concretes by their structures.

In the building in which AAC's which are particularly designed as light materials, facade elements which are suggested to have lesser dimensions are known to be assembled on by means of human skill and energy. These components can be 60cm in width and 8-10cm in thickness in storey levels. As with gas and foam concrete elements whose dimensions are greater than their thickness, thin insulating matting equipment with rare intervals appeared in order to obtain durability under the of assembly and usage conditions. As with autoclaved aerated and concrete elements whose dimensions sizes are greater than their thickness, thin matting equipment with rare intervals is applied in order to obtain durability under the conditions of assembly and usage.

Prestressed prefabricated hollow core slabs are also used as wall elements (Yapı Merkezi Co., panelton). These elements are produced at 120cm standard width and seven different thickness (10cm, 12cm, 15cm, 20cm, 25cm, 30cm, 38cm). With these elements, rough openings for windows and doors can be left on the walls and chimney, ventilation and installation crawl spaces can be opened or the cavities which are already in it can be used as canals and various anchorages can be placed. It is also possible to produce sandwich shaped wall elements with isolation layers. The normal wall element is formed with the pouring of a lightly equipped protective concrete layer after the setting of the material that will maintain the desired heat isolation level. Hollowed panel elements and the concrete protecting the isolation are linked to each other with the use of galvanized and stainless steel S irons.

4.3. ELABORATION OF THE SUGGESTED MODEL CONCERNING THE FEASIBILITY OF ADAPTABLE DESIGNING OF MULTI-STOREY HOUSING

This section will deal with the solution of the design model developed for housing with adaptable design. For this purpose, two different designs will be put forth with the area (m^2) values obtained through various previous acceptances. These examples will be examined in comparison with the offered model. Later, adaptable design housing model to one of the examples will be solved and its detail solutions will be provided.

EXAMPLE 1: Within the multi storey housing structure to be composed of concrete prefabricated column + beam + floor system, we can compose housing units through the repetitive use of modules made up of square units of 3.60x3.60m dimensions so as to be the multiples of 3M=30cm. The cubic geometry of the selected module results in the mutual characteristic of the components to be used at either direction. This in turn is an important factor in the minimization of element variety.

The 3.60m dimensions of the module allow for the usage of 3 segmented floors of 120m width. Again this value (3.60x3.60) determines the dimensions of the room. In this situation, the following values are obtained for the households in regard to the housing areas (m^2) determined before:

- 1 unit 3.60x3.60m = 12.96m²
- 2 units 25.96m² - 1 person household
- 3 units 38.88m² - 2 person household
- 4 units 51.84m² - 3 person household
- 5 units 64.80m² - 3 person household
- 6 units 77.76m² - 4 person household
- 7 units 90.72m² - 5 person household
- 8 units 103.68m² - 5 person household

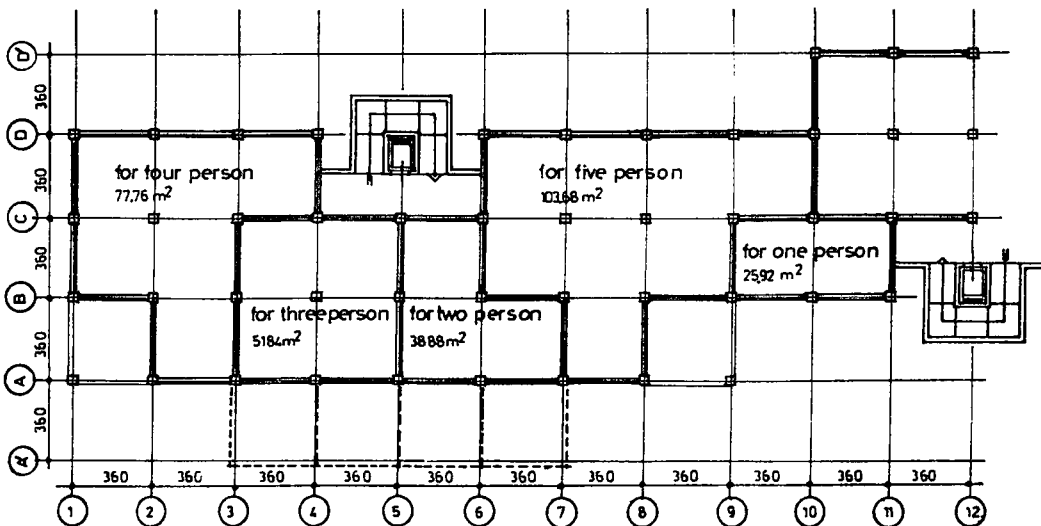


Figure 4.9 Housing types, composed of 3.60x3.60m square units

Figure 4.9 displays the housing types, composed of 3.60x3.60m square units. When we examine these housing units, the ‘allowing for free plan organization’ thought as one of the factors proposed in the adaptable design housing model, is bruised with the existence of columns. In addition to this, since the 3.60m dimension is a small distance, the column and beam elements’ dimensions will also be small. Yet the element number (column, beam, floor) will increase.

EXAMPLE 2: Along with the above presented example, let us consider - as a second proposal - the formation of housing units with units of wider distance. We might determine a 6.00x6.00m distance as a multiple of 3M within the multi-storey housing structure composed of column + beam + floor. In this case, we obtain values close to the housing areas (m^2) we determined before;

$$25.00m^2 - 1 \text{ person household}$$

$$1 \text{ unit } 6.00 \times 6.00m = 36.00m^2 - 2 \text{ person household}$$

$$53.00m^2 - 3 \text{ person household}$$

$$2 \text{ unit } 6.00 \times 6.00m = 72.00m^2 - 4 \text{ person household}$$

$$3 \text{ unit } 6.00 \times 6.00m = 108.00m^2 - 5 \text{ person household}$$

These housing units are illustrated in Figure 4.10. The distance obtained in this example is greater than that in the first example. Hence, the number of components (column, beam, floor) within the structural system are less. In return, their dimensions and weight are greater. Yet this example allows better opportunity for the free plan organization. For this reason, within the following sections of the study, the second example will be dealt with in detail.

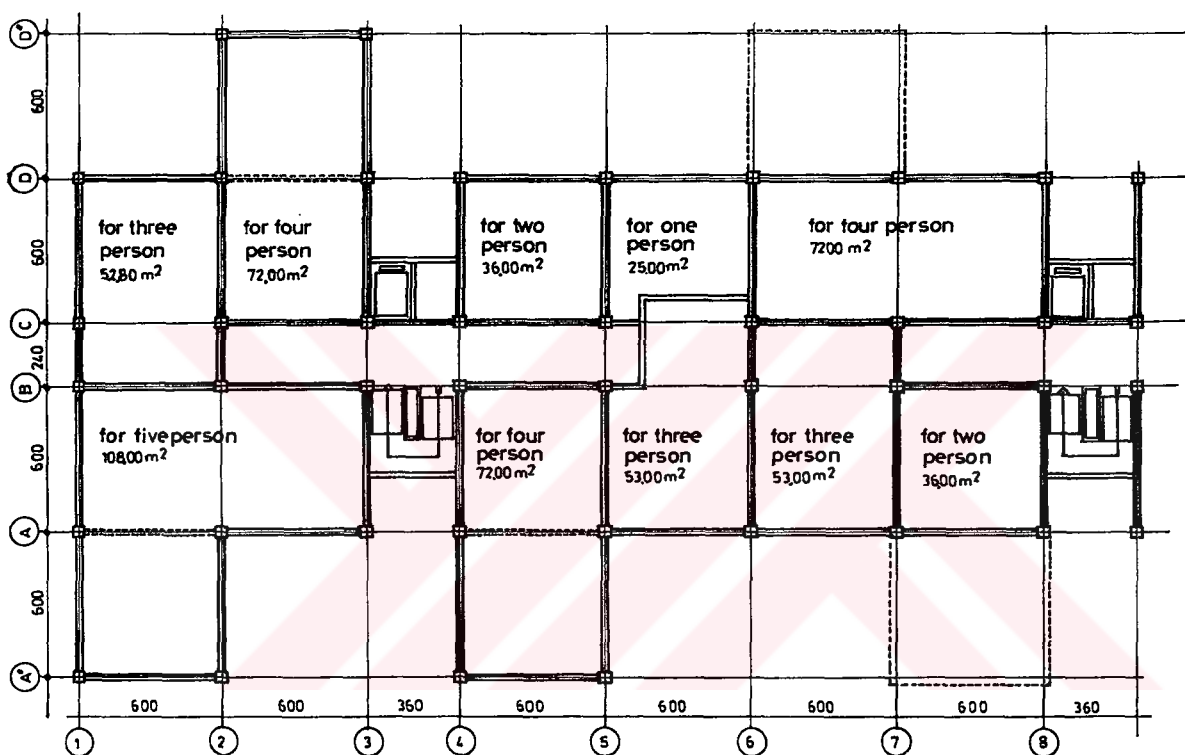


Figure 4.10 Housing types, composed of 6.00x 6.00m square units

Within this study, static computations will not be applied in the determining of the dimensions of the column, beam and floor that make up the structural system. Still, decisions will be made in relation to these dimensions in the frame of certain logic.

Multi-storey applications with prefabricated skeleton systems -especially those applications in earth quake regions- are reinforced with curtain elements. As these curtain elements can be obtained through conventional methods, they can also be manufactured in a prefabricated manner. A majority of the horizontal loads that influence the structure

are born of earth quake effects. In respect, the structure is reinforced with concrete curtains and an effort to maintain its stability against earth quakes is made by meeting the majority of the horizontal loads with these curtains and conveying a very little portion of the loads to the frames. Such approaches are undoubtedly logical within themselves. Yet, these types of applications violate the 'prefabricated structural system models composed of concrete bar elements' in terms of their qualities. Concrete curtains are included in the 'curtain frame' system supported by prefabricated curtains and comprise a different category with both their systematic behavior and their static computations. Hence, these concepts are completely diverse to the scope. In addition to this, the bearing of the earth quake loads at large to the curtain elements results in the qualification of the bar elements - which are the main element of this type of system - as a secondary system element in terms of their load bearing characteristic.

In both the examples, floor elements of 120cm width have been used. The cavities within these floor elements will be used as canals for the installations. The usage of 120cm wide segmented floors in the 6.00x6.00m square modules allows for the facility of both the production of these components and their mounting. The production, transportation and mounting of the 6.00x6.00m single piece floor component will introduce problems. Figure 4.11 displays the plan illustrating the column, beam, floor types and layouts.

With the consideration that the column dimensions determined before as 30x30cm will not be adequate for the 6.00m distance and 5 storey height, the column dimensions have been determined as 40x40cm.

As the beam dimension the 30x40cm rectangular beam manufactured in the market will be used. The cavities within the floor elements to be mounted on these rectangular beams will be used as canals on the horizontal plane for installations. For this reason, in order to maintain the continuity of the canals, the floor has to be mounted upon the beams in a free manner. 'T' or 'L' type beam elements will disturb this continuity. The

direct mounting of the floor upon the beams will maintain production, mounting and installation facility.

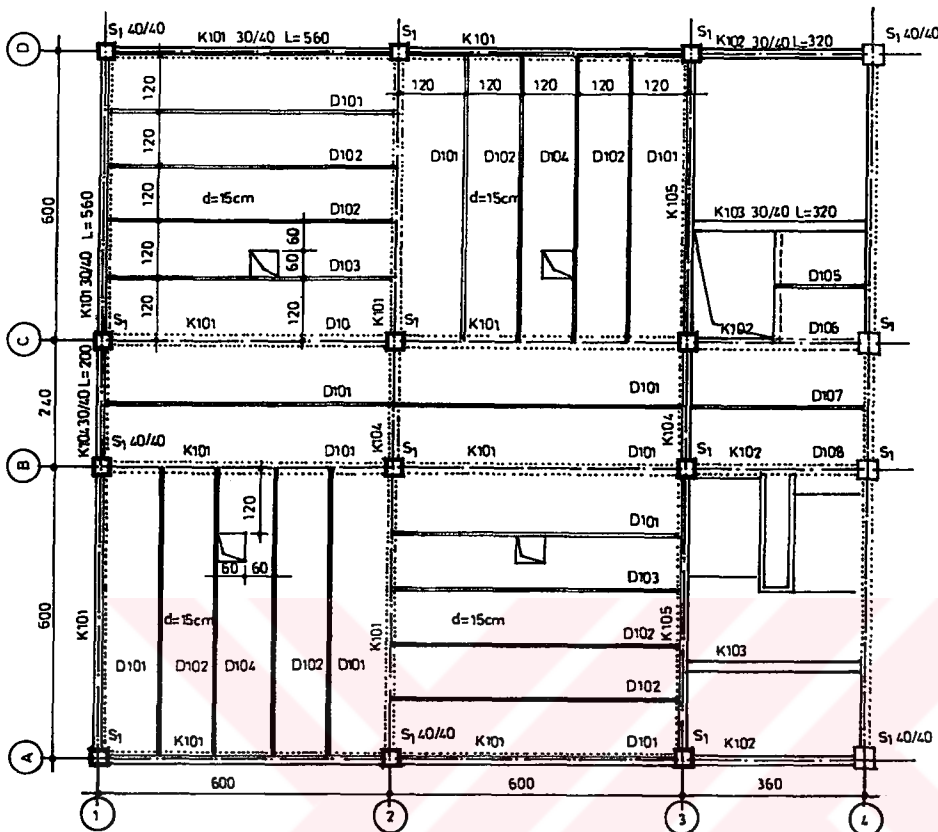


Figure 4.11 The plan illustrates the column, beam, floor types and layouts

The panel elements without bearing characteristics to be used as wall elements should be capable of providing for modifications during the inhabitancy and renewal phases of the housing and should also be endowed with detail solutions. So as to satisfy the change and modification of the layout of the wall elements during the inhabitancy phase of the housing, these elements should be of segmented element quality and should be light components that do not require heavy duty labor. The 60cm wide AAC (gas concrete) panel elements produced in the market could be used. Yet, junction points form at every 60cm on the surfaces composed of these elements. For this reason, the mounting labor of these elements increases. The junctions of a multi segmented surface should have care emphasized upon them; especially in housing to take place in an earth quake region.

The 60cm dimension of the AAC (gas concrete) panels is a standard production dimension. When inquired, these panels could be manufactured at 120cm width. In other words, with the removal of a panel on the wall surface, inter-access between the spaces will be achieved.

Another alternative is the usage of 120cm wide prefabricated hollowed panel elements as partition wall elements. The cavities of these panels allow for the passage of horizontal installations (e.g. electricity). In this manner, connection or outlets to these installations passing through the cavities can be obtained from any desired point on the wall surface. Yet, these panels with cavities require machine power during their modifications due to their weight.

When the two alternatives are compared in terms of their demounting characteristics, the AAC (gas concrete) panels are more advantageous due to their light weight. Yet these elements may be damaged during the demounting process. For this reason, so as to avoid damage to the panels during mounting, it is necessary to take precautions at the junction points. Special manufactured 120cm wide AAC (gas concrete) panels will be used as partition wall elements. It is possible to form a sandwich wall by inserting an isolation layer between two AAC (gas concrete) panels. The sandwich types of panel elements with cavities will be used on the facade. 5 of these elements of 120cm width have to be placed in the same direction. These panels are situated outside, in facade of the system components (column, beam, floor). For this reason, the system axis of this structure has been determined as 6.00m x 6.00m. The production of the columns according to the total storey height is necessary in terms of stability. For example, the transportation and mounting of a 5 storey high (approximately 15m) column is not economic. For this reason, the columns should be manufactured at one storey height and should be made rigid at the site.

Using of crane is necessary during the montage process of column, beam, floor and facade panels of dwelling. Man power is going to be enough for the setting of partitive panels at interior spaces.

4.3.1. ADAPTABILITY WITHIN THE HOUSING UNITS (Table 4.3)

Previously we had examined the adaptable design housing model under three headings. The possible technical solutions were studied under these headings. In this section, the planning solutions of the previous studies will be presented.

Table 4.3 Adaptability within the housing units

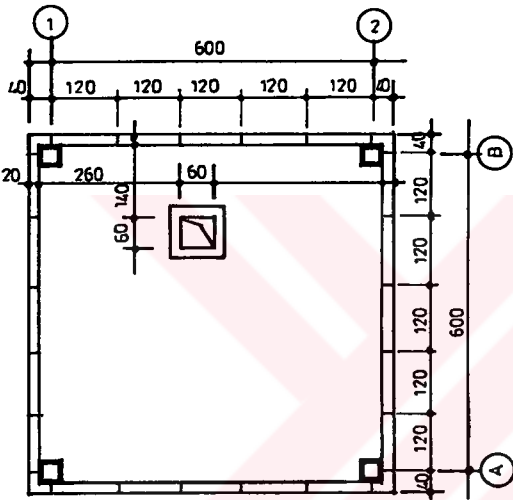
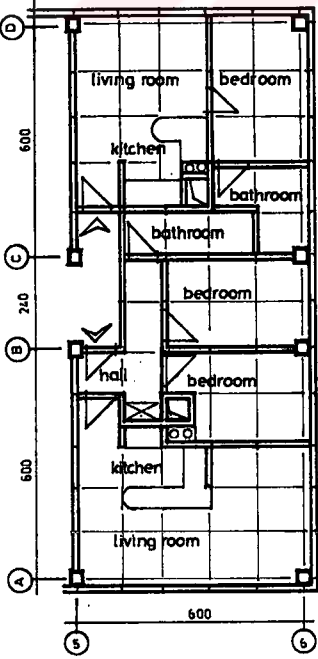
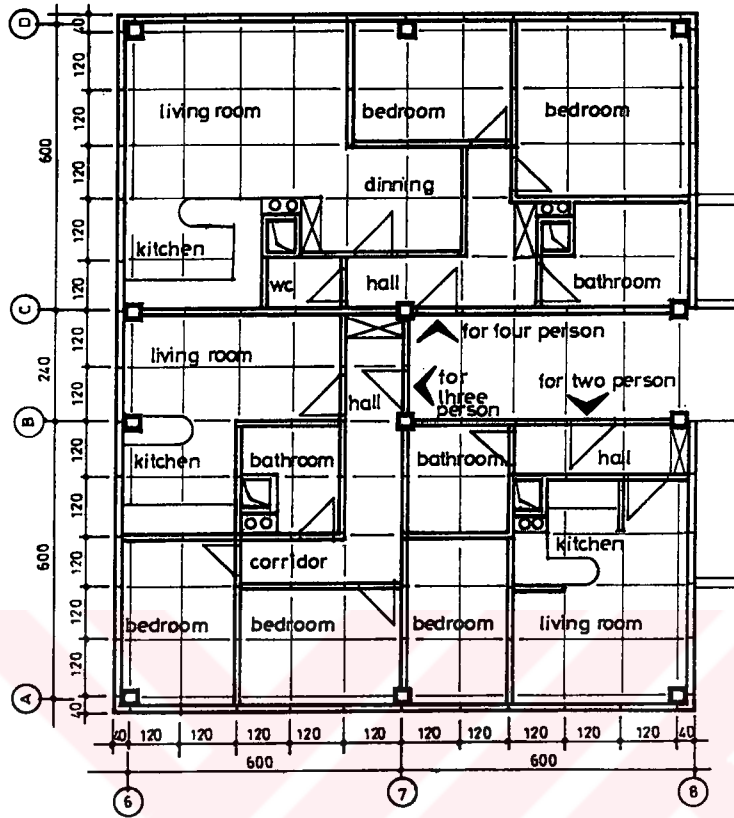
Table 4.3-1 1	INSTALLATION SOLUTIONS COMBINED WITH FREE PLAN ARRANGEMENTS
	<p>The situating of wet spaces (bathroom, WC, kitchen) around installation chimney is possible. In this manner, the rest of the spaces (bedrooms, living rooms) can be organized freely. The hole located within the floor elements necessary for the installation chimney can be prepared during the production of these components.</p>
	<p>The various m² housing types serving various household populations (for one person, for two person, for three person and for four person) are displayed in following figures.</p>

Table 4.3-2
1 **INSTALLATION SOLUTIONS COMBINED WITH FREE PLAN ARRANGEMENTS**



2 **FLEXIBILITY OF INHABITANCY THANKS TO SIMILAR DIMENSION SPACES - MULTIPLE RELATIONSHIPS AMONG THE ROOMS**

Similar sized spaces and the function of the spaces will be apt for modification during the inhabitancy phase of the housing.

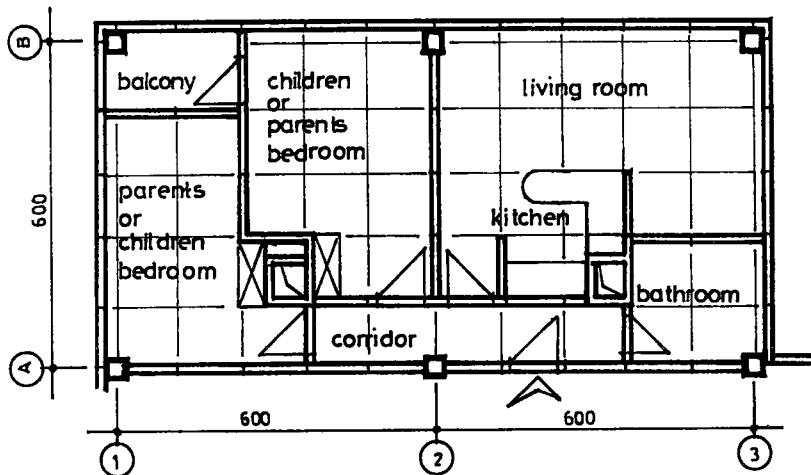
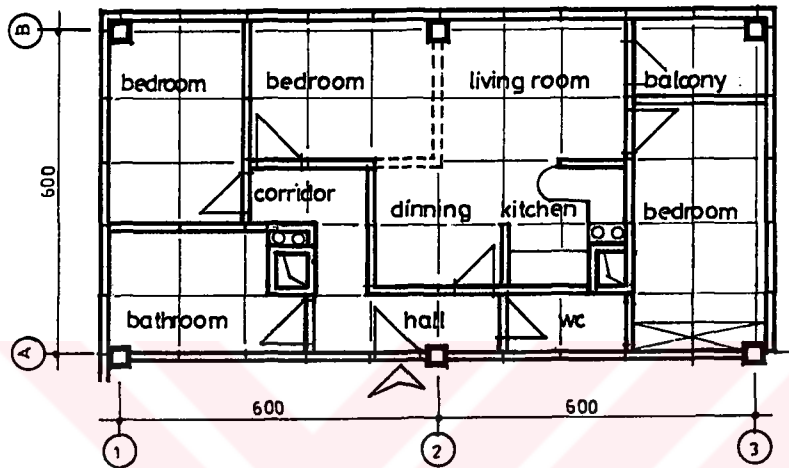


Table 4.3-3	MULTIPLE RELATIONS AMONG THE SPACES USING MOBILE WALL PARTITIONS
3	

Different access between rooms will be maintained during the inhabitancy phase with the mounting or dismantling of the 120cm wide panel elements. Different plan compositions will be maintainable.



4	ADAPTABLE KITCHEN AND BATHROOMS
---	---------------------------------

The counters and closets located in the kitchen space should be of a demountable quality. The kitchen spaces have been considered as open kitchens within the layout plans. According to the household numbers, an increase in the number of WC and bathrooms is possible.

4.3.2. ADAPTABILITY AMONG THE HOUSING UNITS (Table 4.4)

Table 4.4 Adaptability among the housing units

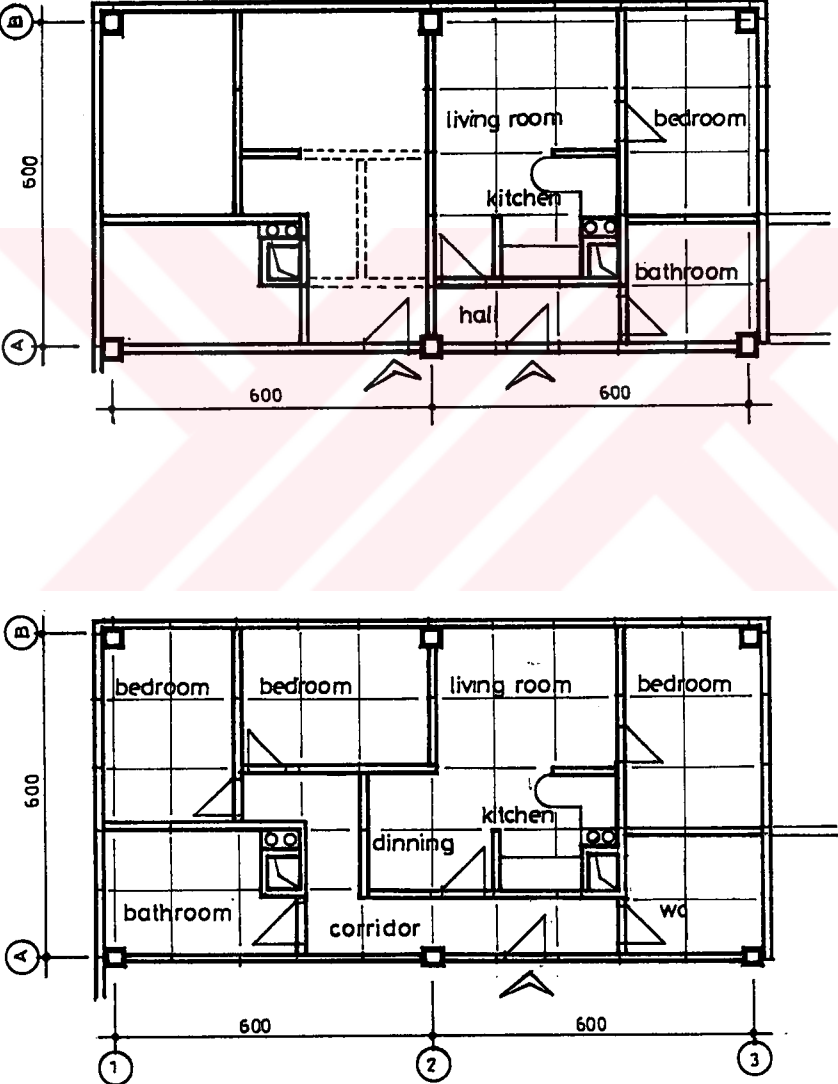
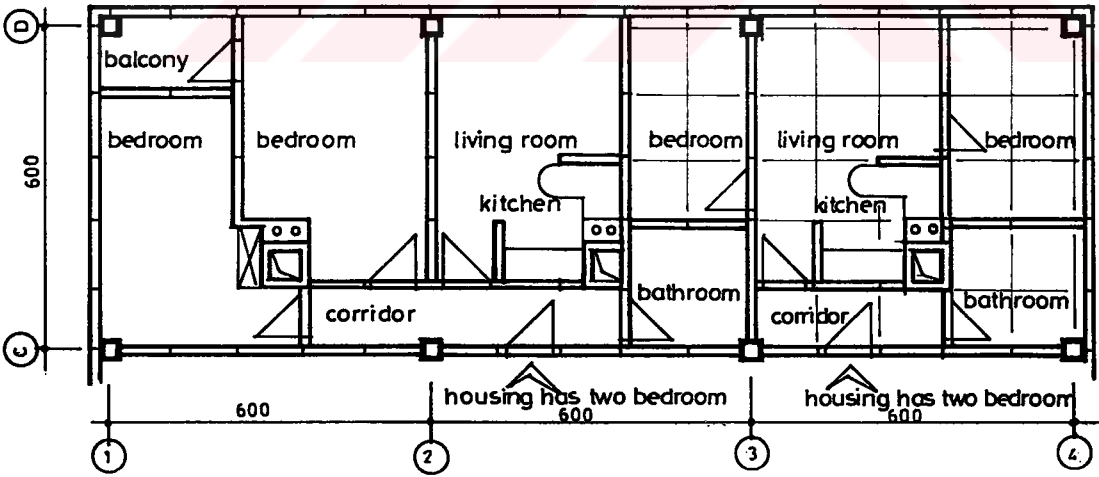
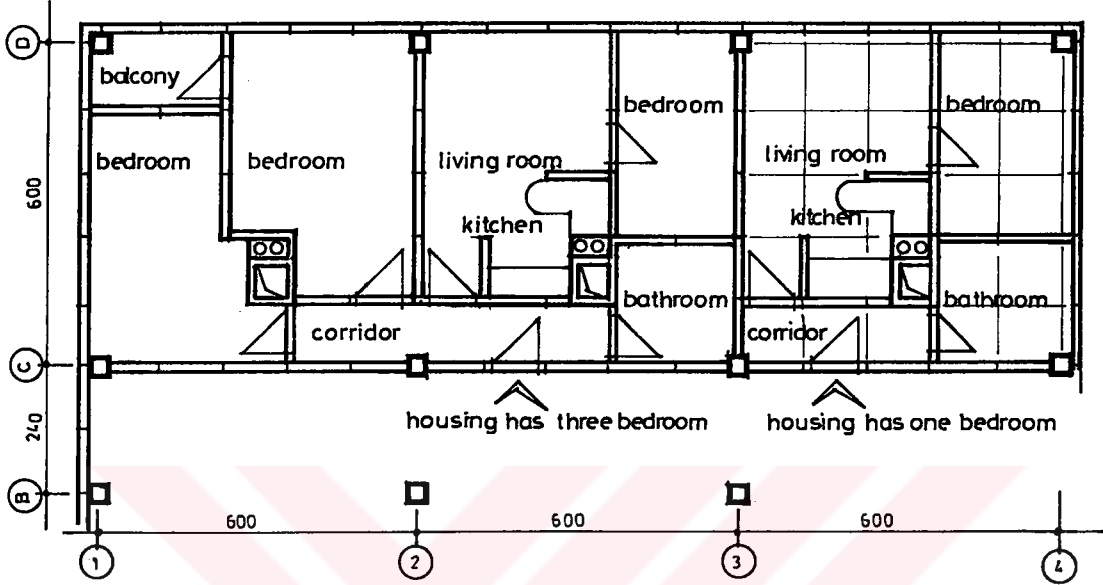
Table 4.4 -1 1	COMBINABLE HOUSING UNITS - UNSTEPPED CONSTRUCTION COMPATIBILITY
<p data-bbox="220 555 1117 589">Dwelling units may combined by movability of partitive wall elements.</p> 	

Table 4.4 -2
2 THE ROOM EXCHANGEABLE BETWEEN THE HOUSING UNITS

Room interchangeability within the housing units, is possible.



4.3.3. ADAPTABILITY BETWEEN THE HOUSING UNITS AND INTERNAL AND EXTERNAL FEATURES (Table 4.5)

Table 4.5 Adaptability between the housing units and internal and external features

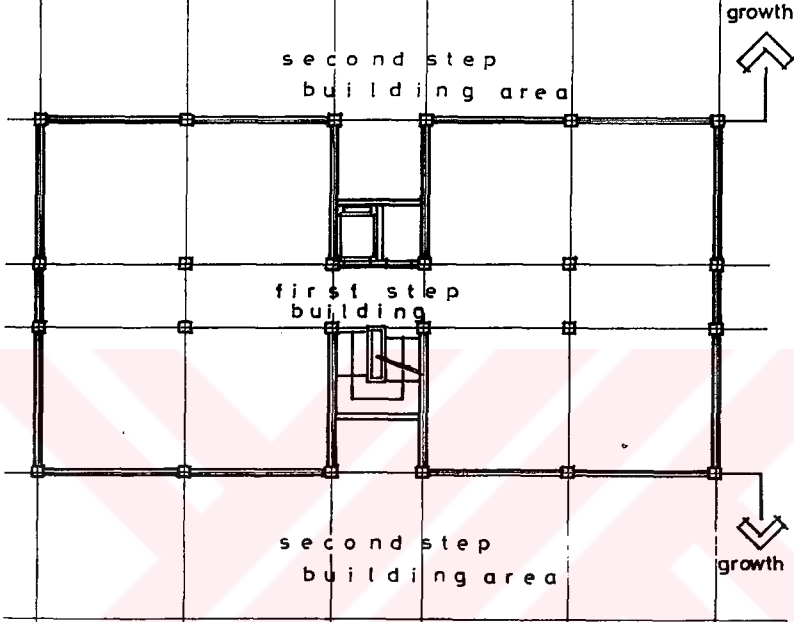
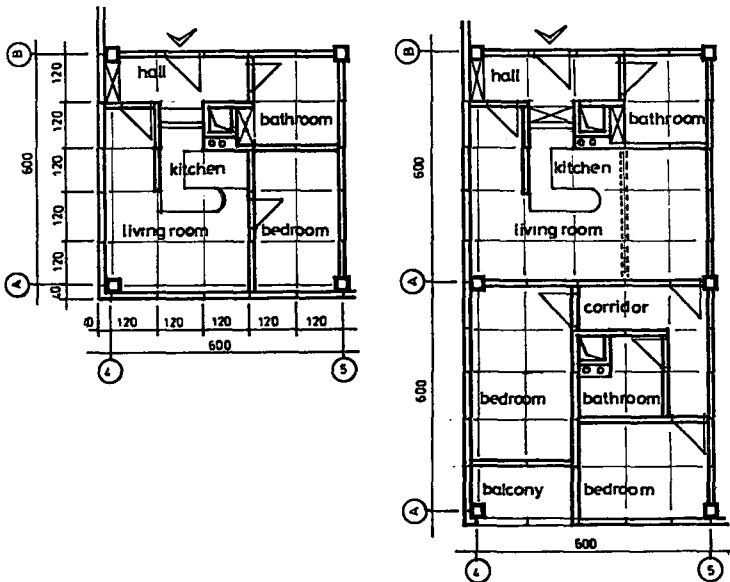
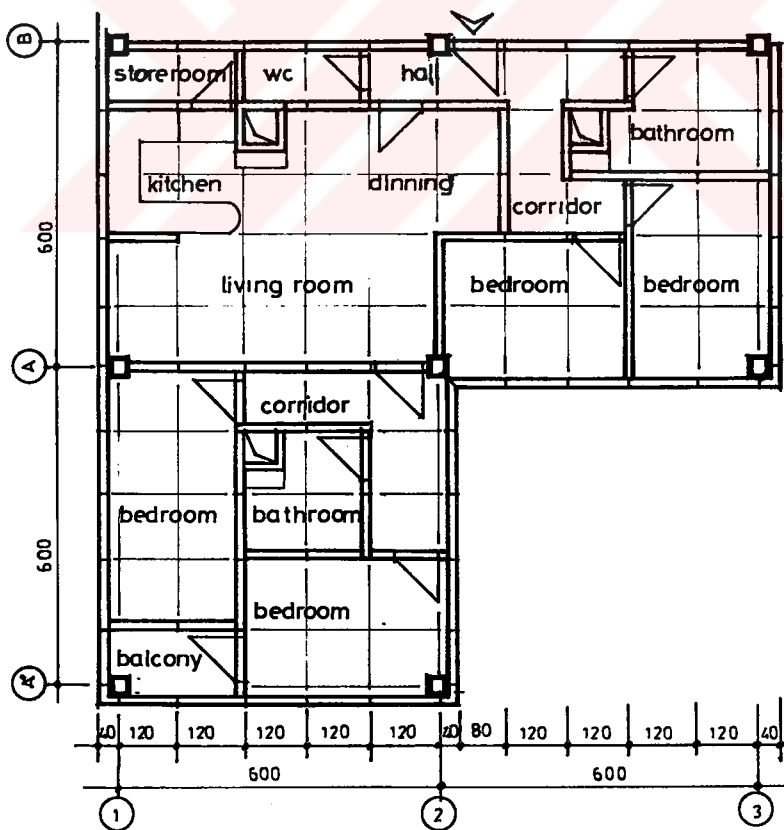
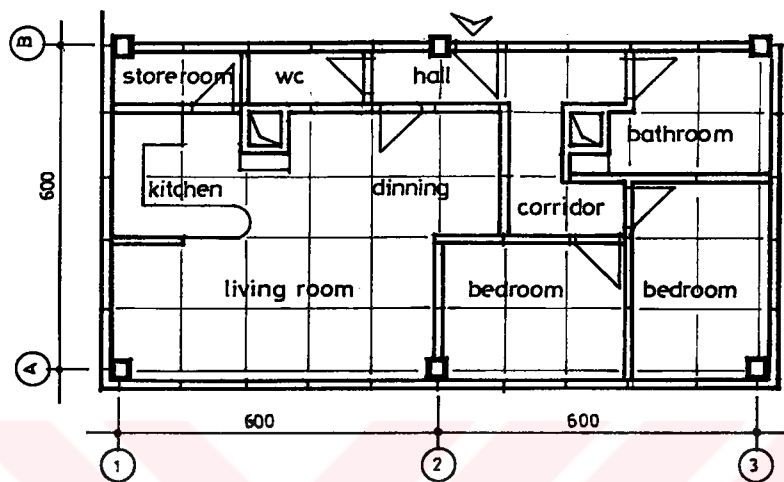
Table 4.5 -1 1	EXPANDABLE HOUSING UNITS - GRADUAL CONSTRUCTION CAPABILITIES
	
<p>Following figure displays the transformation of a 36m² two person household flat to a four person household form with the addition of a new 6.00m x 6.00m unit to the structure.</p>	
	

Table 4.5 -2	EXPANDABLE HOUSING UNITS - GRADUAL CONSTRUCTION
1	CAPABILITIES

By following figure, the transformation of a four person household to a 5 person household form with the addition of a new unit is displayed.



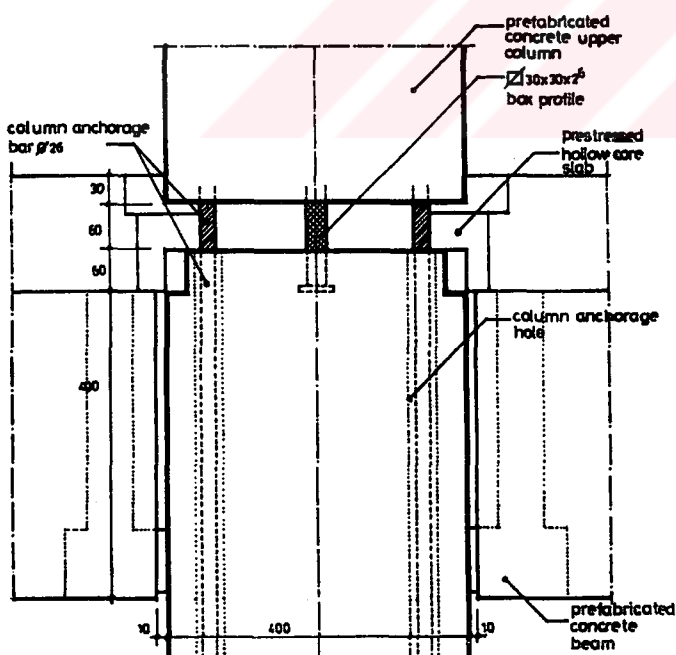
4.4. JUNCTION POINT SOLUTIONS

So as to bring distinction to the complex 'node point detail works', it is necessary to consider the element relations separately as; column + beam (+ facade panel), beam + beam (+ facade panel), column + column, floor + floor (+interior partition panel), floor + beam (+interior partition panel); to study these relations in terms of

- . geometric solution shapes,
- . static-constructive junction possibilities;

and to examine them with various characteristics. In the geometric solutions of the details, decisions are made taking into consideration of criteria related to;

- . Production, transportation and mounting facilities,
- . Installation and detail structure relations,
- . Designer-user desires,
- . Modular coordination principles,
- . Static-constructive connection types.



Column+Column Connection:

The columns produced at one storey height are made rigid during mounting as is shown in Figure 4.12. The segmented columns have been designed as elements bearing the horizontal loads and the vertical loads that are inherited according to the layout proportion of the designed structure model. The inter-connecting of the columns is maintained through the filling of the

at the base of the columns into these sockets (Yesügey, C., n.d.).

Column + Foundation Connection:

The columns are freely placed into the sockets located on the foundations and are connect with the reinforcement of concrete.

Column + Beam Connection:

The dimension and equipment of the beams are completely of free abutment and in a form that is liable of conveying both vertical and horizontal loads safely. Their dimensions are 30cm x 40cm x 5.60m.

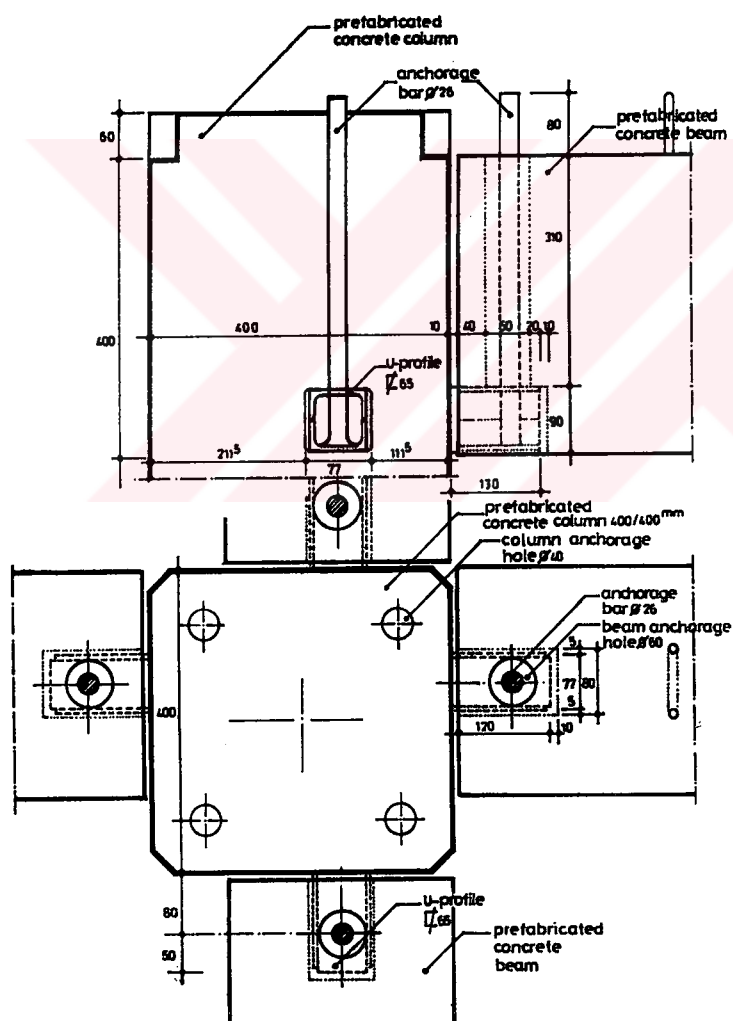


Figure 4.13 Column to beam connection

The beams are connected to the gusset at the ends of the columns with cogs through the usage of double anchorage bars and the connection point is filled with high quality mortar (Figure 4.13). Also, the clamping equipment in the hairpin form left on the columns are connected and concrete is applied, thus, along with the beam-column connection, the whole building is completely braced at all storey levels.

Floor + Floor Connection:

The floor is mounted on the beam elements side-by-side in a free supporting way and are united with wet connections from end to end with the maintaining of the necessary equipment clamps (Figure 4.14).

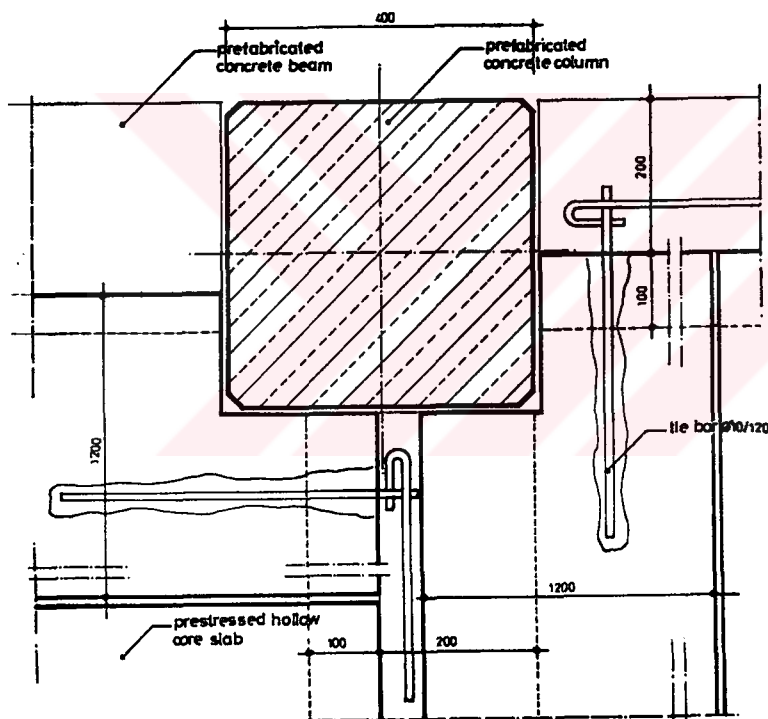


Figure 4.14 Floor to floor connection

The floor elements are 15cm thick and 120cm wide panels with cavities. After the mounting of these panels, 5cm thick topping concrete is poured.

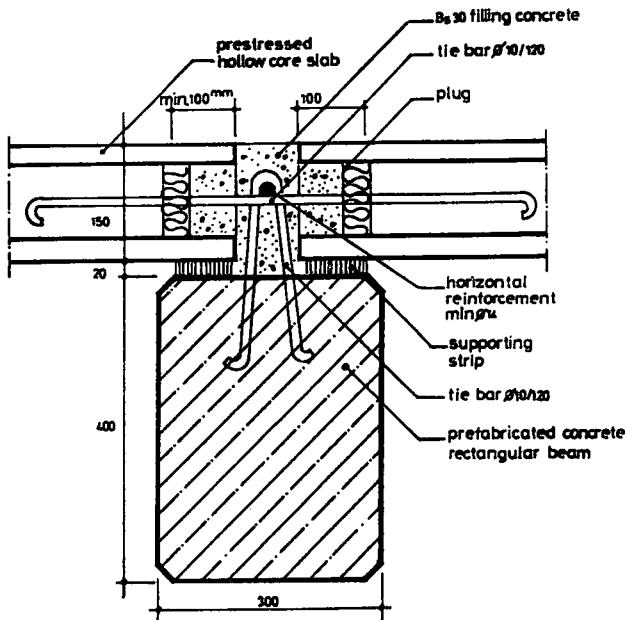


Figure 4.15 Floor to beam connection

Floor + Beam Connection:

Figure 4.15 illustrates the connection of the floor elements at the center beam. In figure 4.17 the connection of the floor element to the corner beam is seen.

The connection bars of the floors set in free abutment upon the beams is connected to the hairpin shaped equipment anchored in the beams and is united with wet connections.

Column + Beam + Floor + Outer Facade Panel Connection:

The facade element-structure relation can be grouped according to the element layouts;

- . The organizing of facade elements in facade of the structure (outer layout)
- . The organizing of facade elements between the structural factors (central layout)
- . The organizing of facade elements behind the structural factors (interior layout)

During the determining of the element layouts, the activity of the mounting connection and especially the structure physical problems should be taken into consideration as well as the aesthetic worries (Figure 4.16).

- a) During the organization of elements between structural factors, heat bridges form within the beam and loss of temperature comes to being. There is the danger of water infiltration through the cracks in the beds.
- b) The covering of the column or curtain-wall surface with only a concrete layer does not maintain sufficient heat isolation.

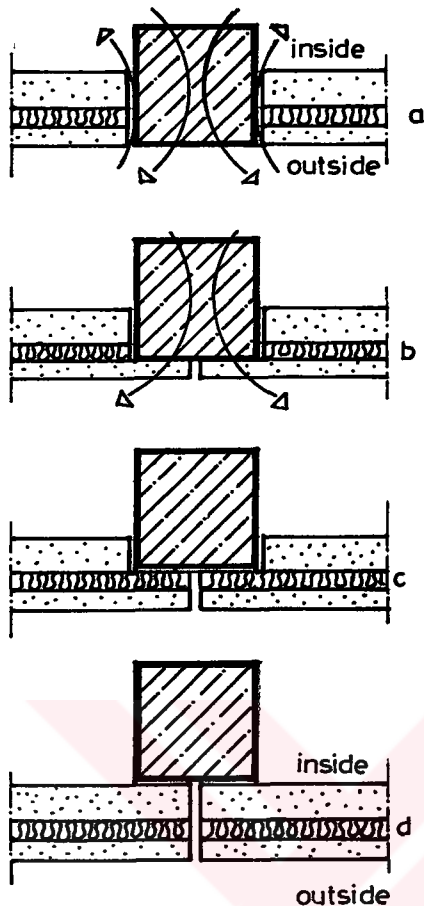


Figure 4.16 The location of facade panels

that it is a nicely solved detail in terms of the structure's physical properties. 12cm thickness is enough for the panel element.

Also, the option of 'd' is increasing the amount of panel element type which is used to be at facade. When 5 type of panel necessary in option 'c' 3 kind of panel are necessary in option 'd'.

Figure 4.17 shows the bolt linkage of the demountable quality panels. The solution is dry linkage. The sandwich panel elements will be produced at 2.70m length in full sections and 1.40m length at sections with windows.

c) It is an optimum solution in terms of maintaining heat isolation and the protection of the structural factors against external factors. The structure is completely protected against external effects. However, it's only the solution which increase the panel type (kind) amount.

d) It is a nicely solved detail in terms of the building's physical properties yet since the columns overlap to far into the space, it may cause problems related to the usage of the spaces. However, panel kind (type amount) which use at facade, are much less.

Within these solutions, the 'd' alternative has been chosen due to the fact

The sandwich panel element thickness is a total 22cm with the 12cm panel elements with cavities, the 5cm heat isolation layer and 5cm concrete filling. The panel elements are set into the anchor elements at the base and hanged at the top.

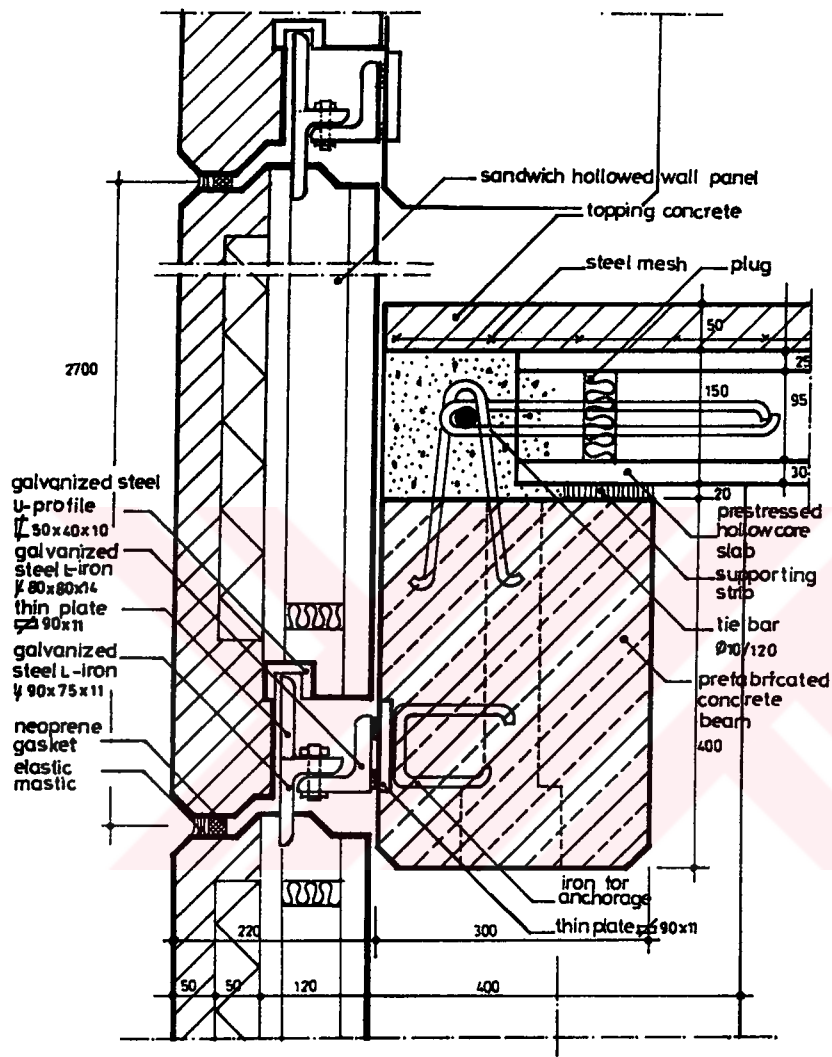


Figure 4.17 The bolt connection of the demountable facade panels

Since there is no need for a long lasting support in the mounting of this type of connection, there is the time saving advantage born of the initializing of load conveyance of the elements with the connecting along with the absence of a waiting period, yet, the manufacturing has to be carefully supervised in terms of dimensions and precautions must be taken against corrosion.

For this reason, the elements used at the connections must be produced from stainless steel material. The relation of these elements with the column and their connection in the other sections are shown at Figure 4.18, Figure 4.19 and Figure 4.20 .

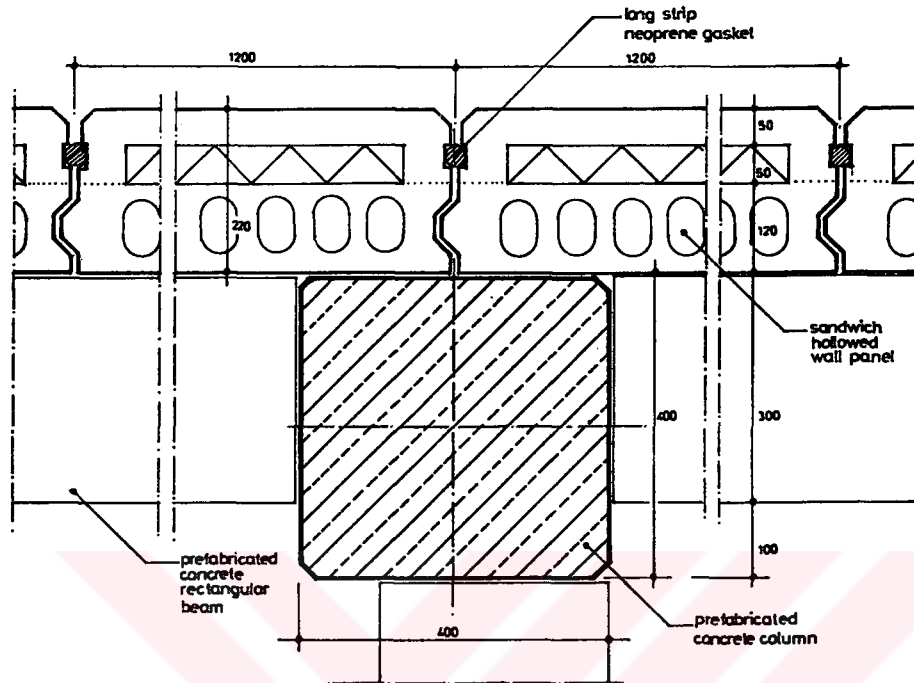


Figure 4.18 The relation of sandwich hollowed wall panel with the column and their connection in the other section.

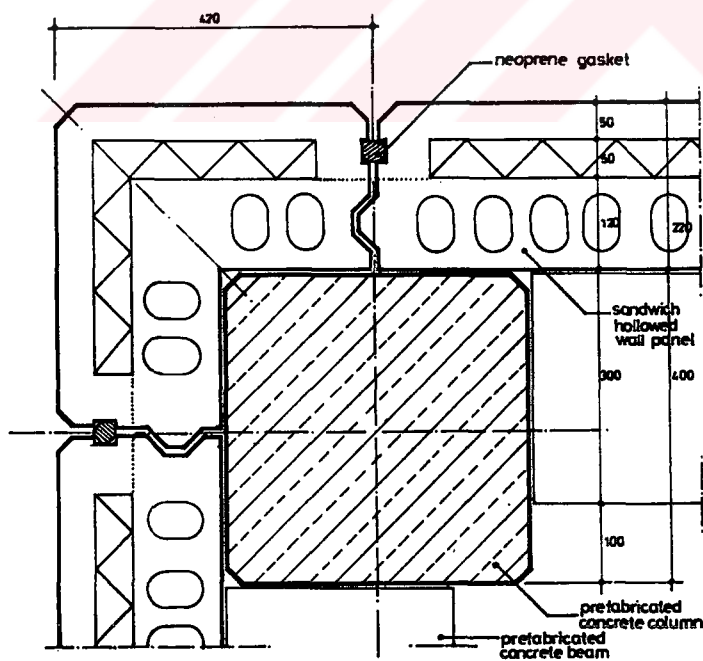


Figure 4.19 The relation of sandwich hollowed wall panel with the column and their connection in the other section.

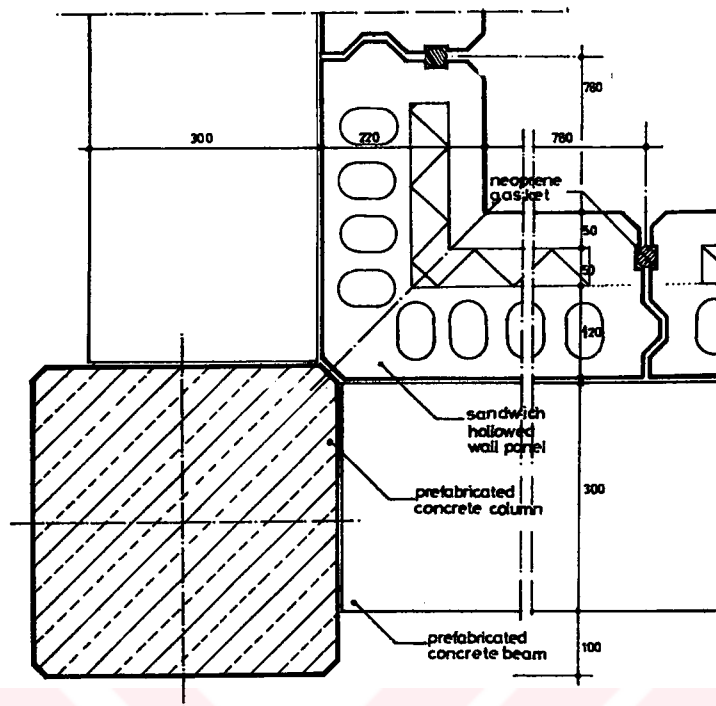


Figure 4.20 The relation of sandwich hollowed wall panel with the column and their connection in the other section.

Column + Beam + Floor + Interior Curtain Panel Connection:

So as to maintain the modifications desired during the usage and renewal stages of the adaptable design housing model, the interior curtain panels have to be detailed with demountable quality.

Figure 4.21 shows the mounting of the 10cm thick, 120cm wide (54kg weighted) autoclaved aerated concrete (gas concrete) panel element into the socket anchored in the prestressed hollow core slab. With this solution, the panel element will be easily demountable. Yet, these sockets have to be mounted on the floor elements at certain distances before the topping concrete is poured.

The socket shaped metal elements are not constant along the whole of the wall. The cross shaped sockets are situated at the junction points of the 120cm grid (Figure 4.22). The whole structure is designed according to the 3M multiple of 120cm. For this reason,

it is possible to move the wall elements along this grid. These cross shaped sockets will be covered with metal lids in the absence of a wall.

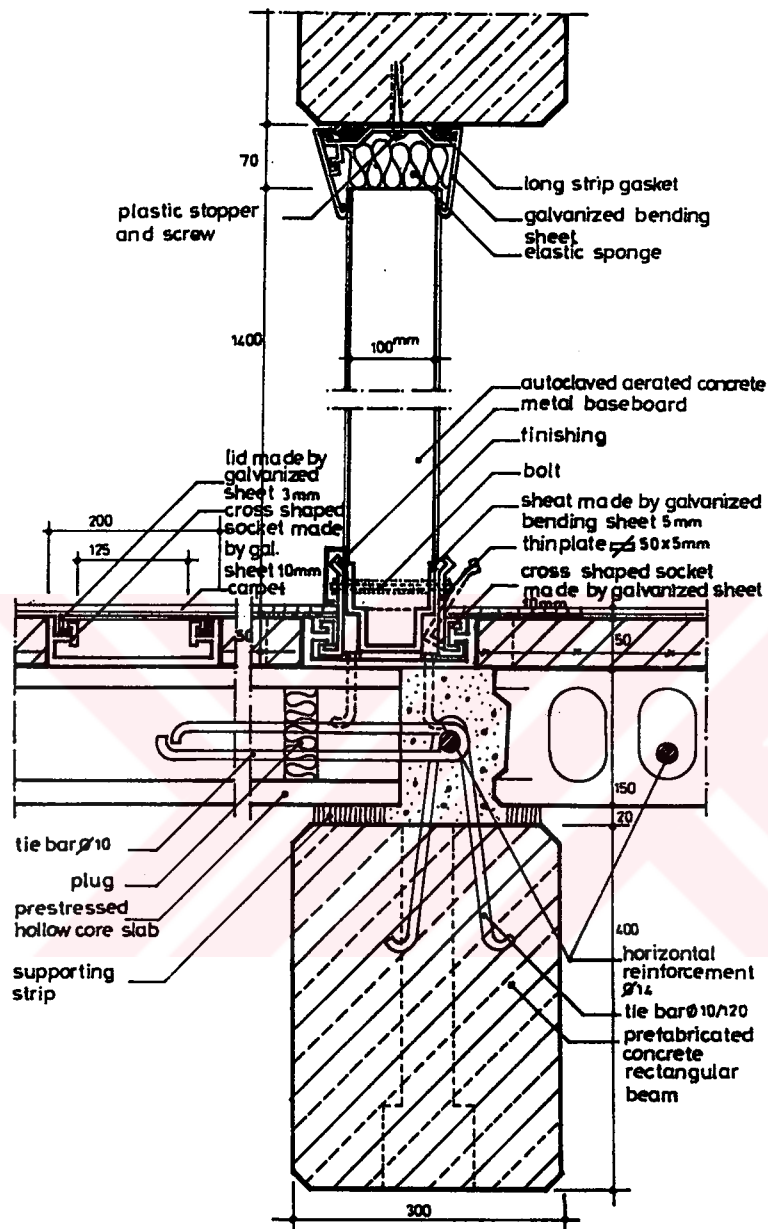


Figure 4.21 The mounting of the AAC (gas concrete) panel components into the socket anchored in the prestressed hollow core slab.

In the adaptable design housing, the whole area except for the wet spaces have to be covered with the same floor. Also, it has to be a type of floor that provides for future modifications.

For this reason, the cheapest and easiest solution has been considered to be the covering of the whole base with rugs.

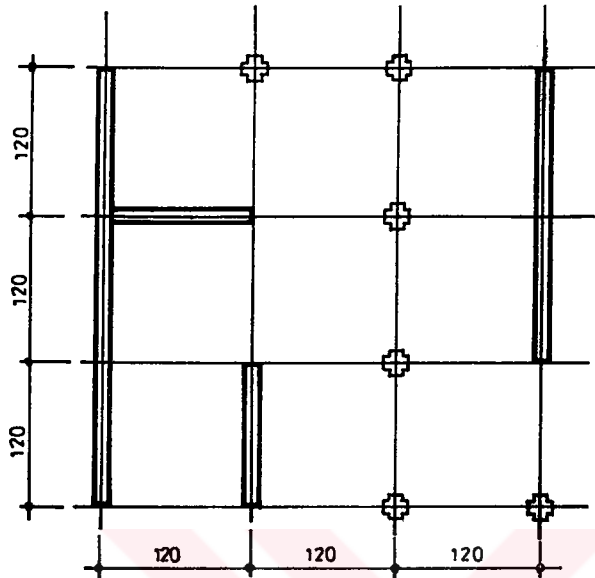


Figure 4.22 The cross shaped sockets are situated at the junction points of the 120cm grid

Interior curtain panels, possess two different lengths according to their situation under-the- beam and under-the-floor. The panels used under the beams are approximately 2.10cm long while the panels to be used under the floor are approximately 2.50cm long. The ceiling connection detail of this element is displayed in Figure 4.21. The connection detail of the panel element to the ceiling have been designed in a manner that allows for the panels to be dismantled in the future.

CHAPTER FIVE

CONCLUSIONS

5. CONCLUSIONS

This study discussed the concept of adaptable design multi-storey within the context of realisation of housing production. The three major chapters of the five chapter study concluded unique outcomes.

The second chapter of the thesis classified flexibility, adaptability, variability purpose studies. According to these classifications especially the interaction between the users and adaptable housing was examined and then flexibility, variability and adaptability-purpose approaches were grouped into three categories and studied. Firstly, limited flexibility solutions which can be realised upon the decisions made in the design phase was determined as initial flexibility of the system; secondly the approaches which are variable in the phase of inhabitancy as organisations flexibility of the system and finally possibility of enlargement and growth as development flexibility of the systems.

Description of adaptable design housing was made using data obtained from these three approaches. Based on this description examination of adaptable design housing approach within the framework of the process of housing production was found necessary. Potential physical adaptability types were determined. The factors which are necessary to realise the use of potential physical adaptability were defined as principles of adaptability. These principles are technical approaches to create adaptability, the use of adaptability, transferring the information of adaptability to the users, or management concept for the ways of transfer and adaptability. The technical approaches needed to

create adaptability were found out. The subject of adaptability uses was studied on the three mass-housing examples applied in İzmir. Comparative analysis was made of interaction between the structural system and spatial characteristics of the housing based on respects of the users, their subjective evaluations and the physical features of the dwellings. According to this analyses;

- . Necessity for the production of the flexibility, variability and adaptability purpose dwellings.
- . Necessity for the production of the dwellings adaptable to the changing demands of the households in the process of time.
- . The necessity for providing the participation of users/households in the process of housing production was emphasised.

A housing model adaptable to changing demands of the users will be able to solve quantitatively the problem of housing in the developing countries such as Turkey. Participation of users/households in the production process will be able to create the housing unit suitable to the structure of the related households.

The necessity for the determining most available construction and bearing system related to the realisation of adaptability-purpose housing model necessity was discovered. For this purpose, the most suitable industrialised construction system was primarily searched for in chapter three. Since they aimed to find social and quantitative solutions to the problem of housing in the adaptable model, fully industrialised construction systems which allow rapid and serial production were decided to be studied. Based on the approach, a comparative analysis was performed in order to establish prefabricated system most suitable to likely variations in future. The technical approaches required to create the adaptability established in the previous chapter were discussed as analysis criteria. This comparative analysis concludes that the prefabricated skeleton system composed of column-beam-floor components have the maximum variability. In the fourth chapter in which adaptable design housing model was suggested, the data decisions determining the housing production were put forward. These data decisions were

established as environmental conditions and programming resolutions. All these factors were examined regarding the realisation of adaptable design housing.

Within the framework of environmental circumstances, management for adaptability participation of users and the ways of transferring adaptability knowledge, acts and related regulations, land area and infrastructure, levels of income, financial resources, housing policies and associated politics, and material and technological possibilities were debated.

The decisions were made concerning the necessity for junction, space and land area modular coordination, and selection of building elements. The suggested model upon the decisions made in this chapter was studied in three levels such as in the whole building, among the housing units and inside the housing units.

Within this study, different plan types have been formed through the presenting of a design model that allows for the realization of the adaptable design housing. With the formation of a modular system, flexible plans serving households of various population have been produced. Wall elements that may be moved during the usage process of the housing and detail solutions that provide the modification of the spaces within the housing have been developed. Detail solutions that allow for the expansion of the housing unit with the addition of a new structure once again during the usage and renewal processes of the housing have been developed. Gradual expansion is technically possible. In terms of the laws and regulations on the other hand, it will be maintainable with the long term easement contracts established in relation to the payment plan and feasibility plans determined before hand.

The consequences obtained by this study can be summarised as follows;

Housing adaptability is a complex topic which can be observed from different view points. In this dissertation adaptability is seen as potential of possible uses and as a process of use.

By doing so it is proved that adaptability in its physical aspect is only a part of the story; even within this aspect the technical approaches are varied and complicated.

Communication, ownership and management are all important factors which define the success of adaptability. When designing adaptable housing, at least the following recommendations should be taken into consideration;

It is very important to develop the idea of adaptability early in the building programming phase. Certain solutions of adaptability are useful only in certain situations.

Application of any ideas of housing adaptability should be combined with careful consideration of the specific requirements and conditions.

The appropriate solution should be found only after several questions are answered, such as. Adaptability for whom? For which time-period of usage? With what kinds of possibilities and constraints, for instance, materials and costs? How should the adaptability be managed? etc.

Cooperation among architects, manufacturers, managers and households is necessary for successful application of adaptability. The knowledge of adaptability as a quality and the way of using this quality must be shared by all the people involved.

Several adaptability approaches should be possible in one building. Some adaptability is used during the construction phase, the changeable flat size, for instance; some in the future, changeable multi-storey housing layout, for instance. Some adaptability for changes in the inhabitancy phases, changeable cabinets for instance.

Adaptability should be easy. Adaptability tends to be well used when the households can do-it-themselves.

The management for housing adaptability should be well prepared especially for forms of adaptability which need physical changes.

Misunderstanding and misuses of these flexible elements can happen, if the management fails to make clear how to use them by household contract. Appropriate management not only puts restrictions on how to use the flexible elements, but gives also proper introductions and technical assistance.



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APPENDIXES

Appendix 1

Questions of Survey Method

Anket çalışma tarihi: Mayıs 1988

Anket yöntemi: Gelişigüzel seçim

Anket Soruları

1. Blok ve Hane numarası:.....
 - b)Salon mutfak ilişkisi; İyi değil(),İyi()
 - c) Mutfağın balkona bakması;İyi değil() İyi()
 - d) Mutfağın ışıklığa bakması;İyi değil() İyi()
 - e) Banyo ile odalar ilişkisi; İyi değil(), İyi()
 - f)Diğer.....
2. Aile fertleri sayısı;
 - a)1(),b) 2(),c) 3(), d)4(), e)5(), f) 6()
3. Kaç yıldır bu evde oturuyorsunuz;
 - a) 1-3yıl (), b) 4-6yıl ()
 - c) 7-10yıl (), d)10 yıldan fazla ()
4. Eviniz;
 - a) Kira (),
 - b) Size ait ()
 - c) Yakınlarınızdan birine ait ()
 - d) Diğer.....
5. Evinizin salon dışında oda sayısı;
 - a) 1(), b)2(), c)3()
 - d) 4(), e)5()
6. Mekan sayısı yeterlimi?; Evet (), Hayır ()
7. Mekan büyüklükleri yeterlimi?; Evet (), Hayır ()
8. Mekanlarınızın yerleşiminden memnun musunuz?; Evet (),Hayır ()
9. Nedeni;
 - a)Oturma odası mutfak ilişkisi; İyideğil(), İyi()
10. Bu evde oturmaya başlamadan önce tasarım ve yapım aşamalarında eviniz ile ilgili kararlarda katılımı buldunuz mu? Evet(), Hayır()
11. Cevabınız evet ise bunlar nelerdir?;
 - a) Mutfak bankosunun yerinin belirlenmesi;()
 - b)Mutfak bankosunun tipinin ve mermerinin seçimi; ()
 - c)Mutfak, banyo ve Wc'nin seramiklerinin seçimi; ()
 - d)Banyo ve Wc'nin klozet, lavabo, küvet/duş, ve armatürlerinin seçimi;()
 - e)Oda büyüklüklerinin belirlenmesi;()
 - f)Oda konumlarının belirlenmesi;()
 - g)Salon ve odaların duvar, döşeme kaplamalarının seçimi;()
 - h)İç kapıların tip ve renklerinin seçimi;()
 - i)Diğer,.....
12. Evinizi alırken, ödeme koşulları size uygun muydu?; Evet (),Hayır()

13. İstedığınız oda sayısı ve oda büyüklüğüne sahip evi alabildiniz mi?;Evet (),Hayır ()

14. Bu evde oturmaya başladığınızdan bu yana evinizde herhangi bir değişiklik yaptınız mı?; Evet (), Hayır ()

15. Cevabınız evet ise; bunlar nelerdir?;

- a)Mutfak balkonunu kapatarak mutfakı büyütmek;()
- b) Balkonları ve pencereleri kepenk ile kapatmak;()
- c)Salon balkonunu kapatarak salonu büyütmek;()
- d) Oda balkonunu kapatarak odayı büyütmek;()
- e) Mutfak tezgahını ve dolaplarını yenilemek;()
- f) Mutfak tezgahının yerini değiştirmek;()
- g)Mutfak duvarını yıkarak salona/odaya bakan bir açık mutfak haline getirmek;()
- h)Diğer.....

16. İmkancınız olsaydı, evinizi daha kullanışlı

hale getirmek için nasıl bir değişiklik yapmak isterdiniz;

- a)Mutfak balkonunu kapatarak mutfakı büyütmek;()
- b) Balkonları ve pencereleri kepenk ile kapatmak;()
- c) Salon balkonunu kapatarak salonu büyütmek;()
- d) Oda balkonunu kapatarak odayı büyütmek;()
- e) Mutfak tezgahını ve dolaplarını yenilemek;()
- f) Mutfak tezgahının yerini değiştirmek;()
- g)Mutfak duvarını yıkarak salona/odaya bakan bir açık mutfak haline getirmek;()

h)Diğer.....

17. Mutfak, banyo, wc gibi, servis mekanlarında sorununuz var mı?; Evet (), Hayır ()

18. Cevabınız evet ise, bunlar nelerdir?;

- a) Mutfak mekanı ışıklığa bakıyor;()
- b) Mutfak mekanı küçük, yetersiz kalıyor;()
- c) Mutfak dolapları yeterli değil;()
- d)Kat kaloriferi kazanı için ayrı bir mekan düşünülmemiş;()
- e) Banyoda duş teknesi yerine küveti tercih ederim;()
- f)Banyoda küvet yerine duş teknesini tercih ederim;()
- g) Banyo dışında, ayrıca bir ebeveyn banyosu yapılmış olması gereksiz;()
- h) Banyo dışında, ayrıca bir ebeveyn banyosu yapılması gereklidir;()
- i)Diğer.....

19. Isınma sorununuzu nasıl çözdünüz?;

- a)Merkezi ısıtma(),
- b)Kat kaloriferi(),
- c)Soba (),
- d)Diğer,.....

20. Isınma sorununuzu çözüm şekliniz yeterlimi; Evet (), Hayır()

21. Kat kaloriferi kullanıyorsanız. Kalorifer kazanını yerleştirmek için başka bir mekan -örneğin wc-bozdunuz mu? Evet(), Hayır()

22.Yaz aylarında eviniz aşırı sıcak oluyor mu? Evet(), Hayır()

23. Serinlemek için klima, spilit gibi çözümlere gittiniz mi?; Evet (), Hayır ()

24. Cevabınız evet ise ne kullanıyorsunuz?;

- a) Spilit (), b) Klima (),
c) Vantilatör ()
d) Diğer.....

25. Klima yada Spilit kullanıyorsanız, daha önceden tesisatı, duvarda takılabileceği yer mimar/müteahhit tarafından düşünüp, belirlenmiş miydi? Evet (), Hayır ()

26. Güneş, rüzgar vb. iklimsel etkiler bakımından evinizin konumundan memnun musunuz?; Evet (), Hayır ()

27. Cevabınız hayır ise, nedeni;

- a) Kışın az , yazın çok güneş alıyor ()
b) Kışın çok rüzgar alıyor ()
c) Yağmur yağınca çatı akıyor ()
d) Yağmur yağınca duvar sıvaları/kağıtları kabarıyor ()
e) Yağmur yağınca balkon kapısından içeriye su giriyor ()
f) Işık az aldığı için ev karanlık oluyor ()
g) Diğer.....

28. Evinizde istenmeyen sesler (gürültü), örneğin komşularınızın sesleri yada sokaktan gelen sesler rahatsız edici nitelikte mi?; Evet (), Hayır ()

29. Yanıtınız evet ise,

- a) Gürültü dış duvarlardan geliyor ()
b) Gürültü iç duvarlardan geliyor ()
c) Gürültü döşemeden geliyor ()
d) Gürültü tavadan geliyor ()
e) Gürültü pencere ve balkon kapısından geliyor ()
f) Gürültü hane kapısından geliyor ()
g) Gürültü tesisat boşluğundan ve havalandırma bacalarından geliyor ()
h) Gürültü ışıklık mekanından geliyor ()

i) Diğer.....

30. Evinizde size, duvarları hareket ettirerek mekanlarınızın yerlerini değiştirme yada genişletme imkanı verilseydi. Ne yapmak isterdiniz;

- a) Oturma odasını büyütmek ()
b) Oturma odası ile mutfağı birleştirmek ()
c) Salon ile mutfağı birleştirmek ()
d) Mutfağı genişletmek için balkonu kapatmak ()
e) İki odayı birleştirip daha büyük bir oda elde etmek ()
f) Salonu küçülterek bir oda daha kazanmak ()
g) Wc'yi iptal ederek banyoyu büyütmek ()
h) Wc'yi iptal ederek mutfağı büyütmek ()
i) Diğer.....

31. Bu evin ilk kullanıcısı mısınız?; Evet (), Hayır ()

32. Cevabınız hayır ise, sizden önce oturanlar evde herhangi bir değişiklik yapmışlar mı? Evet (), Hayır ()

33. Cevabınız evet ise, bu değişiklikler nelerdir?

- a) Balkonları kapatmışlar ()
b) Wc'yi iptal ederek kiler yapmışlar ()
c) Wc'yi iptal ederek kat kalorifer kazanını yerleştirmişler ()
d) Salonu bölerek 1 oda daha kazanmışlar ()
e) İki oda arasındaki duvarı yıkarak bir büyük oda elde etmişler ()
f) Mutfak duvarını yıkarak açık mutfak haline getirmişler ()
g) Diğer.....

34. Apartmanınızın yada evinizin bakım/temizlik işlerini üstlenen yönetici;

- a) Bir kişi mi? (), b) Bir firma mı? ()

d)Diğer.....

35. Proje ve yapım aşamasında eviniz ile ilgili mimar veya üretici firma ile görüştünüz mü?Evet(), Hayır()

36. Cevabınız evet ise; Proje ve yapım aşamasında eviniz ile ilgili kaç kere görüştünüz yada kaç kere toplantı oldu?

- a)1(), b)2(),c)3(),d)4(),
e)5(),f)6(), g)7(),
h)Hiç toplantı yada görüşme olmadı(),
i)Diğer.....

37. Burada konut edinme sebebiniz;

- a)Uygun fiyat(),b)Tavsiye üzerine ()
c)İş yerinize yakınlık ()
d)Yakın çevrenizin burada yaşaması ()
e)Evinizin büyüklüğü ve kullanımının cazip gelmesi ()
f)Temiz hava ve kent gürültüsünden uzak olması ()
g)Manzara ()
h)Sosyal, eğitim tesisleri ve spor alanları olması ()
i)Diğer.....

38. Evinizde eksikliğini duyduğunuz mekanlar var mı?Evet(), Hayır()

39. Cevabınız evet ise;

- a)Kiler (),b)Atölye (),
c)Hobi odası ()
d)Misafir yatak odası (),
e)Misafir tuvalet ve banyosu ()
f)Diğer.....

40. Konutunuzun ve apartmanınızın güvenliğinden memnun musunuz?
Evet (), Hayır ()

41.Güvenlik görevlisi veya kapıcı var mı?
Evet (), Hayır ()

42.Yukarıdaki sorular kapsamında deyinilmeyen.....yaşantınızla ilgili bizimle paylaşmak istediğiniz olumlu görüşlerinizi aşağıdaki bölümde ifade etmenizi rica ederiz. Vakit ayırdığınız için tekrardan teşekkür ederiz.

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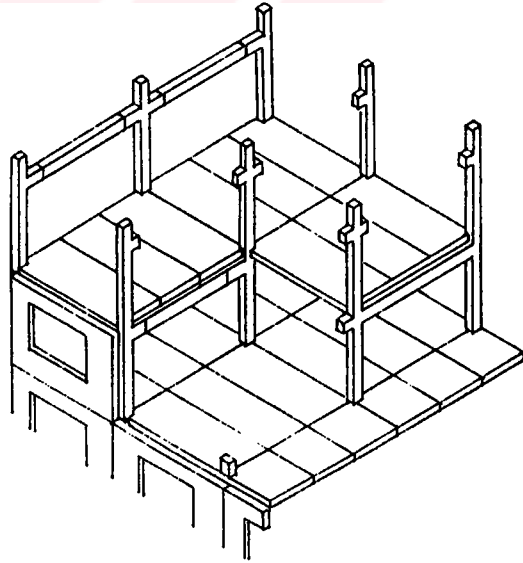
Appendix 2

Skeleton System (column-beam-floor)

**sistem tanıtım
föyü**

1.1.1.

kolon - kiriş - döşeme sistemi



sistemin ismi : VEZİROĞLU/TÜRKİYE

1 tanıtıcı bilgiler

2

KOD T-1.1.1.

TARİH:17.9.85

1.1 SİSTEMİN TÜRÜ

PREFABRİKE BETONARME İSKELET (KOLON-KİRİŞ-DÖŞEME) SİSTEMİ

1.2 TİCARİ ADI VE ADRESİ

Veziroğlu İnşaat Sanayi ve Ticaret A.Ş.
Ürgüplü Sokak No.4 YEŞİLYURT / İSTANBUL

1.3 PATENT İSMİ

Yok.

1.4 SİSTEMİN KURULUŞ TARİHİ

1965

1.5 SİSTEME UYGUN BİNA TÜRLERİ

Konut, endüstri yapıları, pazar yerleri.

1.6 SİSTEMİN FİZİKSEL ÖZELLİKLERİNİN KISACA AÇIKLANMASI

Sistem prefabrike betonarme kolon, kiriş ve döşeme elemanlarından oluşmaktadır. Dış ve iç duvarlar ise bölücü paneller ile yapılmaktadır.
Maks. açıklık (konutlarda): 4.0 m , Maks. kat sayısı: 3 kat, Kullanılan başlıca malzeme: Betonarme, Tasarlama modülü: Yoktur.

1.7 SİSTEMİN ORGANİZASYONU

1.71 Üretim

"Veziroğlu" tarafından gerçekleştirilmektedir.

1.72 Taşıma

"Veziroğlu" tarafından gerçekleştirilmektedir.

1.73 Montaj ve Şantiyede Yapım

"Veziroğlu" tarafından gerçekleştirilmektedir.

1.74 Tasarım

"Veziroğlu" tarafından tasarlanmakta veya gelen projelere sistem uyarlanmaktadır.

1.75 Bakım, İşletme

Yok.

1.8 YILLIK ÜRETİM KAPASİTESİ

.m² konut alanı: 15.600 m²

1.9 ULUSLARARASI ONAY BELGELERİ

Yok.

1.10 ÖNEMLİ UYGULAMALAR VE TARİHLERİ

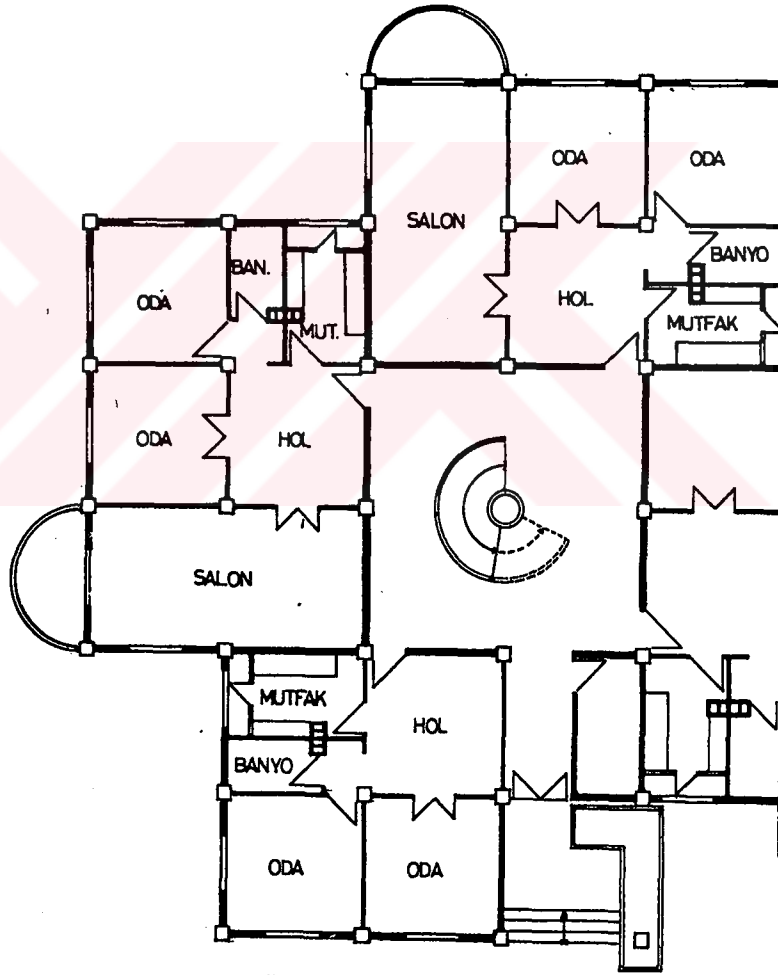
Bilgi yok.

2 açıklayıcı bilgiler²

KOD: T-1.1.1.

TARİH: 17.9.85

2.3 SİSTEMİN UYGULANDIĞI BİNALARDA İÇ MEKAN ORGANİZASYONU VE BİÇİMLENME İLKELERİ



ÖRNEK TIP KONUT PROJESİ

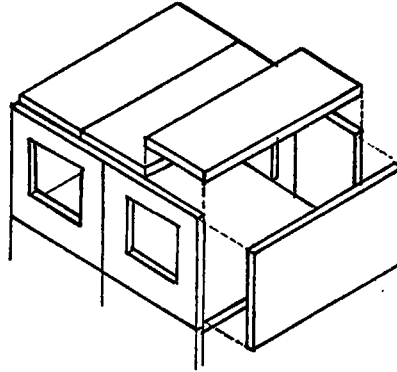
Appendix 3

Panel System (panel-panel)

**sistem tanıtım
föyü**

1.2.1.

büyük panel sistemi



sistemin ismi : OYAK-KUTLUTAŞ PANEL SİSTEMİ

1 tanıtıcı bilgiler

5

KOD:T-1.2.1

TARİH:23.12.85

1.1 SİSTEMİN TÜRÜ	PREFABRİKE BETONARME BÜYÜK PANEL SİSTEMİ
1.2 TİCARİ ADI VE ADRESİ	OYAK-KUTLUTAŞ İstanbul Prefabrike Eleman Sanayi ve Ticaret A.Ş., Meclisi Mebusan Cad. 319/3 Salıpazarı - İSTANBUL
1.3 PATENT İSMİ	Balency (Fransa)
1.4 SİSTEMİN KURULUŞ TARİHİ	1978 (Fabrika üretimine geçiş 1981)
1.5 SİSTEME UYGUN BİNA TÜRLERİ	Konut, otel, hastahane, okul vb.
1.6 SİSTEMİN FİZİKSEL ÖZELLİKLERİNİN KISACA AÇIKLANMASI	Sistem fabrikada üretilen prefabrike betonarme büyük boyutlu duvar ve döşeme panellerinin yapı yerinde montajı ile oluşmaktadır. Maks. açıklık: 5.40 m, Maks. kat sayısı: değişken, Kullanılan başlıca malzeme: Betonarme, Tasarlama modülü: 60 cm dir.
1.7 SİSTEMİN ORGANİZASYONU	
1.71 Üretim	"OYAK-KUTLUTAŞ" tarafından gerçekleştirilmektedir.
1.72 Taşıma	"OYAK-KUTLUTAŞ" tarafından gerçekleştirilmektedir.
1.73 Montaj ve Şantiyede Yapım	"OYAK-KUTLUTAŞ" tarafından gerçekleştirilmektedir.
1.74 Tasarım	"OYAK-KUTLUTAŞ" tarafından gerçekleştirilmekte ve gelen projelere sistem uyarlanmaktadır.
1.75 Bakım, İşletme	-
1.8 YILLIK ÜRETİM KAPASİTESİ	.m ² konut alanı: 120.000 m ² /yıl (Tek vardiyada) .m ³ işlenen ana malzeme: beton ~45.000 m ³ /yıl
1.9 ULUSLARARASI ONAY BELGELERİ	-
1.10 ÖNEMLİ UYGULAMALAR VE TARİHLERİ	.Edirne Emlak Kredi Bankası Konutları (Mimar Sinan Sitesi) 510 konut, 1985 .Edirne Trakya Üniversitesi Yurt Kompleksi (3 Blok), 1985 .Edirne Karayolları Lojman Blokları (2 Blok, 20 birim) 1985 .İstanbul Ayazağa Polis Lojmanları (264 konut) .İstanbul Ataköy Emlak Kredi Bankası Konutları, (470 konut) devam ediyor.

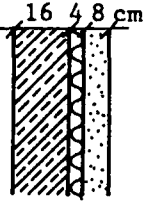
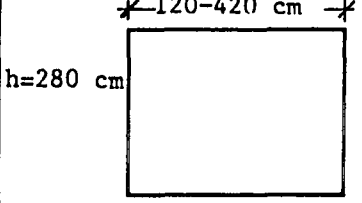
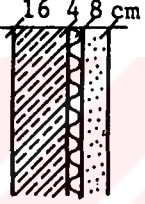
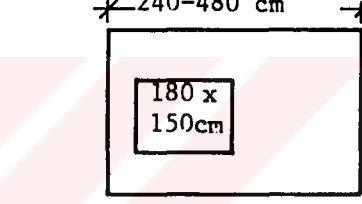
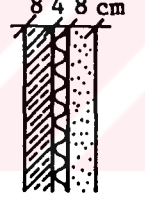
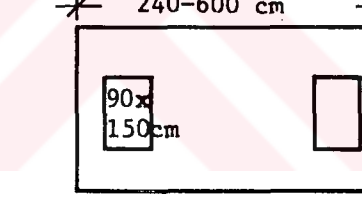
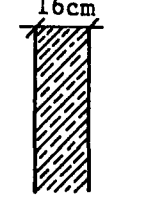
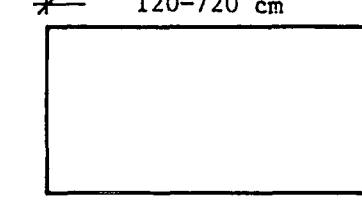
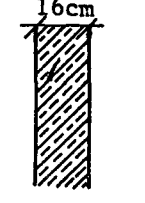
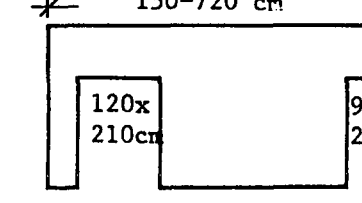
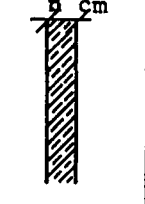
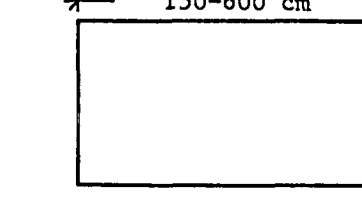
2 açıklayıcı bilgiler

5

KOD: T-1.2.1

TARİH: 23.12.85

2.11 ELEMAN TABLOSU

ELEMAN ÖZELLİKLERİ ELEMAN TÜRLERİ	ELEMANLARIN MALZEMELERİ	ELEMANLARIN AĞIRLIKLARI	ELEMANLARIN KONSTRÜKSİYONLARI	ELEMANLARIN BOYUTLARI
TAŞIYICI DIŞ DUVAR PANELİ (DOLU)	Betonarme 16 cm, Isı yalıtım 4 cm, waschbeton 8 cm	Maks. 7000 kg		
TAŞIYICI DIŞ DUVAR PANELİ (BOŞLUKLU)	Betonarme 16 cm, Isı yalıtım 4cm, waschbeton 8 cm	Maks. 6500 kg		
BÖLÜCÜ DIŞ DUVAR PANELİ (BOŞLUKLU)	Betonarme 8 cm, Isı yalıtım 4cm, waschbeton 8 cm	Maks. 5600 kg		
TAŞIYICI İÇ DUVAR PANELİ (DOLU)	Betonarme 16 cm	Maks. 8000 kg		
TAŞIYICI İÇ DUVAR PANELİ (BOŞLUKLU)	Betonarme 16 cm	Maks. 6300 kg		
BÖLÜCÜ İÇ DUVAR PANELİ (DOLU)	Betonarme 8 cm	Maks. 3400 kg		


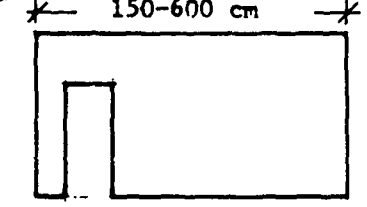
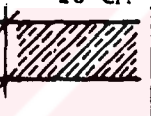
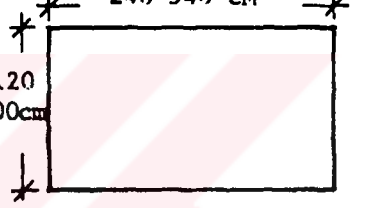
2 açıklayıcı bilgiler

5

KOD:T-1.2.1.

TARİH:23.12.85

2.11 ELEMAN TABLOSU

ELEMAN ÖZELLİKLERİ ELEMAN TÜRLERİ	ELEMANLARIN MALZEMELERİ	ELEMANLARIN AĞIRLIKLARI	ELEMANLARIN KONSTRÜKSİYONLARI	ELEMANLARIN BOYUTLARI
BÖLÜCÜ İÇ DUVAR PANELİ (BOŞLUKLU)	Betonarme 8 cm	Maks. 3000 kg		
DÖŞEME PANELİ	Betonarme 16 cm	Maks. 6500 kg		

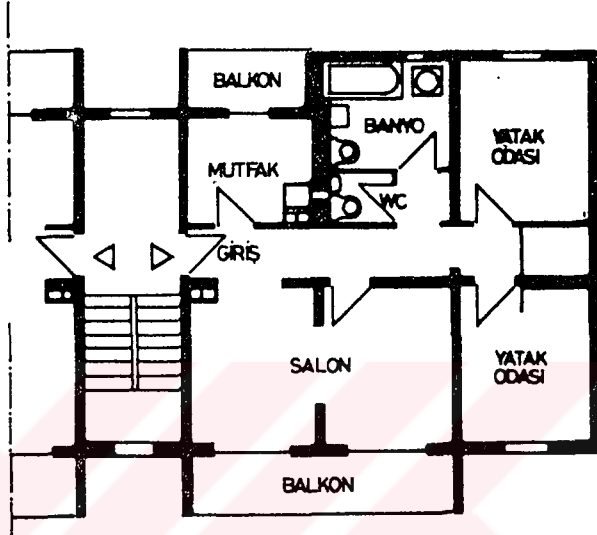
2 açıklayıcı bilgiler

5

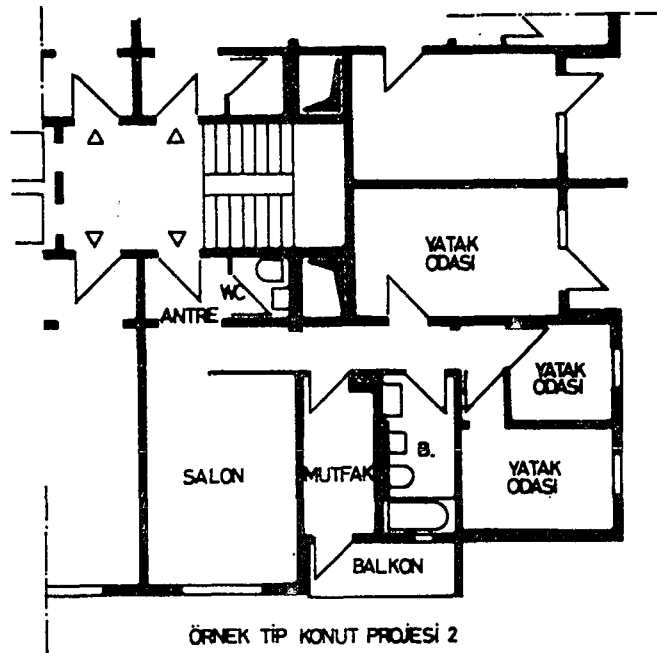
KOD: T-1.21.

TARİH: 23.12.85

2.3 SİSTEMİN UYGULANDIĞI BİNALARDA İÇ MEKAN ORGANİZASYONU VE BİCİMLENME İLKELERİ



ÖRNEK TIP KONUT PROJESİ 1



ÖRNEK TIP KONUT PROJESİ 2

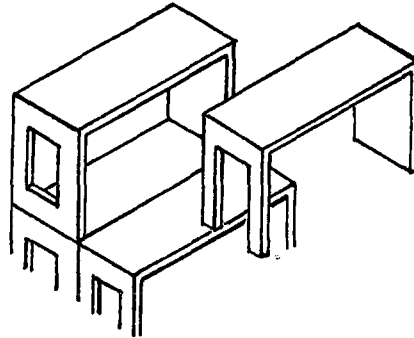
Appendix 4

Open Cell Sytem

**sistem tanıtım
föyü**

1.3.2.

açık hücre sistemi



sistemin ismi: YÜBETAŞ / TÜRKİYE

1 tanıtıcı bilgiler

14

KOD: T-1.3.2

TARİH: 23.9.85

1.1 SİSTEMİN TÜRÜ

BETONARME PREFABRİKE AÇIK HÜCRE SİSTEMİ

1.2 TİCARİ ADI
VE ADRESİ

YÜBETAŞ, Yüksel Beton Sanayi ve Ticaret A.Ş.
Tunalı Hilmi cad. Kuğulu İşhanı B Blok 155-156
Kavaklıdere - ANKARA

1.3 PATENT İSMİ

YÜBETAŞ

1.4 SİSTEMİN KU-
RULUŞ TARİHİ

1981

1.5 SİSTEME UYGUN
BİNA TÜRLERİ

Konut, okul, villa, turizm yapıları, sosyal tesisler.

1.6 SİSTEMİN Fİ-
ZİKSEL ÖZEL-
LİKLERİNİN
KISACA
AÇIKLANMASI

Sistem fabrikada üretilen prefabrike betonarme hücre-
lerin yapı alanında yan yana ve üst üste montajı ile
gerçekleştirilmektedir.
Maks. açıklık: 9.60 m, Maks. kat sayısı: 5 kat,
Kullanılan başlıca malzeme: Beton ve çelik Tasarla-
ma modülü: Yok.

1.7 SİSTEMİN OR-
GANİZASYONU

1.71 Üretim

"YÜBETAŞ" tarafından gerçekleştirilmektedir.

1.72 Taşıma

"YÜBETAŞ" veya taşaronlar tarafından gerçekleştiril-
mektedir.

1.73 Montaj ve Şan-
tiyede yapım

"YÜBETAŞ" tarafından gerçekleştirilmektedir.

1.74 Tasarım

"YÜBETAŞ" şirketler grubuna dahil ORSEL A.Ş. tarafın-
dan gerçekleştirilmektedir. Ayrıca gelen hazır pro-
jelere sistemin uyarlaması da yapılmaktadır.

1.75 Bakım, İşletme

"YÜBETAŞ" tarafından 5 yıl süre ile bakım hizmeti ve-
rilmektedir.

1.8 YILLIK ÜRETİM
KAPASİTESİ

.m² konut alanı: 73.000-81.000m² (2700-3000 adet hücre)
.m³ işlenen ana malzeme: 60.000 ton (çift vardiya)

1.9 ULUSLARARASI
ONAY
BELGELERİ

Sanayi ve Teknoloji Bakanlığı "İhtira Beratı" 1984.

1.10 ÖNEMLİ
UYGULAMALAR
VE TARİHLERİ

.Mardin çimento fabrikası dubleks lojmanları ve sosyal
tesisleri, 1982
.İzmir-Bostanlı ilkokulu, 1982
.Ankara Milli Savunma Bakanlığı lojmanları (380 konut) 1984

KOD: T-1.3.2

TARİH: 23.9.85

açıklayıcı bilgiler

SİSTEM ELEMANLARININ ÖZELLİKLERİ

ELEMAN TURLERİ	TEMEL	KOLON	KİRİS	DÖŞEME	CERÇEVE	TAM MÜCRE	YARIM MÜCRE	TASIVICI DİS DUVAR	BOĞUCU DUVAR	TASIVICI İÇ DUVAR	BOĞUCU İÇ DUVAR	MERDİVEN	ASANSOR	CATI	VB
ELEMANLARIN ÜRETİM YERİ	+	-	-	-	-	+	+	-	-	-	-	-	-	-	-
ELEMANLARIN BOYUTLARI	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ELEMANLARIN AĞIRLIKLARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ELEMANLARIN YÜZEY ÖZELLİKLERİ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ELEMANLARA AIT TOLERANSLAR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ELEMANLARIN MALZEMELERİ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ELEMANLARIN ÜRETİM YERİ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ELEMANLARIN BOYUTLARI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ELEMANLARIN ÜRETİM YERİ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ELEMANLARIN ÜRETİM YERİ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ELEMANLARIN ÜRETİM YERİ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ELEMANLARIN ÜRETİM YERİ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

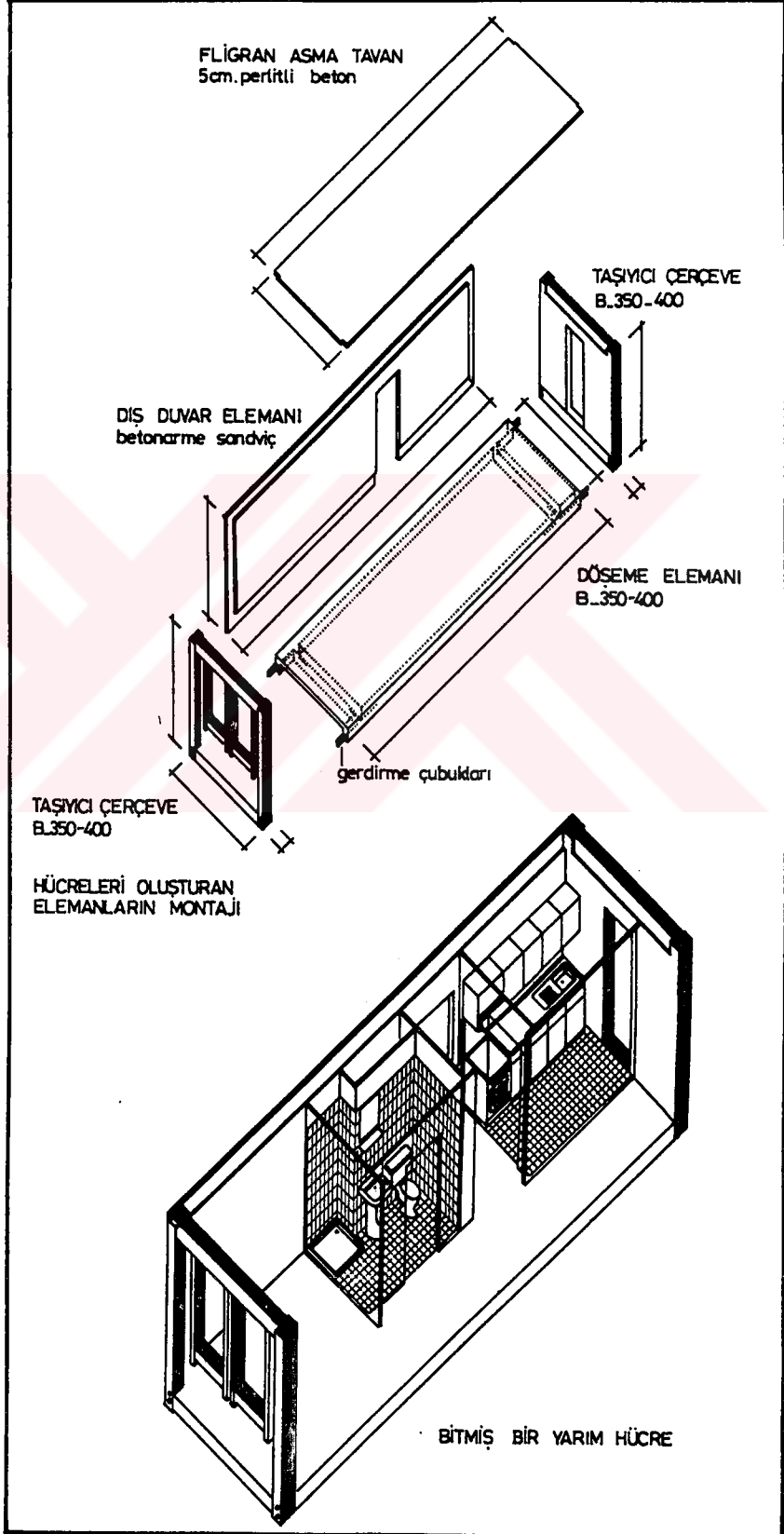
2 açıklayıcı bilgiler

14

KOD: T-1.3.2.

TARİH: 23.9.85

2.2 SİSTEM ELEMANLARININ BİRLEŞİM NOKTALARI



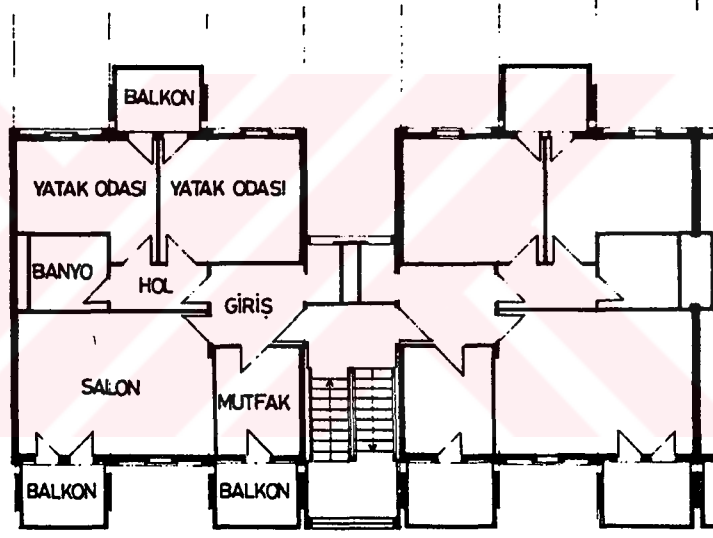
2 açıklayıcı bilgiler¹⁴

KOD: T-1.3.2

TARİH: 23.9.85

2.3 SİSTEMİN UYGULANDIĞI BİNALARDA İÇ MEKAN ORGANİZASYONU VE BİÇİMLENME İLKELERİ

Bir doğrultudaki açıklık (960 cm) sabittir. Diğer doğrultuda bir sınırlama yoktur. Ayrıca 960 cm olan açıklık doğrultusunda arada kolon kullanılarak 2 x 960 cm açıklık geçilebilmektedir.



ÖRNEK TİP KONUT PROJESİ

Appendix 5

İMAR KANUNU ve İLGİLİ MEVZUAT

KAT MÜLKİYETİ KANUNU (İlgili Maddeler)

Kanun No : 634

Resmi Gazete : 2.7.1965

Kabul Tarihi : 23.06.1965

Sayı : 12038

C) Kat Mülkiyetinin Kurulması

I- İstem ve Belgeler

Madde 12 - (Değişik: 2814 - 14.4.1983) Kat mülkiyetinin kurulması için, anagayrimenkulün kat mülkiyetine çevrilmesi hususunda o gayrimenkulün maliki veya bütün paydaşları tarafından imzalanan bir dilekçenin tapu idaresine verilmesi veya istemde bulunulması lazımdır. Bu dilekçe de veya istem üzerine tapu idaresince düzenlenecek tutanakta, anagayrimenkulün, kat mülkiyetine konu olacak bağımsız bölümlerinin ayrı ayrı değerlerinin ve bu bölümlere değerleri ile oranlı olarak tahsisi istenen arsa paylarının gösterilmesi şarttır.

Dilekçeye veya istem tutanağına, kanunlara göre temlik tasarrufları için verilmesi gerekenlerden başka, aşağıda yazılı belgeler de eklenir.

a) Anagayrimenkulün (yapı veya yapıların) dış cepheler ve iç taksimatı, bağımsız bölüm, eklenti ve ortak yerlerinin ölçüleri açıkça gösterilmek suretiyle bir mimar veya mühendis tarafından yapılan ve anagayrimenkulün maliki veya bütün paydaşları tarafından imzalanan ve içinde gösterilenlerin doğruluğu belediyece tasdik olunan proje ve birden çok yapılarda yerleşimlerini gösteren vaziyet planı ile belediyece verilen yapı kullanma belgesi;

b) Anagayrimenkulün (yapı veya yapıların) ön ve arka cephelerini ve mümkünse yan cephelerini gösteren, en az 13x18 büyüklüğünde ve doğruluğu belediyece tasdikli bir fotoğraf;

c) Her bağımsız bölümün arsa payını, kat, daire, iş bürosu gibi nevini ve bunların birden başlayıp sıra ile giden numarasını, varsa eklentisini gösteren ve anagayrimenkulün maliki veya bütün paydaşları tarafından imzalanmış noterden tasdikli liste;

d) Bağımsız bölümlerin, kullanış tarzına, birden çok yapının varlığı halinde bu yapıların özelliğine göre 28 inci maddedeki esaslar çerçevesinde hazırlanmış kat mülkiyetini kuran malik veya malikler tarafından imzalanmış bir yönetim planı.

Madde 13 - (Değişik fıkra - 2814 - 14.4.1983) Tapu memuru kendisine verilen belgelerin tamam ve usulüne uygun be dilekçeyi verenlerin veya istemde bulunanların yetkili olduklarına kanaat getirdikten sonra, kat mülkiyeti veya kat irtifakı kurulmasına dair sözleşmeyi düzenler. Bu sözleşme aynı zamanda tescil istemi sayılır.

Sözleşme düzenlenince, anagayrimenkulün kayıtlı bulunduğu tapu kütüğü sayfasındaki (mülkiyet) hanesine (bu gayrimenkulün mülkiyeti kat mülkiyetine çevrilmiştir) ibaresi yazılarak sayfa kapatılır ve kat mülkiyetine konu olan her bağımsız bölüm, kat mülkiyeti

kütüğünün ayrı bir sayfasına o bölüme bağlı arsa payı ve anagayrimenkulün kayıtlı bulunduğu genel kütükteki pafta, ada, parsel, defter ve sayfa numaraları gösterilmek suretiyle tescil edilir; anagayrimenkulün kayıtlı bulunduğu genel kütük sayfasına da, bağımsız bölümlerin kat mülkiyeti kütüğündeki defter ve sayfa numaraları işlenmek suretiyle, kütükler arasında bağlantı sağlanır.

Anagayrimenkulün kapatılan sayfasında evvelce mevcut olan haklara ait sicil kaydı, Tapu Sicili Tüzüğü'nün (Taksim halinde kayıtların nakli) ne dair hükümlerine göre, bağımsız bölümlerin kat mülkiyeti kütüğündeki sayfasına geçilir.

Kat mülkiyeti kütüğüne tescil edilen her bağımsız bölüm ayrı bir gayrimenkul niteliğini kazanır ve kütükte o bölümün tasdikli planındaki numarayı alır.

(Değişik 5. fıkra: 2814-14.4.1983)

Kat malikine, anagayrimenkulün çaplı tasarruf belgesinde başka, istem halinde, 12 nci maddenin (a) bendinde belirtilen projeden kendi bağımsız bölümüne ait olan kısmının tasdikli bir örneği de verilir.

D) Kat İrtifakının Kurulması

Madde 14 - (Değişik: 1. fıkra: 2814 - 14.4.1983) Henüz yapı yapılmamış veya yapısı tamamlanmamış bir arsa üzerinde kat irtifakının kurulması ve tapu siciline tescil edilmesi için o arsanın malikinin veya bütün paydaşlarının buna ait bir dilekçe veya istem ile birlikte 12 nci maddenin (a) ve (c) bentlerine uygun olarak düzenlenen proje, plan, liste ve (d) bendindeki yönetim planı ile diğer belgeleri tapu idaresine vermeleri lazımdır. Kat mülkiyetine geçişte ayrıca yönetim planı istenmez.

Bir arsa üzerinde kat irtifakları ancak sözleşmede veya dilekçede her kat irtifakının ilgili bulunduğu bağımsız bölüme tahsisi istenen arsa payı, arsanın kayıtlı olduğu kütüğün (Beyanlar) hanesinde belirtmek suretiyle kurulur ve yapının, verilen projeye göre tamamlanmasından sonra kat mülkiyetine konu olacak bağımsız bölümlerin numarası ve bu bölümlere bağlı eklentiler kütüğün beyanlar hanesinde belirtilir.

Yapının tamamlanmasından sonra kat irtifaklarının kat mülkiyetine çevrilmesi, irtifak sahiplerinde bir tarafından istenince, tescil, kat irtifakının tesciline ait resmi senente ve 12 nci maddede yazılı belgelere ve anagayrimenkulün bağımsız bölümlerinin, evvelce verilmiş olan plana uygunluğunun belediyece tasdikine dayanılarak yapılır.

II- Anagayrimenkulün bakımı, korunması ve zarardan sorumluluk

Madde 19 - Kat malikleri, anagayrimenkulün bakımına ve mimari durumu ile güzelliğini ve sağlamlığını titizlikle korumaya mecburdurlar.

(Değişik 2. fıkra :2814 - 14.4. 1983)

Kat maliklerinde biri, bütün kat maliklerinin rızası olmadıkça, anagayrimenkulün ortak yerlerinde, inşaat onarım ve tesisler, değişik renkte dış badana veya boya yaptıramaz. Kendi bağımsız bölümünde ise anayapıya zarar verecek nitelikte onarım, tesis ve değişiklik yapamaz. Tavan, taban veya duvar ile birbirine bağlantılı bulunan bağımsız bölümlerin bağlantılı yerlerinde, bu bölüm maliklerinin ortak rızası ile anayapıya zarar

III - Bağımsız bölüm ilavesi

Madde 44 - Anagayrimenkulün üstüne kat ilavesi veya mevcut çekme kat yerine tam kat yapılması veya zemin veya bodrum katlarında veya arsanın boş kısmında 24 üncü maddenin ikinci fıkrasında yazılı yerlerin sonradan yapımı veya ilavesi için:

a) Kat malikleri kurulunun buna oybirliğiyle karar vermesi;

b) Anagayrimenkulün bu inşaattan sonra alacağı duruma göre, yapılan yeni ilaveler da dahil olmak üzere bütün bağımsız bölümlerine tahsis olunacak arsa paylarının usulüne göre yeniden ve oybirliğiyle tesbit edilmesi;

c) İlave edilecek yeni bağımsız bölüme tahsis edilen arsa payı üzerinde, tapu memuru huzurunda yapılacak resmi senetle, 14 üncü maddeye göre kat irtifakı kurularak bunun, anagayrimenkulün bütün bağımsız bölümlerinin kat mülkiyeti kütüğündeki irtifaklar hanesine tescil edilmesi ve anagayrimenkulün kapanan eski kütük sayfasıyla 13 üncü madde hükmüne göre bağlantı sağlanması,

Şarttır.

Bu nitelikteki ilave ve genişletmelere muvafakat etmekle beraber kendisi katılmak istemeyen kat maliklerinin arsa paylarından yeni tahsis sebebiyle azalan kısmın bedeli kendilerine ödenmek şartıyla yeni yapılan bağımsız bölüm, kat irtifakı kurulmasına dair olan eski resmi senent gereğince kat mülkiyetine çevrilerek onu yaptıranın mülkü veya yaptıranların ortak mülkü olur ve kat mülkiyet kütüğünün ayrı bir sayfasına yeni malik veya malikler adına tescil edilir.

C) Özel Kanuna Göre Ortaklaştırma (Şüyulandırma) Halinde Kat Mülkiyetinin Durumu

Madde 54 - İmar Kanunu hükümlerine göre ortaklaştırma halinde, ortaklaştırılan gayrimenkuller arasında kat mülkiyetine tabi gayrimenkul varsa, İmar Kanununun 46 ncı maddesi gereğince ortaklığın giderilmesi hususunda bütün malikler anlaştıkları takdirde, ortaklığın giderilmesi bu anlaşma hükümlerine göre yapılır.

Böyle bir anlaşmaya varılmazsa, her gayrimenkulün ortaklaştırmadan önceki geçer değerleri, birinci fıkrada sözü geçen madde hükmüne göre ortaklığı gidermekle görevli sulh mahkemesince ayrı ayrı takdir edilerek, bunlardan değeri en fazla olan gayrimenkulün malikine, öteki gayrimenkullerin bu değerle satın alınmasını teklife karar verilir ve bu teklif kabul ediliğ bedel ödenince ortaklık giderilmiş olur.

Kesinleşen sulh mahkemesi kararının tebliğinden başlayarak bir ay içinde bedel ödenmez veya altı ay içinde ödenmek üzere banka mektubu veya ayni teminat gösterilmezse ortaklaştırılan gayrimenkullerin tümü, imar durumuna göre mümkünse kat mülkiyeti muhafaza ve diğer gayrimenkuller buna ilhak edilerek, eğer bu mümkün değilse kat mülkiyeti kaldırılarak, açık artırma yoluyla satılıp ortaklık giderilir ve satış bedeli her gayrimenkulün, ikinci fıkra uyarınca takdir edilmiş olan değerleri arasındaki orana göre, maliklerine paylaşılır.

E) Belediyesi Olmayan Yerlerdeki Durum

Madde 56 - Bu kanunun belediyelere yüklediği görevler, belediye olmayan yerlerde o yerin bağlı bulunduğu ilçe veya il merkezleri belediyelerince, (eski 6785) 3194 sayılı İmar Kanununun 47 nci maddesinde bahsi geçen sahalarda ise ilgili belediyece yerine getirilir.

Ek Madde 3 - (2184 - 14.4.1983) Bir arsa üzerinde birden çok yapının varlığı halinde, bu Kanunda yer alan hükümlerin uygulanmasında aşağıdaki kurallar dikkate alınır:

a) Vaziyet planına göre yapılacak tüm bağımsız bölümü kapsayan blok veya blokların tamamlanmış bulunması halinde, tamamlanan bağımsız bölümler için kat mülkiyetine geçilebilir. Bu takdirde, tamamlanmamış yapılara ilişkin kat irtifaklarının tapu kütüklerinde nasıl yer alacağı (11 inci maddenin 2 nci fıkrasına bağlı kalınmaksızın) tüzükle belirlenir.

b) Yapılardan her birine ilişkin ortak giderler o yapıdaki kat malikleri, bütün yapılar için müşterek tesis ve yerlere ilişkin ortak giderler bütün kat malikleri tarafından 20 nci maddedeki kurala göre karşılanır. Yapılardan bir kısmının tamamlanmamış olması halinde, kat irtifakı sahipleri de kendilerini ilgilendirdiği ölçüde ortak tesis ve yerlere ilişkin giderlere katılırlar.

c) Blok yapılarda bunlardan yalnız birine ilişkin sorunların çözümlenmesinde kat malikleri kurulu, o blokta bulunan bağımsız bölüm maliklerinden oluşur.



Appendix 6

2985 SAYILI TOPLU KONUT KANUNU UYGULAMA YÖNETMELİĞİ

Resmi Gazete:30.5.1989/20180

BİRİNCİ BÖLÜM

Genel Hükümler

Amaç ve Kapsam

Madde 1 - Bu yönetmelik, 2/3/1984 tarih ve 2985 sayılı Toplu Konut Kanunu ile Toplu Konut Fonu'nun kullanım Şekline İlişkin Tüzüğün uygulanmasını sağlamak amacıyla hazırlanmış olup; Toplu Konut Alanlarının tespiti, inşaaata hazır hale getirilmesi, kredilendirme ve Fonu'un diğer kullanım sahalarına ilişkin esas ve usulleri kapsar.

İKİNCİ BÖLÜM

Krediler

Krediler İlgili Genel Hükümler

Madde 3- 1) Krediler ve Alıcı Payı Hesabına Yatırılacak miktarlar: Toplu Konut Fonu'ndan Kredi talep etmek amacıyla, Alıcı Payı Hesaplarına yatırılacak miktarlar ve buna karşılık açılacak kredilerin miktarı ile kredilerin ödenmeye başlayacağı inşaat seviyeleri aşağıdaki tabloda gösterilmiştir.

Konut Büyüklüğü (Brüt m2)	Açılacak Kredi Miktarı (TL)	Alıcı Payı Hesabına Yatırılacak Miktarın Açılacak Krediye Oranı	Fon'dan Açılan Kredinin Ödenmeye Başlayacağı Asgari İnşaat Seviyesi
40m ² 'den küçük (40m ² dahil)	12.000.000.-	%15	%10
41-60m ² 'ye kadar (60m ² dahil)	15.000.000.-	%20	%20
61-80m ² 'ye kadar (80m ² dahil)	15.000.000.-	%40	%30
81-100m ² 'ye kadar (100m ² dahil)	15.000.000.-	%60	%40