

A LOCAL APPROACH TO URBAN HOUSING DESIGN IN BANGLADESH

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ABSTRACT

One of the most important functions in the production process of housing is the design of houses.

The degree of success of the design depends on how well the house responds to users needs and its performance as a modifier of the external environment. Given the wide variety of problems facing urban housing in Bangladesh, the extent to which built up housing successfully meets user and environmental needs is a major area of concern. There is a growing tendency to adapt western ideas as models for urban housing. Although they are insensitive to local needs they are accepted because there exists no alternatives.

This dissertation attempts to study the influence of local factors on urban housing design through a systematic analysis of traditional housing and examples of existing urban housing. This in combination with the design determinants for urban housing forms the basis for a local approach to urban housing design.

The approach is outlined in the final chapter in the form of a set of recommendations for the design of houses in urban areas.

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CHAPTER ONE

INTRODUCTION.

CHAPTER ONE

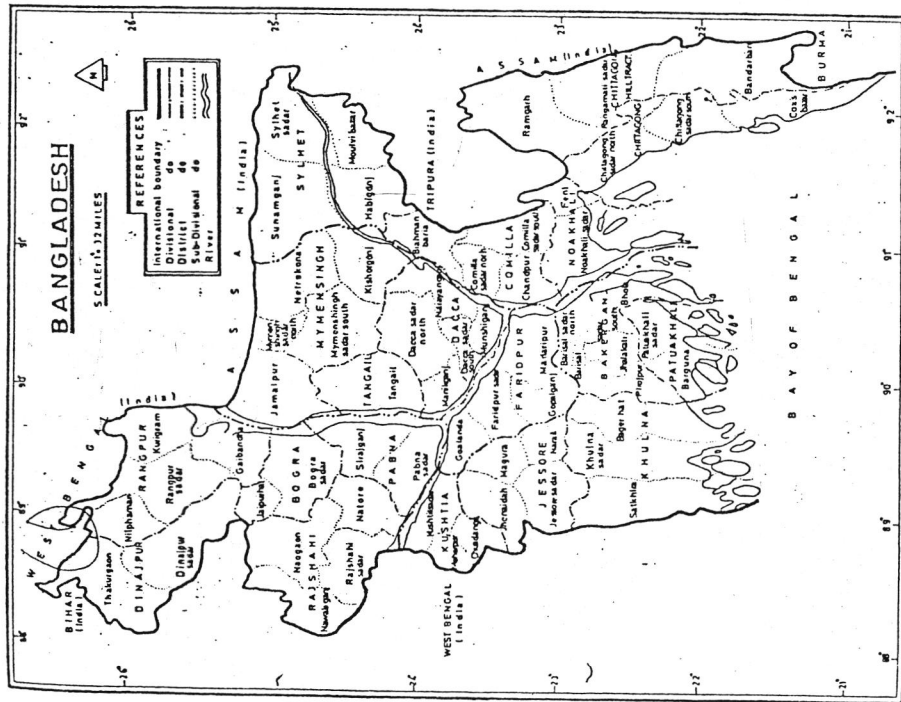
INTRODUCTION

1.1 THE COUNTRY

Bangladesh lies in the eastern part of the Indian sub-continent, and except for a short border with Burma in the south-east, is surrounded on three sides by Indian territory. To its south lies the Bay of Bengal. The country is located between $20^{\circ}34'$ and $26^{\circ}38'$ north latitudes and $88^{\circ}01'$ and $92^{\circ}56'$ east longitudes. The Tropic of Cancer passes almost through the center of the country.

The land area of the country is approximately fifty five thousand square miles, crisscrossed by the branches and tributaries of three major rivers. The land is generally flat except for some hilly regions towards the south eastern parts of the country.

Earliest references to the land presently known as Bangladesh is found in the Indian epics of Ramayana and Mahabharata. With the advent of the Aryans a section of the Dravidian population were driven out of the eastern parts of the Indian sub-continent and came to settle here. They were followed by a part of the Aryan population from the northern parts of the sub-continent. There was also an influx of the Mongolians from Tibet and Burma. The country was ruled by both Hindu and Buddhist rulers who came from other parts of India upto the thirteenth century.



Copied from the map covered by Survey of Bangladesh Re. no. 48 D-17-7575. The map depicts situation as on March 1, 1974.

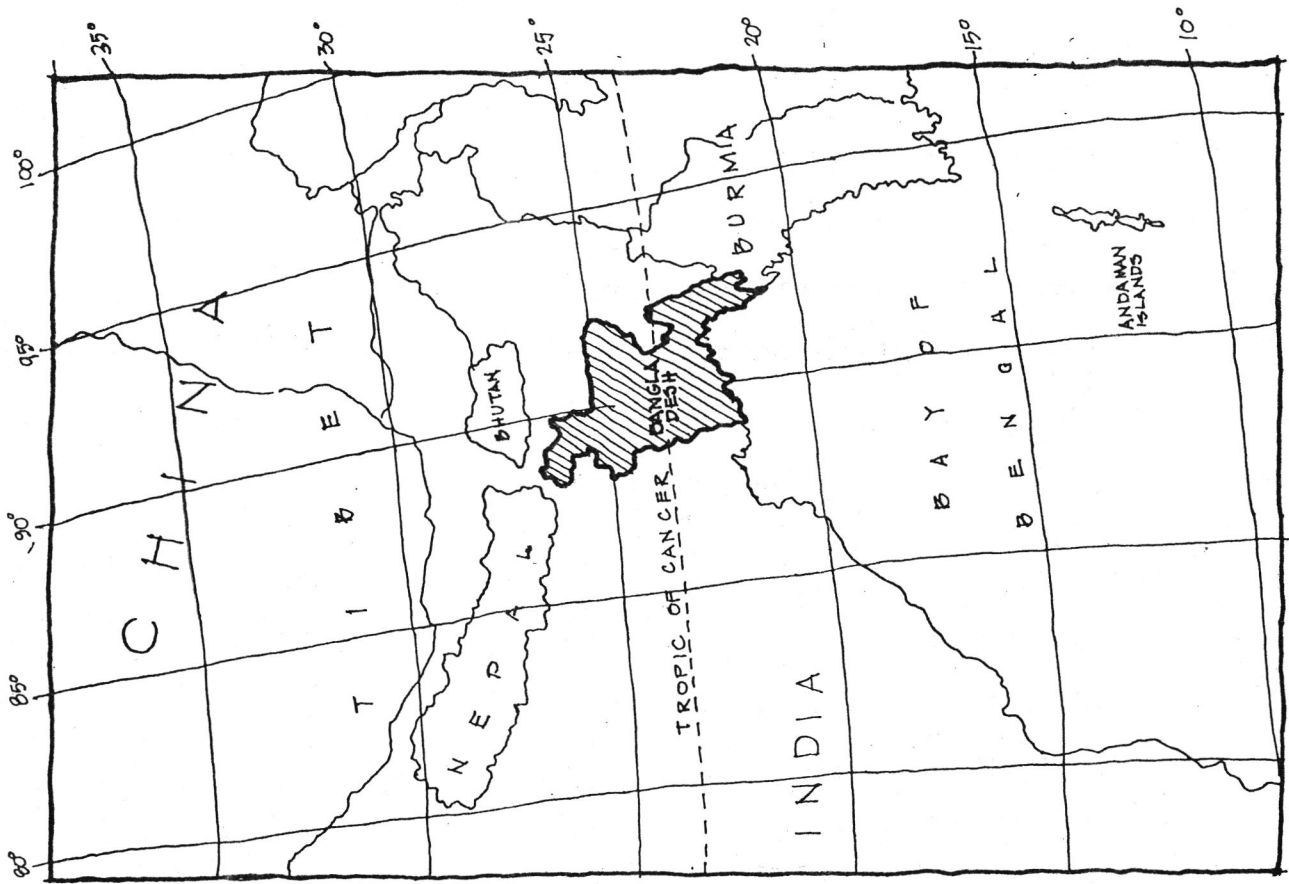
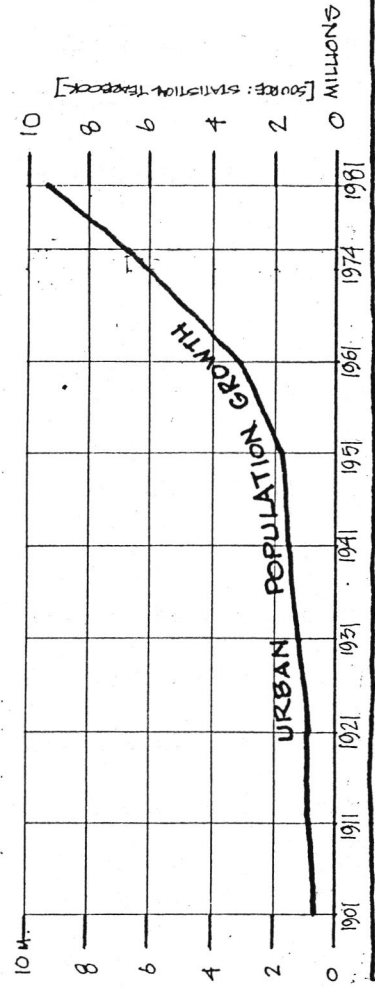


FIG 1.1. BANGLADESH, THE COUNTRY, LOCATION & POPULATION

The Arab Muslims started coming to the region from the early ninth century followed by the Muslims of central Asia. After the Hindu and Buddhist rule the country was under the rule of the Muslims either as independant rulers or as rulers of the imperial authority of Delhi. Throughout the muslim rule different races and nationalities from neighbouring areas came and settled in the region. The Mughal dynasty of imperial India ruled the country till the advent of the British in the eighteenth century.

The country came under British rule in 1756 and was a part of British India until 1947. India was then divided into two independant states and what is presently Bangladesh became the eastern province of Pakistan seperated from the western part by fifteen hundred miles of Indian territory. Pakistan remained as one state for twenty four years and in December 1971 after a liberation war which lasted for nine months Bangladesh became an independant country.

1.2 POPULATION AND HOUSING

Rapid growth of population is one of the major problems facing the country. The total population of the country according to the 1981 census was 89.9 million persons and the growth rate of the population stood at 2.32% compared to the 0.5% growth rate in 1951 (1). Bangladesh is the eighth most populous country in the world and the average density of population is around 1995 persons to a square

mile. (2)

Although about 85% of the total population live in the rural areas and the country is essentially rural oriented and agricultural based there has been a tremendous increase in the urban population in the recent years. Between 1961-74 the urban population growth rate was 6.7% and the projected urban population in the year 2000 exceeds 32 million. (3)

In the rural areas the main problems are mainly to do with provision of services and facilities than with provision of housing itself. The poorer section of the rural population have very poor housing conditions, shelters are usually made of inferior quality materials and being structurally weak the condition of these houses deteriorate rapidly. Interestingly, the poorer sections of the rural population do not perceive housing as their number one problem. Food and clothing being their immediate pressing problem, 53.4% consider shelter to be their third major problem. (4)

On the other hand urban housing has not been able to keep pace with the high rate of population growth specially for the lower income groups. This leads to further densification of already saturated housing areas. The average floor area per person combining all classes of the population in all urban areas combined is around 49 square feet (11sft = 1sq m approximately). This goes up with income level of the people and for the middle income group it is about 75 sft.in some areas. (5)

The condition of housing is obviously worse with the poorer sections of the urban population who live in squatter communities and in slums. Their problem is similar to the rural poor, the main concern being food and clothing. It is worth mentioning at this point, that, the climate is not extreme and it is possible for a person to survive with minimum protection. Their incomes are so low that the less they spend on housing the more they can spend on food. Higher income groups can afford good housing but the middle income section of the population, who spend a reasonable portion of their income housing do not get their money's worth.

The primary reason of the middle income group's inaccessibility to proper housing is the lack of housing units itself. Official estimates present a backlog of around of forty seven thousand units in the capital city, Dhaka in 1974 (6). According to Ali, Dhaka would have to build about 30,000 units a year for the time period 1980-85 to cope with the housing crisis facing the city. (7)

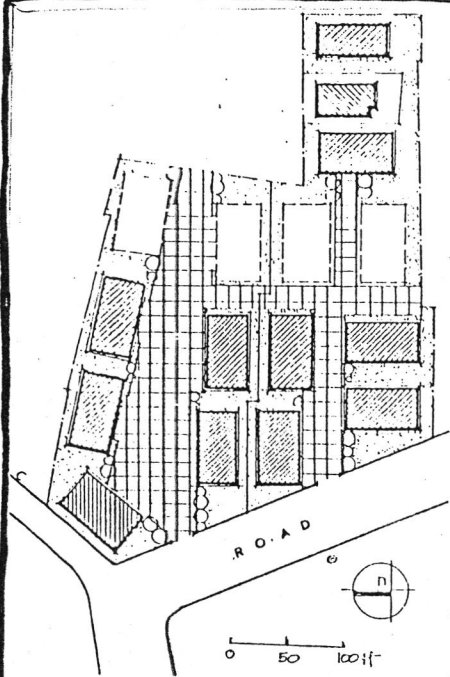
1.3 URBAN HOUSING DESIGN IN BANGLADESH

In the recent years urban housing in Bangladesh has been characterized by 4/5 storey blocks of flats both in the organized government sector and the private sector (fig 1.2). The old parts of the cities consisting mainly of single or two storey houses packed together along narrow streets have given way to multi storey developments of flats in the newer parts of town. This tendency of building flats is very popular with the government housing construction and is becoming increasingly popular with private individuals and recently private developers. The tendency to build high is supported by the popular idea that more people can be accommodated within a given area of land, but the densities of the government housing estates containing 4/5 storey blocks of flats is less than the density of the older parts of town where building heights are lower.

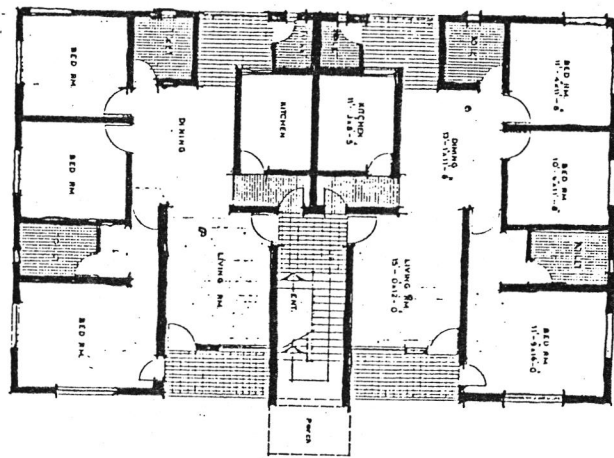
The construction cost of this type of housing is also higher as the materials are mostly imported.

"In the cities of the Third World costs are even higher due to the heavy import of equipments and materials, the high level of skills and precision required and the extensive use of capital, often from foreign sources. These high costs usually result in high social costs because they lead to smaller units. "(8)

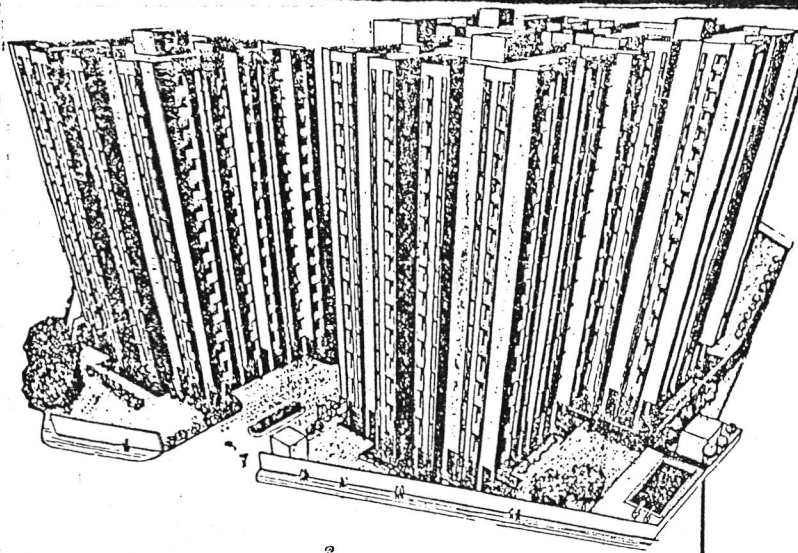
The reduction in the size of the house is accompanied by a high degree of compartmentalization of household functions into rooms as opposed to the multiuse of spaces in the traditional houses of the



PLAN & SITE PLAN SOURCE:
PROCEDURE PUBLISHED BY EASTERN
HOUSING LIMITED.



THE PRESENT.



multi-storied
housing complex

Eastern Housing Limited

THE
FUTURE?

(SOURCE: PROCEDURE PUBLISHED BY
EASTERN HOUSING LTD.)

FIG.1.2. HOUSING DESIGN TRENDS .

rural areas and some of the early urban houses.

1.3.1 ROLE AND INFLUENCE OF GOVERNMENT HOUSING

The concept of housing as blocks of flats was first initiated by the government. Till the arrival at the scene, of private developers, the only efforts at large scale housing production was from the government. The government provides housing for only 4.3% of its employees and most of it is in the urban areas. Although in the overall context of urban housing this is very small number government housing estates are the only places where organised efforts at housing design can be observed in a large scale. (9)

Although the British had left the country in 1947 their influence remained and it was the firm of Minoprio, Speⁿceley and Macfarlane who proposed the redevelopment of the old city in their Draft Master Plan for Dhaka in 1958 as;

" it will be possible to redevelop wholly in blocks of flats not exceeding three stories high. We believe, however, that life in three storey blocks of flats with the advantages is preferable to living in closely packed slum houses. "(10)

There had already been some flats built as housing for government employees but it was this sort of idea that lead to the establishment of blocks of flats as ideal housing.

Although initially buildings were three stories high, soon stories were added to accomodate more flats. Government colonies began to

spring up which had rows of blocks of flats and it was this that gave government housing a individual character which was and is every one idea of large scale housing.

With time other semi-government organizations followed the example of the government and more blocks of flats began to be built by these organizations as housing for their employees.

All organized efforts in providing housing to certain groups of people either government employees^e of employees of large organizations are characterized by blocks of flats and this form of housing is accepted as a model for urban housing. Recently the government has formulated certain standards for public housing all of which are in the form of blocks of flats. (11) These blocks are generally five stories high and it is not uncommon to find six storey walk ups in some of the housing estates.

The fact that they are occupied and lived in does not mean that they are appropriate for the people. The housing shortage is so acute that there is no choice but to accept what one gets and whatever choice exists, it is between different types of flats.

1.3.2 HOUSING DESIGN TRENDS

Examples of housing set by the government have found widespread appeal as forms of private housing as well. Whatever is done by the government is assumed to be the best utilization of resources and in

order to benefit from the government's experience private citizens find it convenient to copy styles of government flats.

The concept of a dwelling for an urban family as a consolidation of the internal spaces of the house a few floors above the street level is becoming increasingly popular in the urban areas. The reason for this popularity can be greatly ascribed to the influence of government housing standards, and to the fact that alternatives to it have never been explored.

Internal arrangements copy western models which are unable to meet the socio-cultural requirements of household spaces. Requirements relating to concepts of privacy, social relationships, religious practices, household compositions, etc. need particular types of spaces, organised in certain ways. The spaces in urban houses often end up being used in a way not anticipated by the designers. Environmental requirements of light and ventilation are often not given due consideration.

The arrangements of facilities within the household spaces, specially the service areas have to take into account the way household activities take place in Bangladeshi culture. Locations of water sources in the kitchen, toilet facilities etc. do not often conform to the way they are used and householders have to seek alternative means.

Plot sizes have successively become smaller and the taller one builds more houses can be accommodated in a given plot. In attempting

to build on the maximum permissible area as per building laws, very little space is left between buildings in adjacent plots. Conforming to the planning laws of the Dhaka Improvement Trust the gap between two adjacent five storey private houses can be as little as eight feet thereby cutting off light and ventilation to the internal spaces.

The government encourages private citizens to build 4/5 storey flat buildings by providing soft loans. The House Building Finance Corporation gives low interest loans to flat builders.

Unlike government agencies constraints on height of buildings because of the cost of installing lifts and developing infrastructure are not felt by private developers and there are several projects in the private sector of high rise blocks of flats. The implications of high rise building on the character of cities are not pleasant as Habraken rightly points out;

"To pile buildings on top of each other has always meant that several of them constitute one building. It is the first step towards the dangerous increase in scale which threatens living conditions and the subtleties of town organization".
(12)

Although high rise housing has long since lost popularity in developed nations, the idea of building tall is associated with western cultures and is thought to be a "modern" solution to housing. It is not wrong to assume that if the government had the resources it would have built high rise housing at the first opportunity.

1.4 OBJECTIVES OF THE STUDY

Blocks of flats laid out in rigid geometric formations are accepted as housing in the urban areas only because there is no other choice, but it is certainly not the answer to the housing problem of the country.

The design of these houses are based on the modernist traditions and as Brent points out;

" the modern ideology is a statement of how people should live and how the containers in which they live should look. One of the basic beliefs held by modernists was that this ideology was universally relevant to the modern industrial world because it advocated rational planning to meet the unique circumstances of modern life. "(13)

Bangladeshi people are tradition oriented and a lot of household activities take place in the way guided by traditions and not the way the designers want them to. The design of these houses are based on western concepts, which has no relevance to the socio-cultural and environmental context of the country.

Given the shortage, houses have to be built to accomodate the increasing population of the urban areas. The pressure is increasing and it is inevitable that the government will have to take the initiative to either build public housing on a large scale or encourage private developers to do so. In these circumstances it is most likely that the resultant products will be a continuation of the established trend of building blocks of flats. It is this design implication of housing production that concerns this study.

The objective of this study is to seek an applicable approach to urban housing design in Bangladesh based on local needs. In doing so the traditional background of the population and the socio-cultural relevance of the urban house is to be taken into consideration along with the environmental requirements that have to be met. Although the study does not directly deal with it, the relative merits of low rise ground floor housing as alternatives to blocks of flats is a major influence.

"One can list other significant advantages of low-rise housing in the Third World. First, houses can grow, a possibility which is becoming imperative in developing countries where current goals yield other priorities. Secondly, low-rise edifices are far more sensitive to the social, cultural and religious determinants of our environment." (14)

The objectives are particularly based on two major problem areas of present day urban houses.

1. The inability of the component spaces to meet socio cultural requirements of the people.
2. Their inability to respond satisfactorily to environmental needs.

It is wrong to assume that lower income groups have lesser requirements than higher income groups and this study is aimed at no particular income group as such. It is important to realise that, when the main problem of the lower income groups is access to shelter itself, guidelines for house design is of little use. Higher income groups have the means of building houses suited to their individual needs. It is for the general requirements of middle income housing

that design guidelines are most useful.

1.5 METHODOLOGY

The guidelines for the design of urban houses are established on the basis of;

1. An understanding of the traditional houses of the rural areas and the development of the urban house form.
2. Analysis of the socio-cultural and environmental performance of both past and contemporary examples of urban housing.
3. Consideration of the factors that are a major influence of urban housing design.

The rural house form is the basis for an understanding of the house form as derived from the traditional way of life. Although the urban situation is quite different from the villages, the cultural background of the urban population has its roots in rural society. How the rural house responds to activity patterns and socio-cultural needs provides an understanding of how the urban house may be adapted to socio-cultural needs of the urban population. This combined with other aspects of the traditional house provides a broader understanding of the rural context which forms the initial base for a design approach to urban housing.

The course of development of the urban house from its early stages as a modified version of the rural homestead to its present form reveals the changing needs of the urban situation. Certain examples

of urban housing of the past represent better suitability to urban life and some of their characteristics may be modified to be used in the design approach.

Urban housing can be best exemplified by looking at government housing. The next part of the study is based on an analysis of examples of government housing standards. Government housing is also important considering their influence on private housing. The examples are divided into two parts consisting of government housing examples of the past and contemporary housing standards. Specific examples of both categories are analysed as to their socio-cultural adaptability and environmental performance. The failure of some of these houses to meet certain needs can sometimes be ascribed to their designs. On the other hand some examples show better adaptability than others. The analysis reveals the features which are meaningful and can be maintained and the ones which have no significance and should be avoided.

The fact that rural housing is more suited to local needs than urban housing does not mean that the rural environment has to be duplicated in the urban areas. Life in the cities is different in many ways from rural life and this generates its own set of needs. They are a result of many factors that make cities what they are. Traditional behavior is modified to a large extent and so are the nature of activities. The physical characteristics of the city modify the environmental requirements of housing in the cities. The level of facilities are also different. The third part of the study

examines these aspects of urban situation which influence housing design and form the design determinants.

For the design approach in the final part of the study the urban house is considered to be consisting of a number of design elements. These elements are divided into two groups. The first one is concerned with the internal spaces and the second one with the elements concerned with the organization of the house as a dwelling unit.

The design considerations for each element are divided into a number of factors which influence the design of the element. The factors are concerned with both socio-cultural and environmental aspects of design. The identification of each factor is followed by short discussions which ends with a design recommendation. Each factor can then be given physical shape and used in the design process. Not all recommendations relate to physical design and some of them are in the form of specific design considerations.

The identification of the factors as influences on design are influenced by Christopher Alexander's suggestion that a particular element of design is characterized by the pattern of events that happen in it. Each factor can be seen as a pattern in the overall context of the urban environment. (15)

The factors derive themselves mainly from the discussions in the previous sections, on available sources of information and to a certain extent, are based on the author's own observations.

This methodology is independant of the physical dimensions of the elements in question, and the issue of space requirements are dealt with to a certain extent in the appedices.

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CHAPTER TWO

HOUSE & HOUSING
DESIGN

CHAPTER TWO

HOUSE AND HOUSING DESIGN

2.1 TRADITIONAL BANGLADESHI HOUSE

2.1.1 INTRODUCTION

In order to arrive at basis towards formulating a design approach for urban housing it is important to have an understanding of the traditional way of life of the people in the villages.

Bangladesh is predominantly a rural based country with about 85% of its population living in the villages. Urbanization is only a recent phenomenon and over the last ten years the urban population has more than doubled.

	TOTAL POPULATION	URBAN POPULATION	RURAL POPULATION
1974	71.47 million	6.27 million	65.20 million
1981	87.12 million	13.22 million	73.89 million

[source:Statistical Yearbook of Bangladesh (1983-84)]

It is clear that a large portion of the city dwellers are recent arrivals and an even larger portion are first generation city

dwellers. The way of life in the cities is therefore greatly influenced by the way of life in the rural areas.

Certain aspects of behavior do not change whether one lives in the village or the city. While others change quite easily. The space useage in modern day urban dwellings indicate to a certain extent the factors which are still tradition oriented.

It is certainly not possible nor desirable to duplicate the rural environment in the cities neither would it be feasible. But with an understanding of rural houses it is possible to have urban housing which is more sympathetic to traditional way of life.

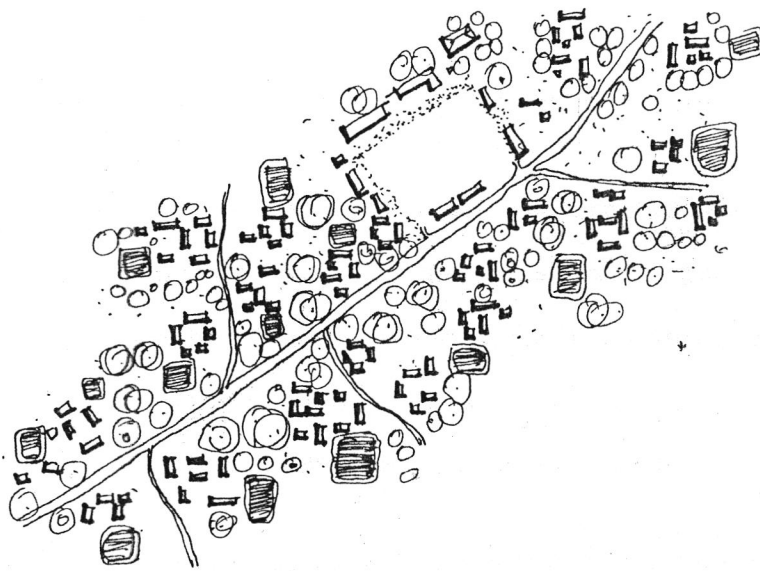
2.1.2 RURAL SETTLEMENTS

The course of rivers and their tributeries, of which there are many, greatly influence the formation of settlements in Bangladesh. Villages tend to be located on areas of high land as a natural protection from frequently occuring floods.

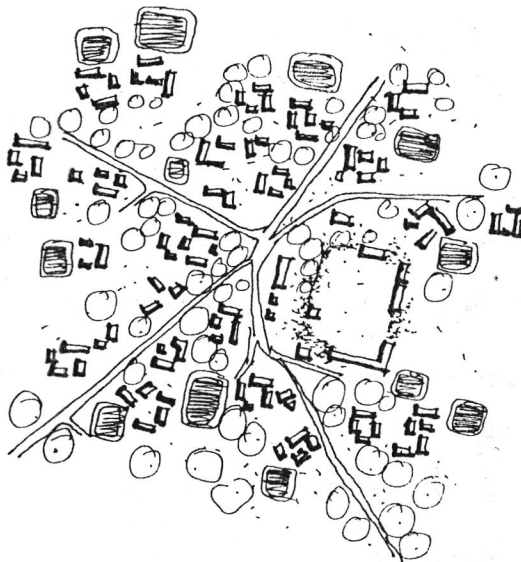
Almost the whole country is agricultural land and the rural settlements are formed like islands on in the middle of cultivated land.

The villages of Bangladesh can be classifed into three categories based on their settlement patterns. (fig 2.1)

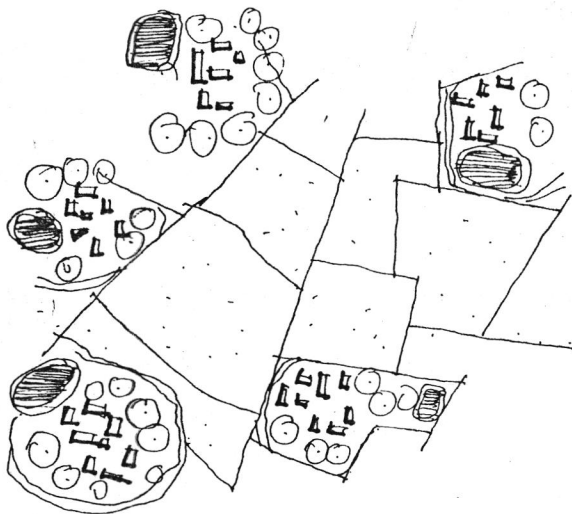
1. Linear villages
2. Clustered villages



•
LINEAR



•
CLUSTERED



•
SCATTERED

FIG. 2.1. RURAL SETTLEMENTS

3. scattered villages. (1)

The LINEAR villages are organised around a major path that runs through them. The homesteads are located on either side of this path. Somewhere along the path near about the center is the village market place. This area may also contain other common facilities like post office, health center etc.

The CLUSTERED arrangement has the homesteads clustered around the common market place, the hub of all village activity. Several walkways branch out from the central area leading to the various neighbourhoods.

The SCATTERED arrangement does not constitute whole villages together but refers to scattered homesteads over the countryside. Several homesteads are grouped together in the middle of the agricultural land which they serve. There are no marketplaces or common areas in this arrangements and these people depend on nearby villages for such facilities.

The arrangements of homesteads in the villages are guided by the availability of high lands. Sometimes homestead land is made high before building on it.

A number of homesteads form a neighbourhood called a "para". The land between adjacent homesteads is low and this gives it physical identity. A number of neighbourhoods together constitute the village.

The network of paths follow no established pattern in the villages. There is a main village road from which various smaller paths branch out. Paths provide the demarkation between adjacent neighbourhoods.

Near the center of the village is the market place. This usually consists of a number of shops around an open space. The open space is where the weekly market takes place. This is the main gathering place for the villagers and if the village has other public facilities they are likely to be located here too.

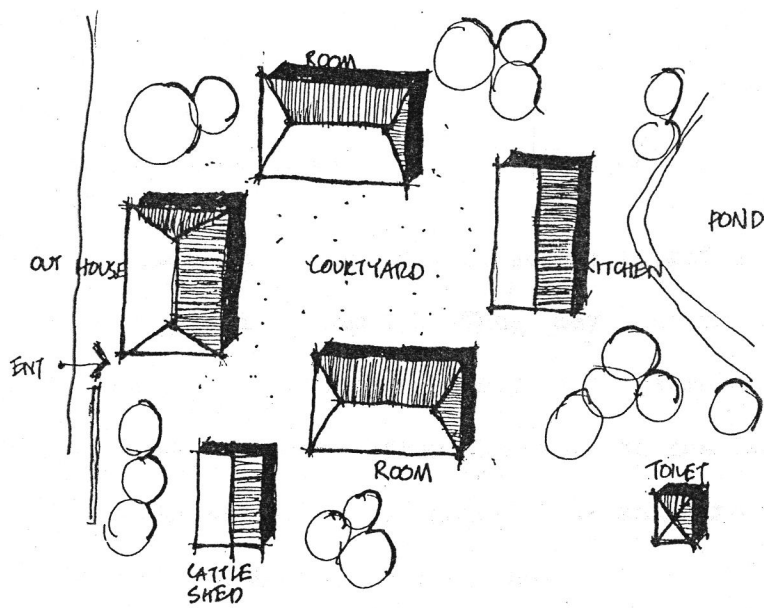
2.1.3 TRADITIONAL HOUSE FORMS

A traditional homestead usually houses extended families and is therefore not one structure but a collection of units and covers fairly large areas. Majority of the homesteads in rural Bangladesh cover an area exceeding .6 acres. (2)

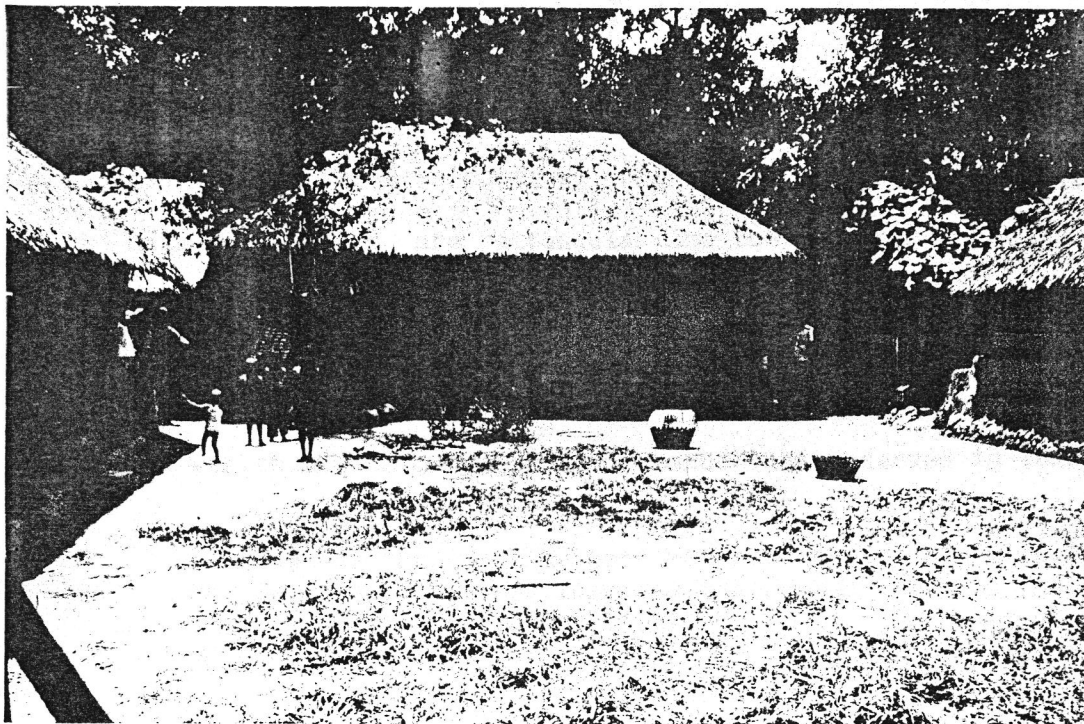
A household consisting of the members of an extended family live together in a "bari" or homestead.

A bari consists of a number of detached units called "ghors" each of which is usually one roomed and houses a family or contains service functions like kitchen, storage etc. (fig 2.2)

The ghors are organized around a courtyard and bigger homesteads may have more than one courtyard. The courtyard is not an enclosed space but has "leaks" into other adjoining spaces. The courtyard is



BASIC FORM
OF THE
TRADITIONAL
HOMESTEAD



THE
COURTYARD.

FIG 2.2. TRADITIONAL HOUSE FORM.

the common space for the whole homestead.

Each ghor or room is within itself a smaller house for a man and his immediate family. They may be the families of the married members of the household for example the married sons of the household head. After the death of the father the sons may decide to establish separate households and the homestead may be divided up into a number of smaller ones.

The household also has a number of common ghors which are contain general functions or house the younger unmarried members of the household. With a marriage in the household one can expect a new ghor to be built.

If the family has animals, and more often than not they do, there is a separate structure for the animals.

The ghors assume a loose and scattered arrangement around the courtyard. There is no fixed order of arrangement of the huts. The huts themselves are rectangular and they tend to form a rectangular courtyard between them.

The number of ghors or huts in a homestead is also a function of the wealth of the owner as Francis Buchanan observed in 1810;

" Among the natives, the poor man has one hut for himself and cattle, the richer man increase the number without altering the plan of the building. "(3)

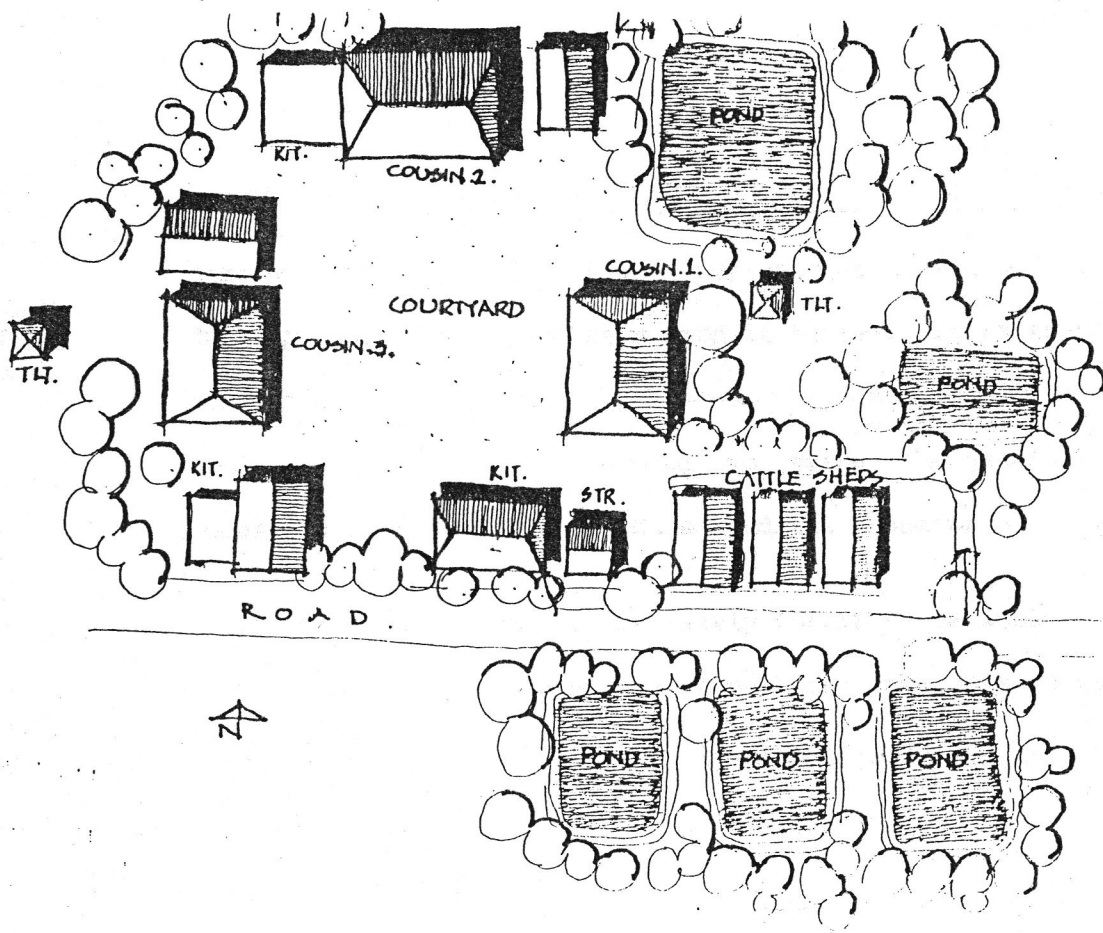
In their arrangements around the courtyard the hut nearest to the entrance is usually not for any family. It is a common one used for receiving guests and visitors and is called the "bangla ghor". Unmarried male members of the household may also live here.

The cattle shed is also located near the entrance of the homestead. This is not a walled structure but is a pavillion like construction with a roof on a timber or bamboo frame. This contains the cows, their feeding bowls, and a part of their hay. The main haystack is located close by.

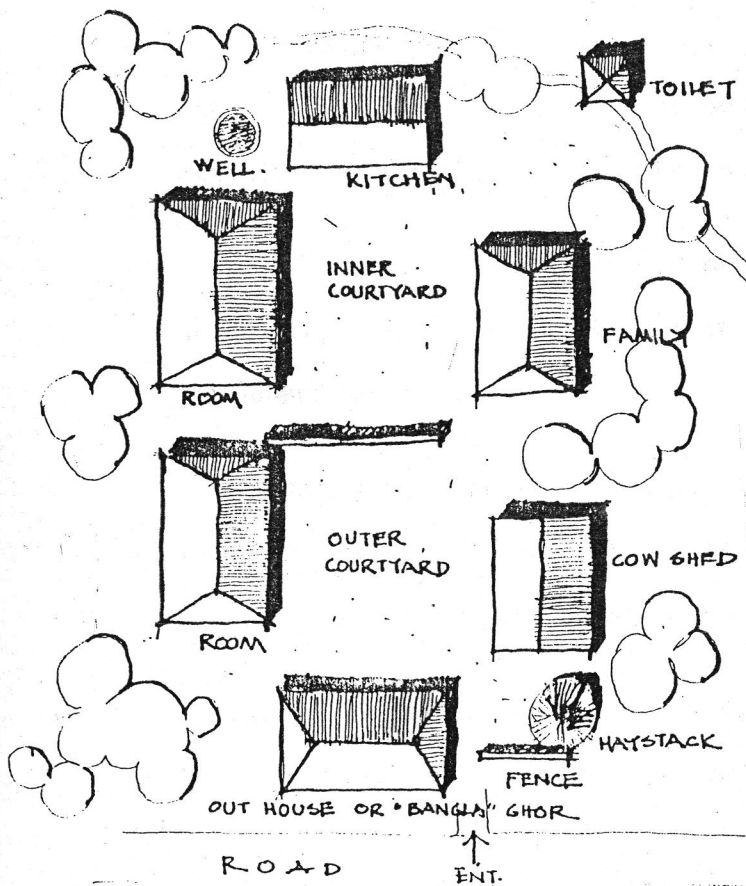
Beyond the bangla ghor is the courtyard and in the other end of it are the service facilities. The number of huts containing the service facilities are at least one, the kitchen. Depending from household to household there maybe more. Larger households may have seperate huts for storing grain and another one where grain is grinded.

The toilet is located farthest away. It is a small structure raised on stilts above the ground. The wastes usually drain off to the surrounding lowland. Bathing facilities are segregated but only for women, who take their baths in enclosed spaces. The male members take their bath in the pond or by the side of the well.

If a homestead has a large number of huts then there may be more courtyards or a bigger one. The preferances in this regard vary.
(fig 2.3)



JATIN BABU'S HOMESTEAD
 CHOTOMANIKHA
 BHOLA
 (COASTAL REGION)



HOMESTEAD
 IN
 RAJAPUR
 DHAKA DIST.

FIG 2.3. TRADITIONAL RURAL HOMESTEADS

Majority of the rural houses are of earth construction and to obtain earth for construction a part of the homestead area is usually dug up and in most cases a pond is formed. It is therefore common for rural homesteads to have a pond. In certain regions where the land is low earth is needed to raise the general level of the homestead in which case the homestead has a number of ponds.

If there is one pond it is likely for it to be located at the rear of the homestead. Covered pavilions are sometimes constructed on the pond for womenfolk to bathe in privacy.

2.1.4 THE HUT

The units or ghors that compose a homestead are small one roomed huts. Inside it is one single space and is rarely divided up into rooms. The average size is around 10 feet by 12 feet (3.3 feet = 1 metre) and they are always rectangular in shape.

They are mostly constructed of local materials like mud, bamboo, and thatch. Very few structures in the rural areas are made of permanent materials.

The hut is constructed on a plinth 12 to 18 inches in height (2.54cms = 1 inch) to protect the inside from floods and insects. The plinth is almost always constructed of mud.

The roof is pitched usually with a characteristic curved ridge. The traditional roof shape is either the "do-chala" or double pitched

or "chow-chala" or quadruple pitched. The roof is quite high and there is usually a lower ceiling inside. The space between the roof and the ceiling is usually used for storage.

" consists of a hut with a pent roof constructed of two sloping sides which meet in a ridge forming the segment of a circle so that it has a resemblance to a boat when overturned. . . "(4)

Some huts have verandahs on one or two sides. The verandeh performs two important functions

1. Provides a transition space between inside and outside.
2. Provides a overhang and thus keeps the walls in shadow.

2.1.5 ACTIVITIES AND SPACE ARRANGEMENTS

In the rural areas, majority of the day to day household activities take place outdoors except when it is raining. The interior spaces are mainly for used for sleeping at night and for storage.

Where the profession of the owner is such that he is not required to go out to work, the homestead is also as a workplace. Blacksmiths, potters, weavers etc. all have work spaces in at home usually in the form of a separte hut near the entrance.

The spaces in the rural homestead can be said to be of three main types;

1. Enclosed spaces: interior spaces, rooms.
2. Semi enclosed spaces: verandahs
3. Open spaces.

The major household activities can be classified as to their locations.

ENCLOSED SPACES	SEMI-ENCLOSED SPACES	OPEN SPACES
sleeping		
	work	work
eating	eating	
cooking	cooking	cooking
food preparation	food preparation	food preparation
	washing	washing
	bathing	bathing
	animal rearing	animal rearing
		kitchen gardening
receiving guests	receiving guests	receiving guests
	leisure	leisure
		playing

In its overall organization the rural homestead displays a high degree of flexibility in the use of space. The courtyard acts as the multipurpose space and to a certain degree all activities extend to the courtyard. The verandahs also accomodate some of the household

activities.

The rooms in the household do not have any special features in their designs to conform to particular needs. Only the kitchen has a earthen stove built in as a part of the earthen floor. There may be similar stoves built as a part of the exterior courtyard space.

Maintenance of the house is an important activity. The earthen floors of the rooms as well as the courtyard have to be regularly swept and resurfaced using water.

All household activity is carried out by the womenfolk, sometimes with the help of the children. The arrangements of the household is such that no internal activity is visible from outside and the privacy of the women are guarded.

There exists a definite sequence of space arrangements between public and private domain in a homestead. The concept of inner and outer house are related both to privacy as well as activity requirements.(fig 2.4)

The outer house or *bangla ghor* is the limit to which outsiders may be admitted. When the visitor is well known to the family he is allowed to enter the rest of the house. The space beyond the outer house which includes the courtyard and the other rooms is private domain this is where the ladies can move about freely. The privacy of the house depends a lot on how well this segregation is achieved.

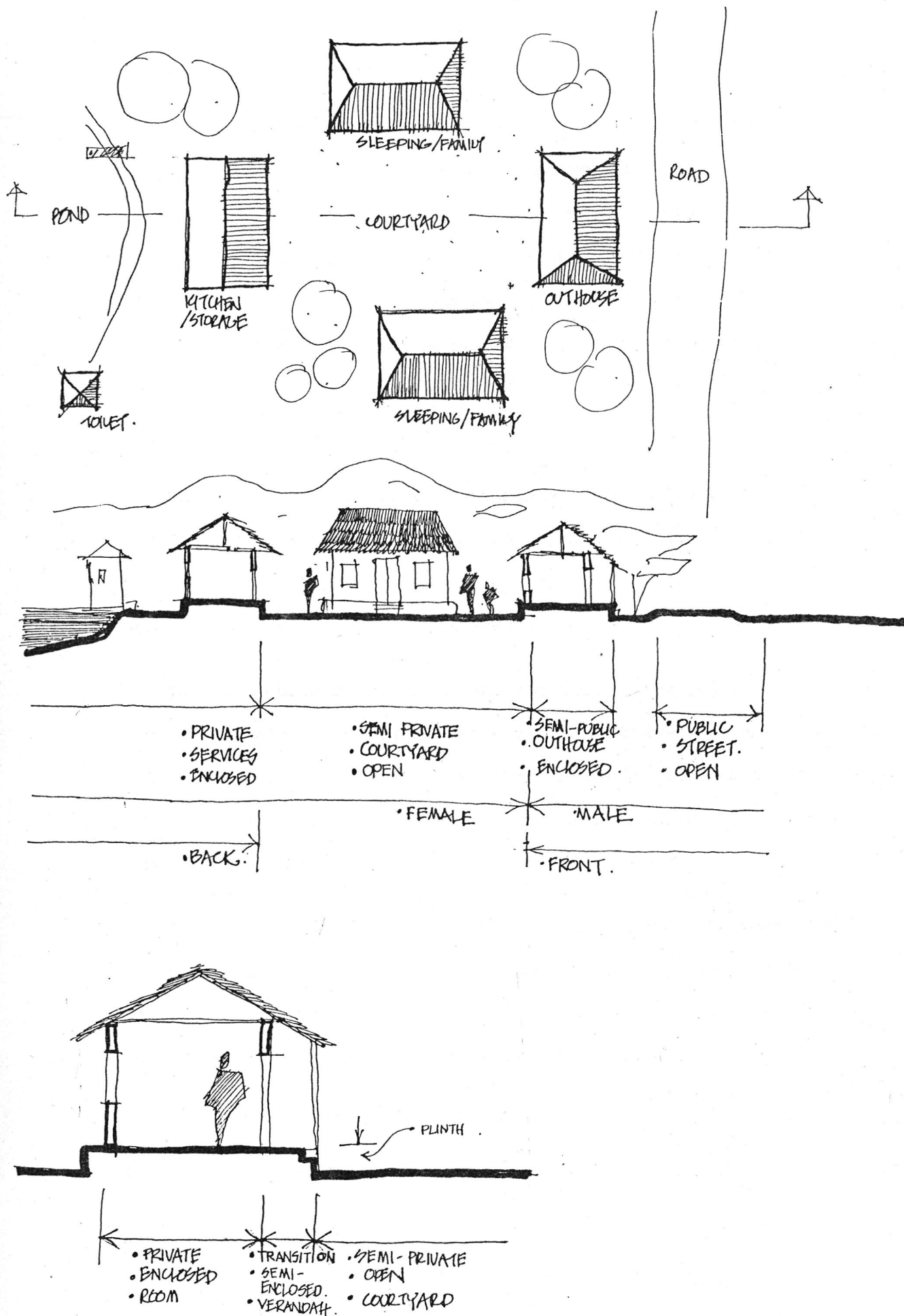


FIG. 2.4. SPACE ARRANGEMENTS

The traditional Bangladeshi house is organized on the concept of front and back. The side facing the street or public path is the front. The concept of front extends beyond the physical meaning of the word. The front of the house is representational of the homestead to the world outside. Visitors gather their impressions about the house from this part. It is therefore important for it to be clean and well maintained and the householders pay a lot more attention towards this.

The back of the house is associated with the service zone and is the most private. Outsiders are not supposed to be there and less importance is paid towards its appearance. The areas beyond the courtyard form the back of the house.

The area between the front and the back is the courtyard. Larger homesteads have more than one courtyard in the event of which one of them may be associated with the front of the house. Homesteads where the courtyards are very large they may be divided up into a number smaller sections.

Trees grow in abundance in rural Bangladesh and each homestead has a fair share of trees and they provide shade to the living areas. The courtyard space however usually has no trees. As Grain is sometimes left to dry here, shade is not desired.

2.1.6 RESPONSE TO CLIMATE

The rural house form has developed over centuries of modifications to environmental factors. Having originated and developed in the the climate of Bangladesh it is best suited to it given the constraints of having to use only the materials which are locally available and not having access to developed technology.

The climate of Bangladesh is Tropical "Hot Humid". During the summer months the temperatures are high and the sun is directly overhead (the tropic of cancer is directly over Bangladesh). The wet season has very high rainfall. The winters are mild with the occasion cold winds from the north.

An understanding of the climatic performance of the traditional house form can be based on the evaluation of its response to each individual element of climate which have a direct effect in the built form.

01. TEMPERATURE

Because the outside temperature is very high in the summer the interior spaces have to be cool. Mud walls are thick and have good insulation properties and help to maintain comfort conditions inside. Bamboo mat wall have pores in them and can "breathe" keeping the interior cool.

The overhang of the roof and the verandahs produce deep shadows on the wall surfaces thus keeping them cool. (fig 2.5)

The roofs are pitched and high with a ceiling at a lower level. This produces an air gap between the roof surface and the room and prevents the heat gain of the roof from reaching the interior spaces.

Thatch wherever used as a roofing material is laid out in layers and is itself a good insulator.

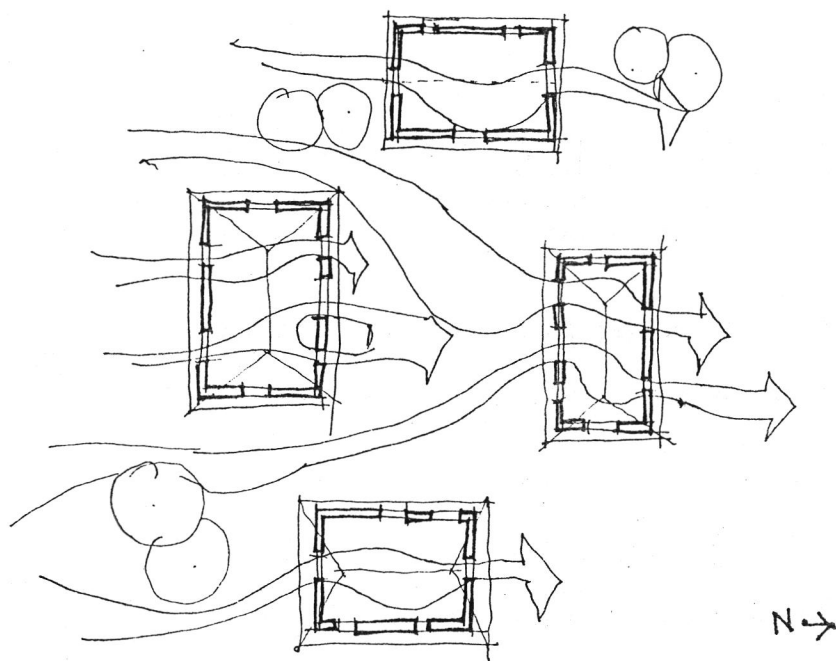
The thermal performance of corrugated iron sheets is not as good as that of mud or thatch. Houses where both walls and roof are constructed of corrugated iron can be quite hot inside.

The abundance of vegetation in the countryside help keep the homestead areas in shade and is an effective protection against solar radiation.

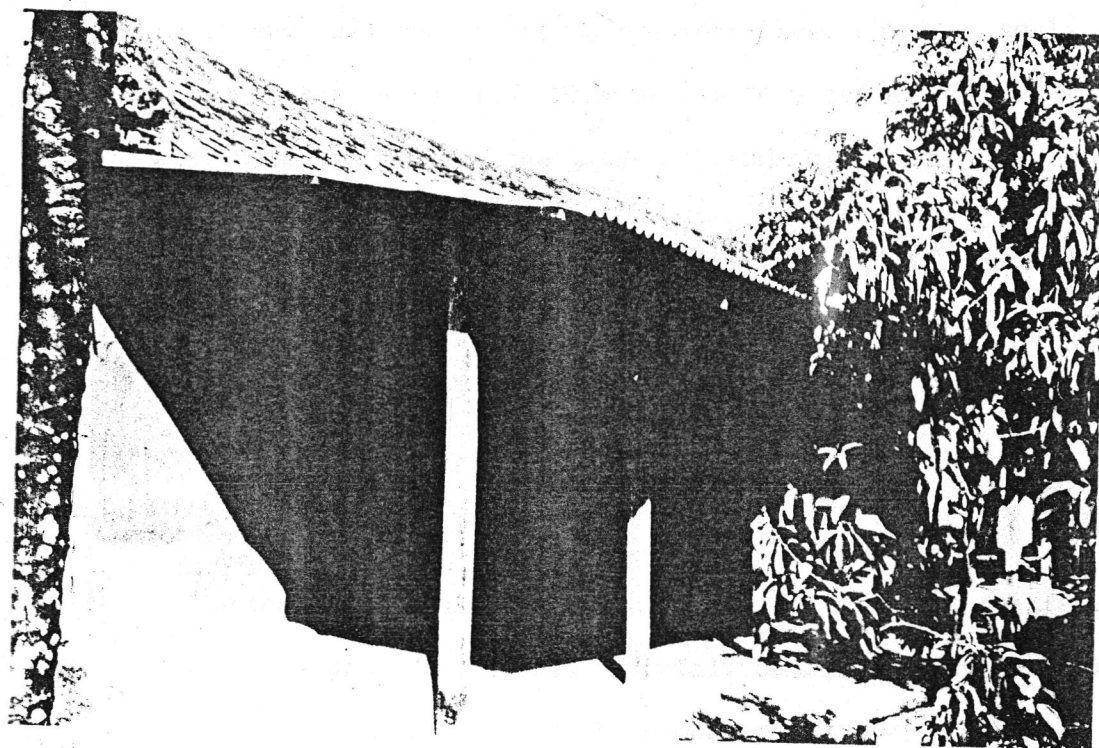
02. WIND

In the climate of Bangladesh where temperatures and humidity are high, there is a constant film of air on the surface of the body. The only way to feel comfortable is to allow a air flow over the surface of the skin which causes evaporative cooling of the body. Air flow, therefore is the single most important criteria for maintaining comfort conditions.

Kukreja describes the characteristics of the houses in the hot humid regions as;



AIR FLOW
THROUGH SPACES



EFFECT OF
OVERHANG/
VERANDAH

FIG 2.5. RESPONSE TO CLIMATE

"The common characteristics of the houses of the hot humid regions is their openness. They are designed to catch every vagrant breeze that happens to spring up, for natural air currents are the best relief in humid climates".(5)

The general principles of layout of traditional homesteads are loose arrangements of rooms around a courtyard which allows air movement through the structures.(fig 2.5)

Air flow during the summer months is from the south south-west direction and all living spaces in homesteads are usually oriented in that direction. The climatic "front" of the house is the south and a "south facing house" is the popular concept for a comfortable house.

The component huts of a homestead are one roomed structures. Structures are of one room depth and since there are usually no partitions and there is uninterrupted air flow the living spaces.

In mud wall constructions openings are usually small and this hampers the effective flow of air to a certain extent although but also helps to protect the interior from solar radiation.

Vegetation also helps direct air flow. Some homestead areas have a row of trees planted in its north side for protection against cold northern winds during winter.

03. RAINFALL.

During the monsoon season there is very heavy rainfall and some places are prone to floods. Rainfall combined with the effect of wind produces driving rain which penetrates living spaces.

The fact that rural homesteads are built on high ground provides the first level of protection against floods. The plinth of the houses provides the second level of protection.

Overhangs and verandahs protect the interior from driving rains. Openings on the walls are small and can be closed shut to keep out the rain. Windows have a small piece of bamboo matting on the outside which is hinged to its upper part and can be adjusted to any height by propping it up with a piece of stick.

Leaky roofs are a problem in rural homesteads. Thatch roofs allows water to seep through and unless there are many layers this cannot be prevented. Often polythene sheets are laid out under the sheets to give a second layer of protection. The use of corrugated iron as a roofing material is preferred as a protection against leaks.

Rain, falling against a mud wall surface also erodes it faster and unless the mud has been carefully prepared before construction maintenance work will have to be carried out more often.

04. HUMIDITY.

The main effect of humidity is the feeling of discomfort associated with it. Air flow through the living spaces is important to counteract this.

Humidity has an effect on the structures itself. High humidity causes the unwanted growth of plant life on the house itself. Moss and lichen grow on the walls and encourages the breeding and growth of certain insects associated with them. This causes frequent maintenance problems.

Mud used for wall construction may have plant seeds in it. Later after the wall has been constructed, due to the effect of humidity these seeds sprout trees and weaken the structure.

05. RADIATION AND LIGHT.

During the summer months the sun is directly overhead and when there is no cloud cover the radiation is direct. The sky dome is very bright during this time. The presence of vegetation and the tree cover protects the surface from heating up and from glare.

The lack of paved areas in the villages means that there is no heating up of the surfaces and problems associated with reflection.

The colour of mud and bamboo construction is dull and because no colour is used on the surfaces there is no glare reflected from the houses itself.

Corrugated iron on the other hand is highly reflective in its new state and is quick to transmit the incident radiation into the interior spaces. After a couple of years use a layer of rust collects on the surface and prevents this to a certain extent.

Because of the small size of the openings and the colour of the walls lighting levels in the interior spaces are low. But the fact that interior spaces are rarely used in the daytime does not make it a serious problem.

2.1.7 MATERIALS AND CONSTRUCTION

Materials for house construction in rural Bangladesh are mostly local. The country has no natural deposits of permanent materials like stone or rock and mud, bamboo and thatch are the most commonly used building materials. Nowadays corrugated iron is becoming increasingly popular not only because it is permanent but also because its use is representational of the owners wealth and well being and boosts his status.

Houses in rural settlements can be classified into three broad categories depending on the type of construction.

1. KUTCHA: Houses totally constructed of local materials like mud, thatch, bamboo etc. using local methods. The word "kutcha" literally means something which is temporary or not sufficiently strengthened.
2. SEMI PUCCA: Where a part of the house is constructed of permanent materials, sand, cement. bricks, corrugated iron sheets etc. For example a house with a cement floor and mud walls is a semi pucca construction.
3. PUCCA: Pucca construction is totally constructed of permanent

materials. The word "pucca" means permanent or strong. Pucca construction is rare in the villages.

80.16% of the houses in the rural areas are of kutcha construction, 17.5% is semi puçca and 2.33% are pucca or permanent.(6)

01. WALLS

Bamboo, mud and tin are materials for wall construction. The latter is becoming increasingly popular because of its permanancy and durability.

Houses with bamboo walls are built on a frame made of bamboo or timber. The wall made of bamboo mats is constructed seperately on the ground on a framework of slit bamboo to give it rigidity and the openings cut into it. The wall is then raised and fixed to the frame of the house.

Bamboo walls are porous and sometimes two layers are used with a polythene sheet between them to make it impervious. If the bamboo is not of good quality then it may decompose due to the effect of rain and moss growth.

Not all types of earth are suitable for wall construction. The earth of certain areas are not cohesive and do not make good walls. Wherever mud is used for wall construction it is first prepared by mixing it with certain additives like lime stone chips, rice husks

etc.to improve its quality or give it more strength. Mud for construction is obtained from a hole dug at site which later becomes the pond.

Mud walls are made from lumps plastered together with water from a shallow foundation and gets narrower as the construction goes upwards.

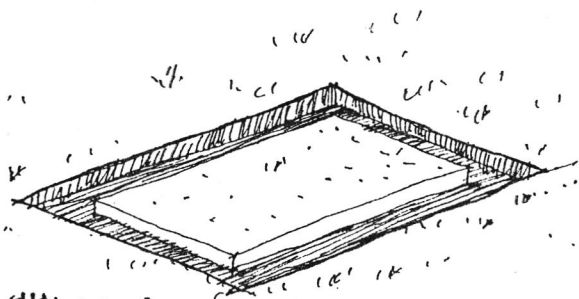
"The walls of permanent buildings are usually constructed of mud laid in strata of 18-20 inches in depth, each strata being allowed to dry before the next was added. Walls are between 26-30 inches at the base, tapering to about three quarters of this breadth at the top. "(7)

Openings are small and a plank of wood is placed over the opening to act as the lintel. Doors and windows are usually made of bamboo mats on a frame or of timber. Some windows have adjustable shutters. Glazing is rare in the rural areas. Richer households have wooden or steel grilles on openings for protection.

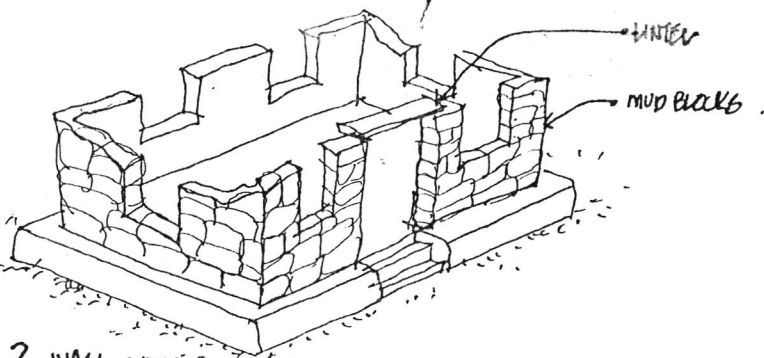
Wherever mud walls are used they are structural and take the load of the roof.

Walls of corrugated iron are the easiest to construct. They are available in standardized sections and are nailed or screwed on to a timber frame made of wood from the mango or jackfruit trees. Bamboo frames are usually used for bamboo walls.

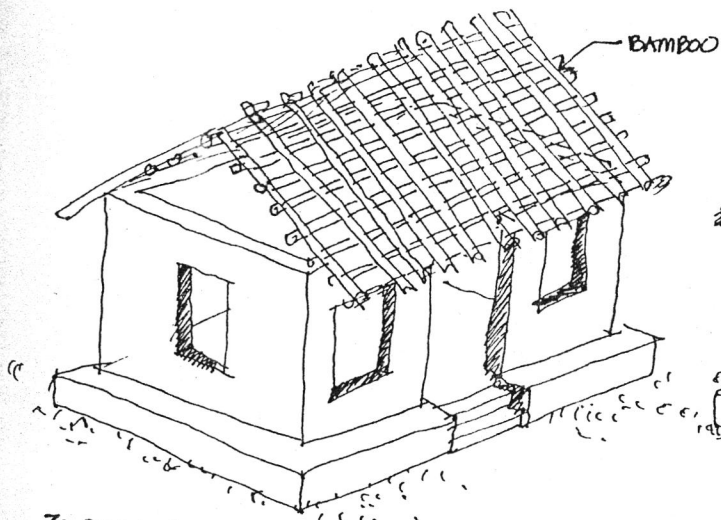
1. SHALLOW FOUNDATION



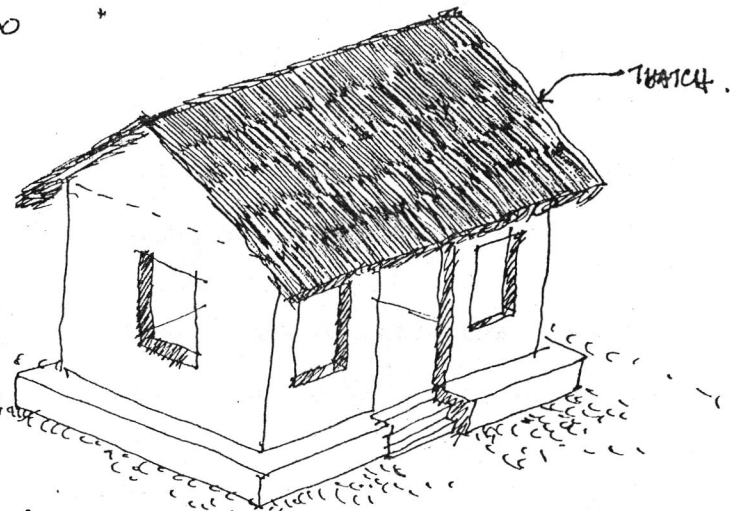
2. WALL CONSTRUCTION



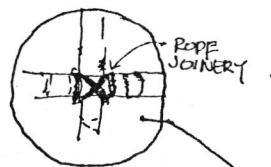
3. ROOF FRAME



4. COMPLETE HOUSE



MUD HOUSE CONSTRUCTION *



BAMBOO MATS
FIXED TO
BAMBOO FRAME

BAMBOO
MATS

CORRUGATED
IRON

BAMBOO/TIMBER
FRAME

MUD
PLINTH

BAMBOO/
TIMBER
FRAME
CONSTRUCTION

FIG 2.6. MATERIALS & CONSTRUCTION

02. ROOFS

The most commonly available and used material for roof construction is thatch. Corrugated iron is also a popular roofing material and is more expensive than thatch.

The use of tiles as a roofing material is restricted to particular regions of the country only. Bamboo is also used in by the tribal people in the hilly south eastern regions of the country.

The roof is usually a bamboo or timber frame on which the roofing material is fixed. Thatch roofs are laid out in layers on the frame and corrugated iron is fixed to it. Wooden framing materials are susceptible to termite attacks and are protected by painting them with a solution of tar and kerosene.

The system of construction adopted determines the roof construction. If the whole house is built on a frame then the roof frame is a part of it. For mud wall the frame is constructed on the the mud wall and rests on it or sometimes the whole roof would be constructed on the ground and then lifted into position on the walls as Williamson observed.(8)

Materials for joinery are varied and depending on the situation can be rope, nails or wire.

03. FLOORS

Except for the houses of the tribal people in the hilly regions which have bamboo or wooden floors mud is the most popular flooring material.

Cement floors or floors made of permanent materials are very few in the villages as permanent floor constructions require a large investment for foundations. Even semi pucca houses with brick walls and permanent roofs are likely to have earthen floors.

2.1.8 PRIVATE AND PUBLIC OPEN SPACES

Within the homestead the courtyard is the main open space. The number of courtyards in a house their relative locations and sizes determine their uses. Usually there is only one courtyard and it has multiple use but with more than one they are likely to be used differently.

Besides being a functional space a courtyard is also a recreational space for the householders. Close friends can be entertained in the courtyard in the evenings and in that sense it has significance in the social life of the householders. Children use it as a play area while their mothers can keep an eye on them. During weddings and other festivities the courtyard is an important outdoor space where guests can be accommodated. When someone in the family dies the funeral procession starts from the courtyard.

Where there is more than one courtyard, one of them is likely to be associated with the front part of the house and the out house or "bangla ghor" (see 2.1.5) The nature of this is more public and it is more accessible to the outsider. Large households may have very large courtyards in the event of which it may be divided up into a number of sections with fences or parts of it may be allocated to separate families for maintenance. Larger courtyards are also divided up when households split up.

There are other open spaces in the homestead besides the courtyard. They are the left over spaces between adjacent huts and the between the homestead structures and the boundary. Usually they are not maintained properly and lie about without apparent use. Since plant life grows very easily in the climate they have to be cleared regularly to allow any use to these spaces. Some households have vegetable gardens in these spaces.

2.2 THE URBAN HOUSE

2.2.1 INTRODUCTION

Urbanization in Bangladesh existed in the pre-colonial days, but it was with colonization that urban areas began to develop their own character. According to King, urban centers that existed in the pre-colonial days were dependent on rural agricultural economy and rural traditions strongly dominated the socio cultural scene. As a result the the life style of the people in the villages and the cities tended to be similar in nature. (9)

The development of the city as a result of colonialism created new functions for the city. Public services were institutionalized and this created a dependence on the city. The city also created new occupations and the result was migration of some of the rural population to the cities. Although cultural attitudes remained more or less the same the environmental context was different from the rural areas.

Earlier forms of the cities were just denser versions of the villages. The concept of separating work place from the place of residence brought about some changes in spatial layout of the houses and their arrangements. The development of the house form in the cities was greatly influenced by the building style of the colonial settlers.

After the end of colonization the cities continued to develop in the same pace and recently in a even faster pace. The development of the house form itself followed the trails of the colonials to their home countries and adapted western models.

As the urban house form developed it became further removed from traditional. Initially urban houses were glorified versions of rural homesteads where traditional living patterns could be duplicated. As it developed there were constraints to the extent these patterns could be maintained and eventually the urban house conformed more to western ideas of living.

2.2.2 THE URBANIZATION OF THE TRADITIONAL HOUSE AND ITS DEVELOPMENT

The urban house in its early stages was a modified version of the traditional rural homestead, and the colonial bungalow was the first major influence in its subsequent development.

In the colonial urban centers the colonial community would live in;

"Bung^alow compound complexes typically consisting of a large single storeyed dwelling located in upwards of two or more acres of enclosed ground."(10)

Starting with the begining of the colonial period the development of the urban house can be categorized into three stages in terms of of formal and organizational characteristics.

01. In its first stage of development the from the traditional homestead the urban house was in part representational of the colonial house. Although the living style of the colonial community had its influence the traditional background of the native population was strong too. The resultant house form had elements borrowed from both the colonial houses and the traditional homestead.

02. The second stage of development of the urban house lead to a consolidated version of the earlier stage keeping the relative location and organization of household spaces same. Improvement of service facilities and decreased availability of space were the main considerations.

03. The final stage of development of the urban house before it arrived at its present form was a result of shrinking plot sizes in the cities and increased influence of western styles of living. Even though the colonial rulers had left the influence of their home countries remained strong.

01. THE FIRST STAGE

This form of the urban house would seem to be a consolidated version of the rural homestead with a number of structures arranged around a common space. As opposed to the rural situation where each unit was single roomed in the urban situation each could be a group of rooms. The structure at the front part of the in house would be a

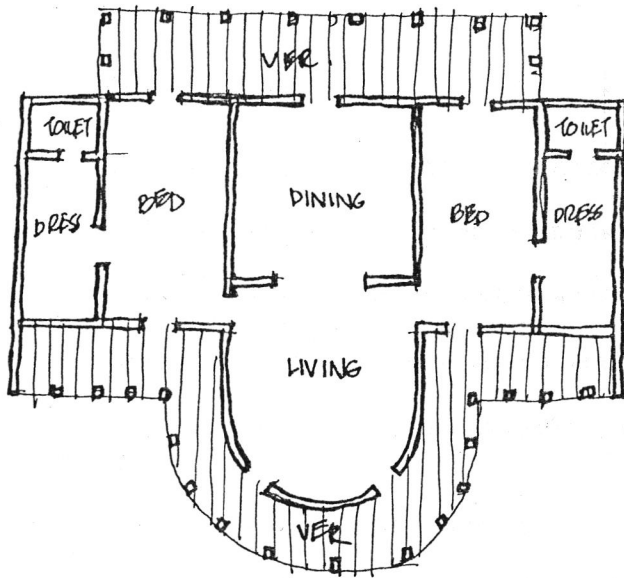
copy of the colonial bungalow in a smaller scale. The services and additions were located at the rear and arranged around a courtyard.(fig 2.7)

The tradition of extended families was strong and several units were needed to house the smaller families that made up the household. The result was a number of structures around a common space or courtyard.

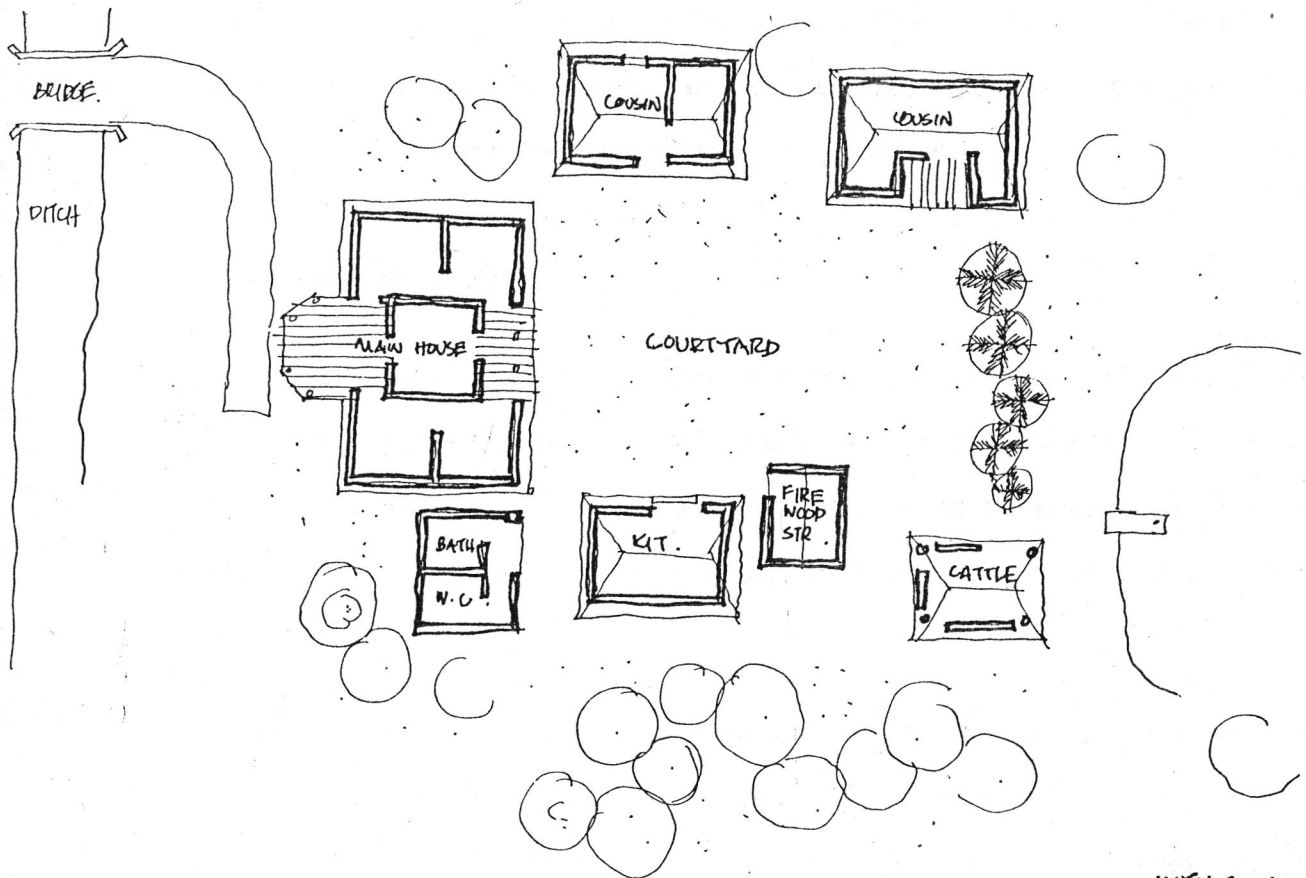
This sort of arrangement allowed the city dwellers to maintain some of the traditional habits and practices. It was possible for the people to keep animals in the house, the courtyard provided the space. These houses usually had a shed for cows within its compound. Small scale vegetable gardening could also be carried out.

The kitchen would be separated from the main house, often with a separate structure for storing firewood. As the roots of these people were in the villages the grain for domestic consumption came from their village fields and this often called for separate storage facilities.

Toilets were also detached from the main house. There was no conventional water borne sewerage system and the houses had to depend on a on-site disposal system. The bathroom could be located in combination with the toilet. Lacking a piped water system, water had either to be stored in a small reservoir in the bathroom itself or had to be carried in bucket from its source.



COLONIAL BUNGLOW*
(SERVICES SEPERATE)



KHAN "BARI", JAIL ROAD, MYMENSINGH

INFLUENCE OF
THE COLONIAL
BUNGLOW ON
URBAN HOUSE
FORM.

FIG. 2.7. DEVELOPMENT OF THE URBAN HOUSE (I)

Verandahs were a common element in these houses and served a number of important functions. They were multifunctional and could be a leisure space or a space for food preparation. The nature of the use of the verandah would also depend on its location, verandahs at the front of the house would have a more formal use and the ones at the rear a more domestic purpose.

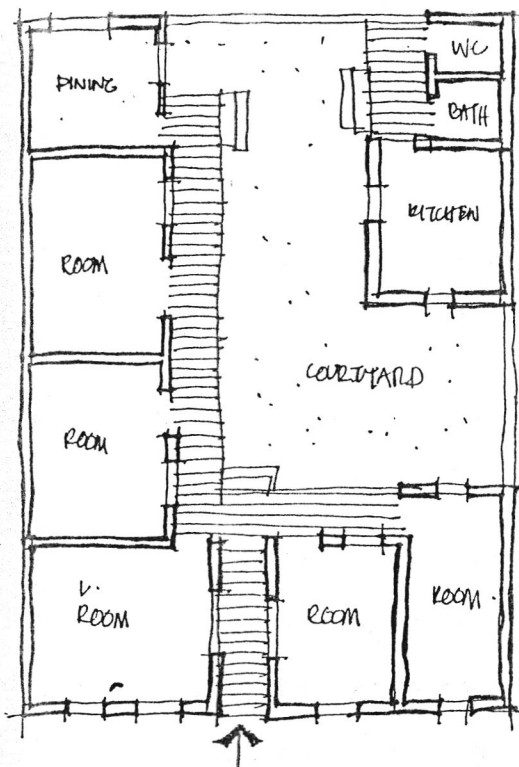
Often, these houses had ponds within their compounds. The inclusion of the pond within the house was more because of its traditional position in the house rather than its functional use. Ponds were used for fish cultivation for domestic consumption.

In its overall character these houses were inward looking and all domestic spaces were arranged around the courtyard. However, the structure facing the street served a dual purpose and was both outward and inward looking at the same time.

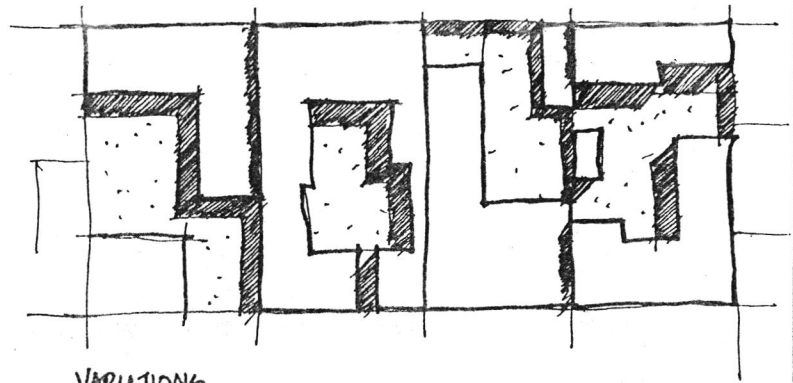
02. THE SECOND STAGE

In its next stage of development the urban house was now a series of rooms arranged side by side around a regular shaped courtyard. The services, like the previous type, would be separated from the main structure or located at a distance from the other spaces. (fig 2.8)

Houses now could be two or more stories in height as opposed to the usual single storied structures of the previous types. This would allow more functions to be accommodated within the same ground



COURTYARD HOUSE



VARIATIONS



VIEW OF COURTYARD FROM TOP .

FIG 2.8. DEVELOPMENT OF THE URBAN HOUSE (II)

area. Streets near the center of the city were narrow and the frontage of the house was reduced. Taylor describes houses upto four stories in height with frontage as little as eight or ten feet having no windows at the sides and a small court at the center. (11)

These houses allowed some allocation of functions to particular rooms specially the rooms at the front of the house would be for recieving visitors and guests. But generally speaking, within the internal parts of the house there were no rigid allocation of spaces to particular members of the family e.g. master bedroom, childrens bedrooms etc.

There was development in building construction techniques and new materials were available which allowed variations and flexibility. Masonary construction and the availabilty of steel allowed greater permanancy and larger spans.

The house area was more defined and unlike the previous types the compound was generally rectangular shaped. As a result the house would follow the site shape and variations would occur within the fixed boundary. "L" or "U" shaped houses were popular.

The concept of zones within the house existed and the more public spaces would be located near the entrance and then services at the rear. The family spaces around the central zones. This was a direct derivation from traditional houses.

The courtyard was generally paved. Verandahs ran along its periphery linking the courtyard to the rooms and the rooms with each other. The verandah was the main circulation channel and its multiuse was somehow restricted by its decreased width.

Spatially the courtyard was more of an enclosed space and didn't have "leaks" as in the traditional homesteads.

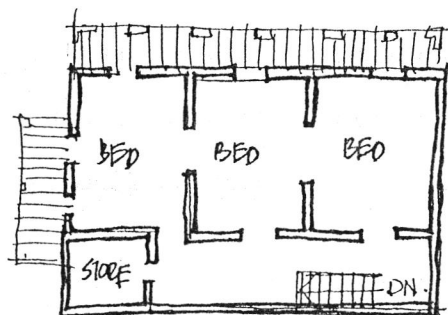
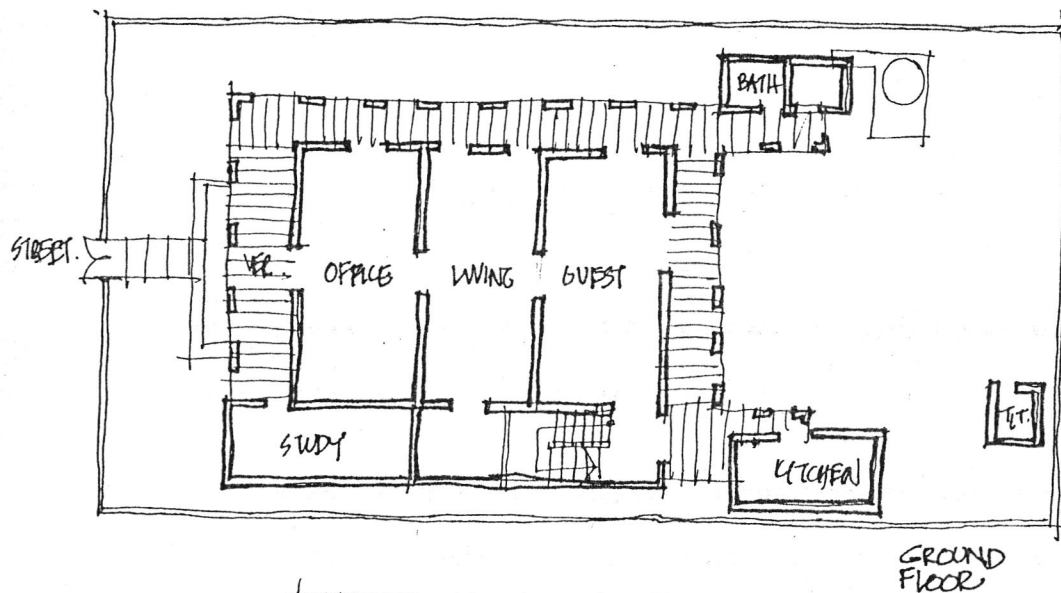
This sort of house was a good interpretation of the traditional houseform in the urban context as Imamuddin argues;

"The changing socio cultural concepts of 'inside and 'outside' of intimacy and exposure, of private life and public space all found appropriate expression in the enclosed courtyard house making it a perfect fit in the urban environment. There followed a mutual adaptation between house form and pattern of living and between way of life and house form so that for a considerable period of time it established itself as the most valid house form." (12)

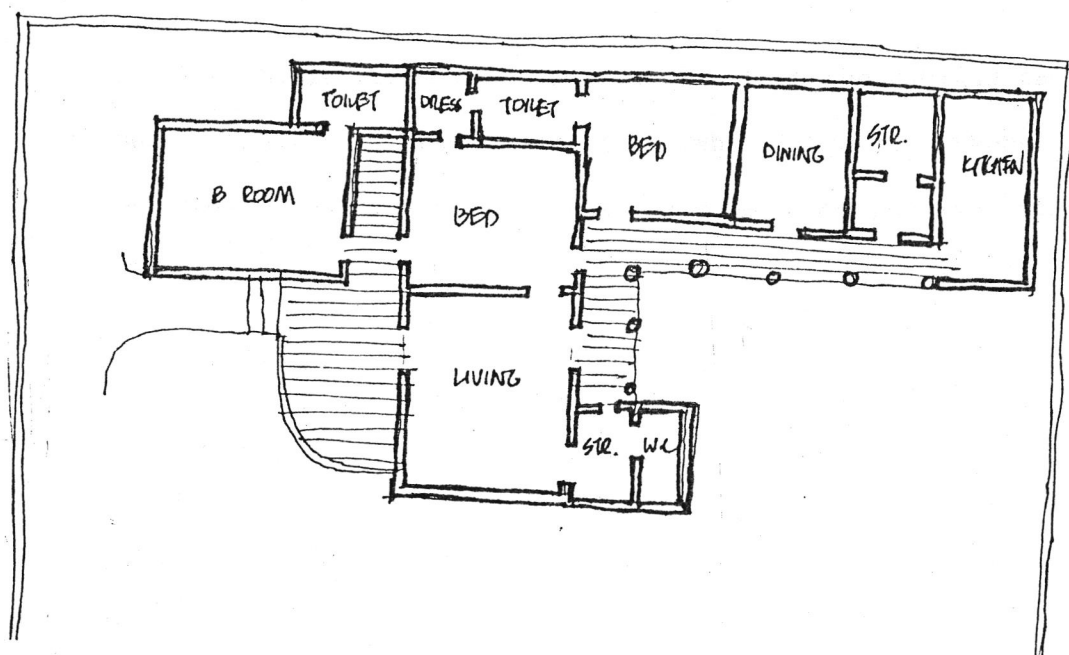
03. THE THIRD STAGE

The courtyard gradually disappeared from the urban house and the interior spaces were further consolidated to form one structure. Some examples showed a marked segregation for service facilities whilst others combined them with the other living spaces. (fig 2.9)

Private open spaces existed but not in the form of courtyards, but as left over space from the plot. Often there were attempts to relate this space to the house in keeping more space at the back than the front. The concepts of privacy lead to the construction of walls along the boundary of the plot which gave some identity to the open spaces inside.



HOUSE AT 6, NYE STREET, WARI, DHAKA



HOUSE AT 6, MOMENBAGH, RADARBAGH, DHAKA

FIG. 2.9. DEVELOPMENT OF THE URBAN HOUSE (III)

The houses could be more than one storey high and often were, but the concept of living in flats, one family above the other, was not widespread until the mid 1950's when the government built first built them as housing for its employees.

Spaces within the houses were now specialized and specific functions allocated to them. Gradually the kitchen and other service facilities began to be incorporated with the other functions. The open spaces were no longer designed as courtyards and a lot of traditional functions lost their meaning.

The verandah, however continued to be a popular element in urban houses and its use was varied. The provision of wide verandahs in some houses allowed some of the courtyard activities to be carried out there.

"The concept of nuclear families had to await the specialization of rooms according to function and the separation of rooms from each other." E.T.Hall (13)

The house form was now read to accept the nuclear family, but it was not always nuclear families who lived in these houses and extended families would often add some rooms to make them suit their needs.

2.2.3 CONTEMPORARY URBAN HOUSES

The concept of a house as an independent structure on a plot of land is no longer common and it is now acceptable to have houses designed as flats over one another.* This lack of connection to the ground does not make it possible to carry out certain traditional functions associated with the ground.(fig 2.10)

Services and facilities have developed the city and a lot of modern amenities are now available to the city dweller. The availability of gas, electricity and running water have resulted in changes in the spatial organization of the house in the city. There have been changes in attitudes towards traditional living and subsequent changes in spatial arrangements.

Service facilities now form an integral part of the house. Kitchens are connected to the house and open off directly from other living spaces. Gas is now available for cooking and there is no need for storing firewood. Methods of food preparation, however, remain quite the same as traditional methods. Because of the availability of improved sewerage systems toilets can now be located within the house.

The sizes of rooms are reduced and they are adjusted to accommodate particular furniture. There is a high degree of compartmentalization of spaces in the house thereby reducing the flexibility of space usage. Circulation is through the internal spaces instead of

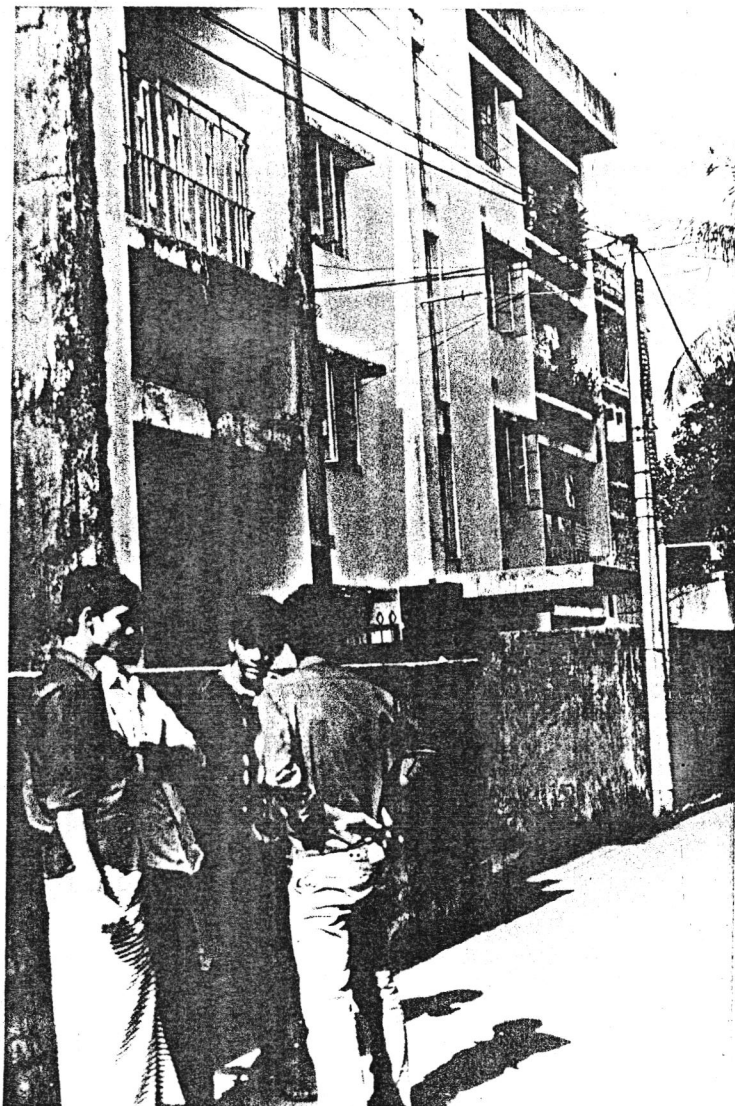
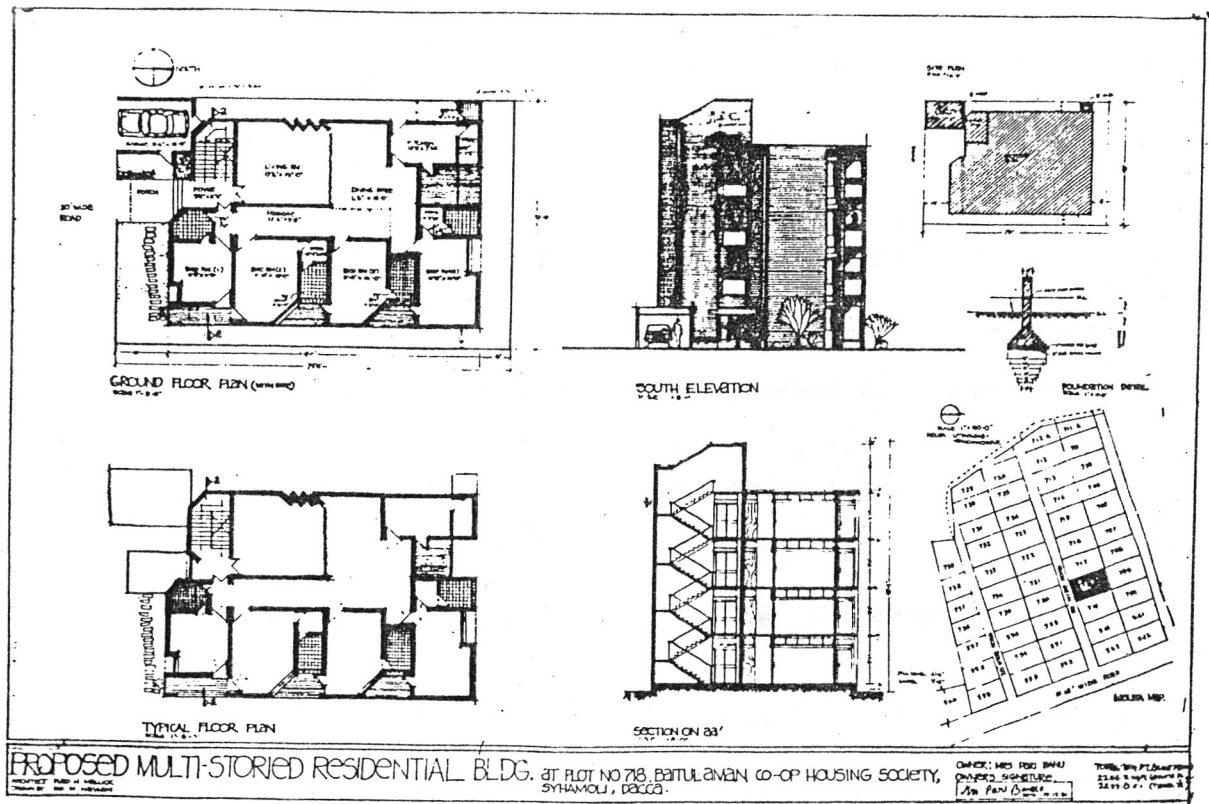


FIG. 2.10. CONTEMPORARY URBAN HOUSES

verandahs. Verandahs are still popular design elements though their sizes have been greatly reduced. They are attached to individual spaces rather than being common to all the areas of the house.

The idea of blocks of flats as housing has been made popular by examples of government housing. These are discussed in detail in the following chapter. The height of these building do not usually exceed six stories in height.

The most common practice is to have two flats per floor and served by a common staircase. This allows both houses to be ventilated. More than two flats would mean blocking the direct path of air for the others.

The houses are usually contained in regular shapes, rectangles or squares, economy of space being the prime consideration. This does not allow any seperation of zones within the house.

The concepts of privacy is strong in Bangladeshi society and private four storey houses have boundary walls. The spaces left between the building and the plot are usually very narrow and have no apparent use, except collecting rubbish.

Other examples exist of independant houses on seperate plots but they are private developments of the upper income groups. Even these houses are built on western standards and have little open spaces inside.

2.3 SUMMARY

The rural house form is a direct response to the needs of the traditional way of life. It has been adapted to the local environmental factors over hundreds of years and in its present state is well suited to the climate of the country. Given the limited availability of building materials in the rural areas and the technological constraints it represents the optimum level of utilization of resources.

Colonial rule initiated the beginnings of today's urban society. Although the urban environment presented a different situation from the villages, attitudes towards way of life were based on established traditions and changed slowly. Gradually and with increased urbanization, there were physical constraints to the extent traditional ways could be maintained in the cities, although attitudes towards living were tradition based.

The urban house form was initially a modified version of the traditional rural homestead and household activities followed traditional customs. Due to the limited availability of land in the cities it developed into a compact version of the previous type, giving way to a totally consolidated urban house form and eventually 4/5 storey blocks of flats. Changes in the urban house form was not accompanied by a similar rate of change in socio-cultural attitudes of the population. The way of life in the cities are, to a large extent influenced by established traditions.

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CHAPTER THREE

PERFORMANCE OF
URBAN HOUSING ;
A STUDY OF EXAMPLES
OF GOVERNMENT
HOUSING.

CHAPTER THREE

PERFORMANCE OF URBAN HOUSING; STUDY OF EXAMPLES OF GOVERNMENT HOUSING

3.1 INTRODUCTION

The government is the single largest provider of built up Housing in Bangladesh mainly in the form of accomodation for its employees. Although the number of units provided is far less than the number of employees, government housing continues to be a strong influence on urban housing in general. The trends established by government housing are followed by other semi-government agencies and to a large extent by private developers. Government housing can therefore be said to be representational of urban housing in general

The analysis is concerned with two categories of government housing ,the first part involves examples of government housing of the past construction of which is now discontinued. The second part concerns examples of government housing based on the government housing standards established in 1985, (1) and which are now accepted as a basis for future constructions.

The examples from each category are analysed on the basis of their socio-cultural adaptibility and environmental performance.

Socio-cultural adaptability refers to the way these examples perform in relation to the way of life of the Bangladeshi people-the ability of these units to respond to the numerous factors which guide day to day life of the residents.

Environmental performance attempts to analyse the response of these buildings in the their relationship to climate and other environmental qualities of the urban areas. The buildings in turn generate certain environmental changes by virtue of their physical qualities.

3.2 DEVELOPMENT OF GOVERNMENT HOUSING

This part consists mainly of examples of government Housing in the past. After the partition of India in 1947 and the subsequent formation of Pakistan there was a tremendous flow of muslim refugees from India into both East and West Pakistan. The need to house these people was felt and this resulted in the begining of government housing. Eventually the need increased with increase in urbanization and this lead to the formation of a Housing and Settlement Wing of the Public Works department. Since then various government agencies have been involved in the production of housing. The following examples look at some of the types that have evolved as a result of their efforts until the development of a new set of standards by the Department of Architecture of the Ministry of Public Works. These types are analysed in the subsequent part of the chapter.

The examples discussed are of the smaller types with floor areas around and below 1200 square feet. Units which are bigger than this are much fewer in number and cannot be said to represent government housing in general.

3.2.1 GENERAL CLASSIFICATION

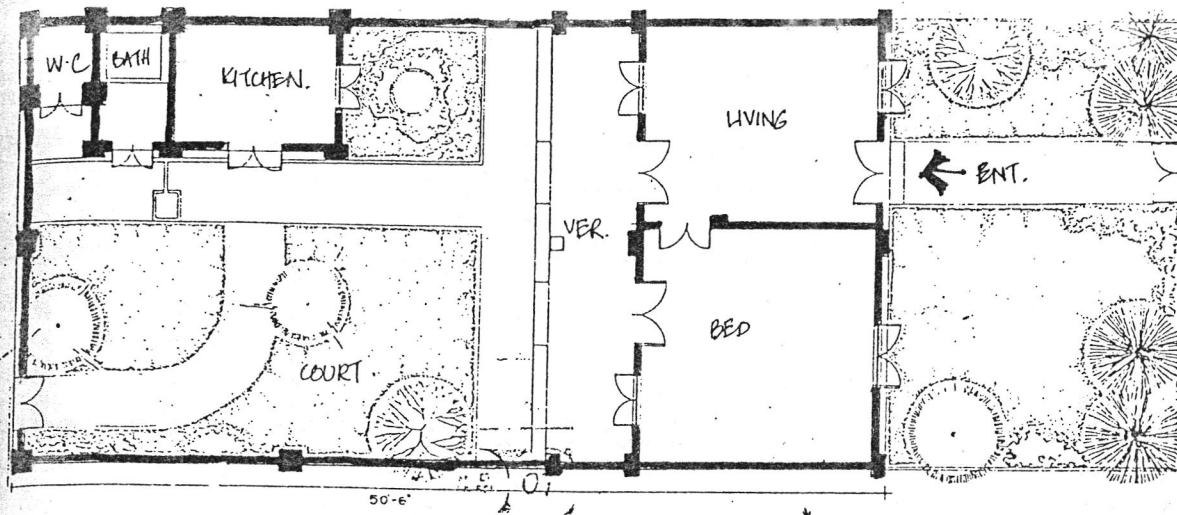
The examples presented are classified into three groups for the purpose of analysis. They are;

1. Single storey row houses
2. Multi-storey blocks with each staircase serving two units.
3. Multi-storey blocks with each staircase serving a number of units.

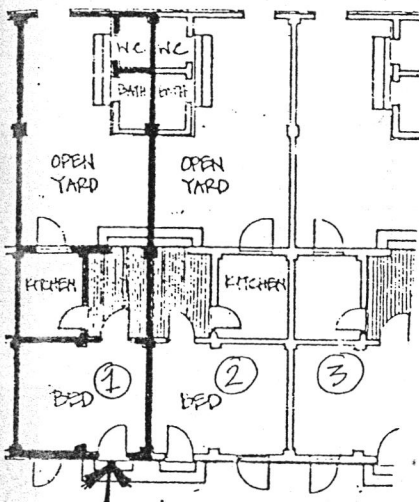
1. SINGLE STOREY ROW HOUSES.

Of the three groups these are the least in number. Construction of houses of this type were more popular in the smaller small towns. Small single storey housing developments like these were also favoured by the Railways as staff housing.(fig 3.1)

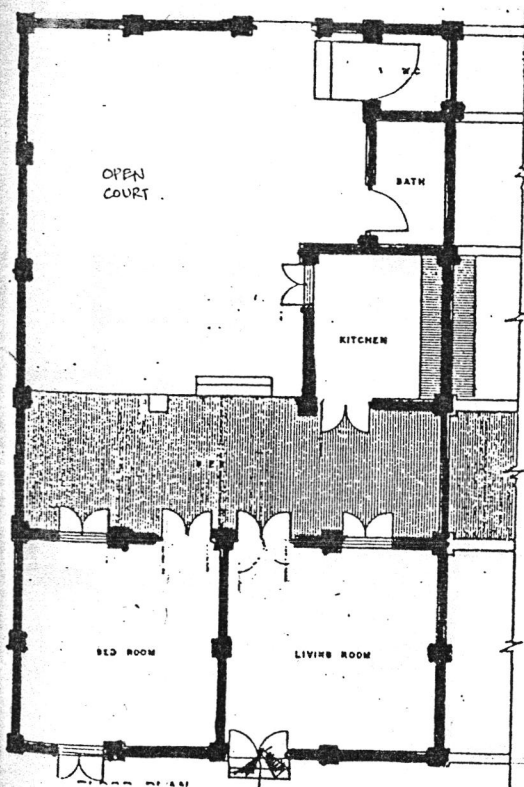
Example 1 of the three examples is from a Housing area called Pallasey Barracks. These houses were constructed right after the partition of India in 1948 and were meant to be temporary accomodation arrangements for lower income government employees. Example 2 is Railway housing meant for lower level employees. This



1.
PLASSEY BARRACKS
HOUSING, DHAKA
538 SFT.



2
HOUSING FOR
EMPLOYEES.
LEATHER
TECHNOLOGY
INSTITUTE
DHAKA
430 SFT.

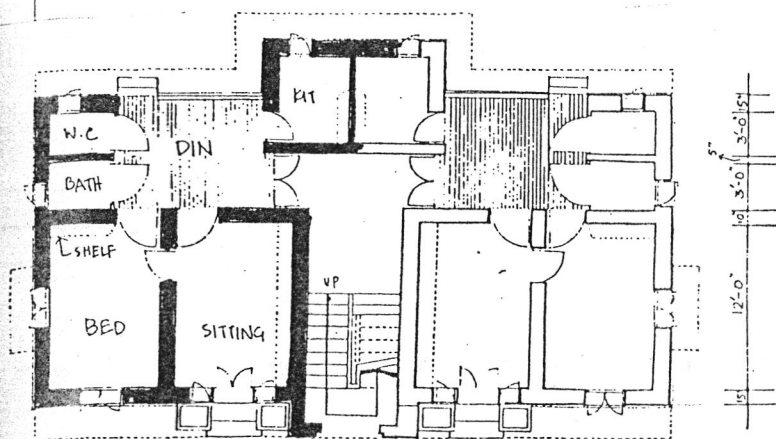


3.
RAILWAY
EMPLOYEES
HOUSING
DHAKA.
445 SFT.

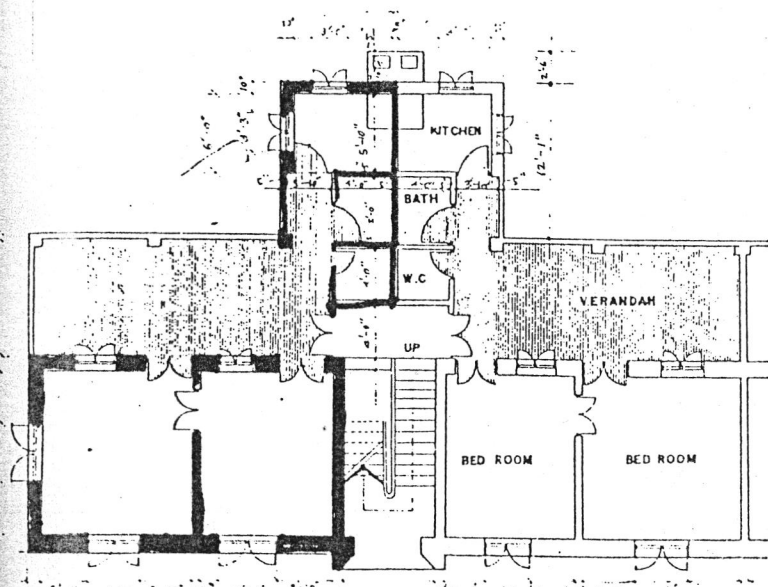
FIG. 3.1. GOVERNMENT HOUSING
EXAMPLES OF SINGLE STOREY ROW HOUSES

[1 sq m = 10.8 SFT.]

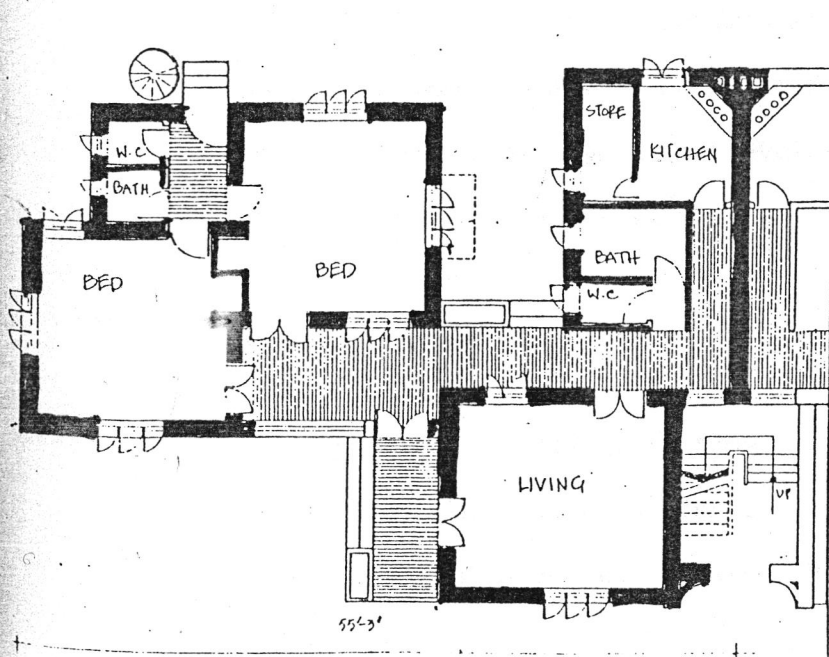
SOURCE: STUDY OF EXISTING GOVT. RESIDENTIAL ACCOMMODATION IN DHAKA. DEPT. OF ARCHITECTURE BU E.T. DHAKA



FLATS FOR GOVERNMENT
EMPLOYEES
MOTIJHEEL, DHAKA
573 SFT.



FLATS FOR CLASS III EMPLOYEES
AT KALABAGAN, DHAKA
811 SFT.



FLATS FOR OFFICERS
MOTIJHEEL COLONY, DHAKA
1214 SFT.

FIG. 3.3. GOVERNMENT HOUSING
EXAMPLES OF FLATS WITH EACH STAIRCASE SERVING
2 UNITS — SERVICE ZONE SEPERATE FROM LIVING AREAS.

E 128 m. = 10.8 SFT.]

is a prototype example and it repeated in Railway employees housing developments in other parts of the country. Nowadays the trend is changing and multi-storied housing is preferred. Example 3 is housing for lower employees of the Leather Technology Institute in Dhaka. This is smaller in size than the other two.

Example 2 and 3 are of almost similar size and all three are of same character. They are on rectangular plots of land and have inner courts. Example 1 and 2 have two rooms in the front connecting the two is a wide verandah at the back. Separated from the main house and in one side of the open courtyard is the Bath W. C. and the Kitchen en bloc. The bigger example has about 500 sft of floor area and about 800sft of open area each. The smaller example has a built up area of about 250 sft and almost the same amount of open area. All these examples have service entrances at the back.

Construction materials are mixed. The walls are five inch brick walls with ten inch brick columns at regular intervals. Roofs in the houses at Plassey are of corrugated iron sheets. Information about roofs of the other two is not available but they are presumably made of the same material as in Plassey.

2. MULTI-STOREY BLOCKS WITH EACH STAIRCASE SERVING TWO UNITS.

Of all the examples this type is the most popular. They are represented by a large number of examples. This type is favoured by most Government agencies as being the ideal accommodation for their

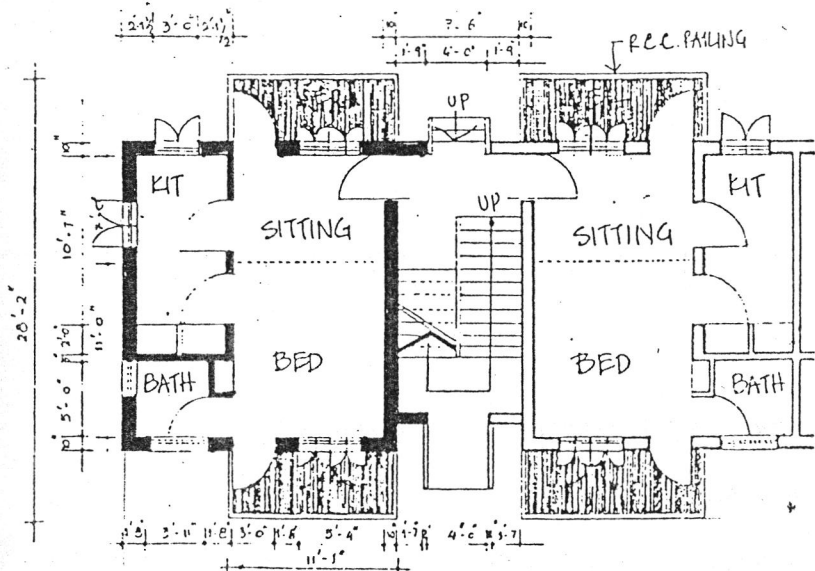
employees. The influence of this type is evident in Government housing standards of today. (fig 3.2 & 3.3)

These units are generally meant for lower level Government employees although it is not uncommon to find higher officials living in these houses due to the shortage in living accommodation. Depending on their sizes they are allocated to high or low ranking Government employees. Their general character is such that they are easily identifiable as Government accommodation anywhere in Bangladesh.

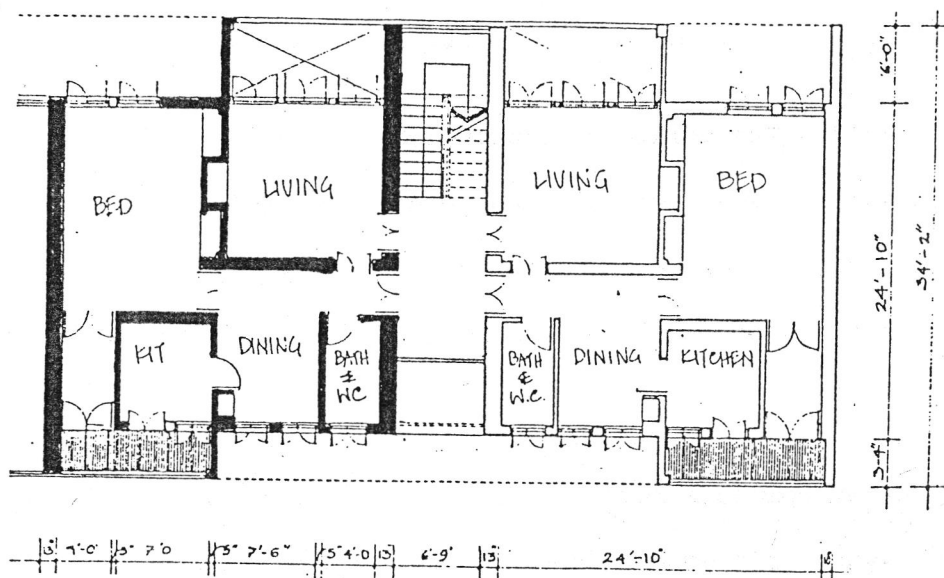
They are usually three or more stories high and more may be added to them whenever the need is felt. Length of each block may vary depending on the number of units contained and some of them can often be quite long.

The flats generally have two or three main rooms and supporting service facilities, depending on the size. Irrespective of size the verandah is a common element in all types of flats.

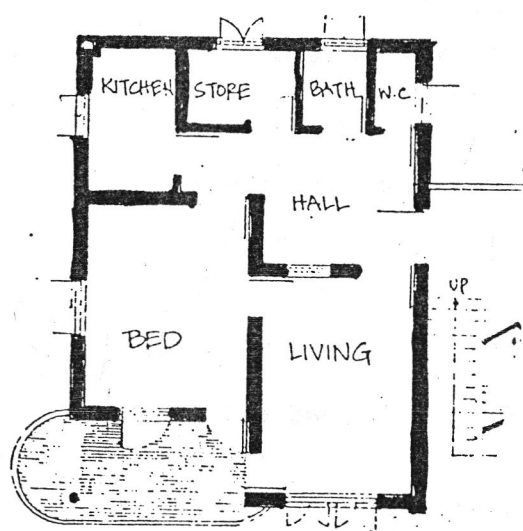
Internal spaces within the flats are organised in two ways. In some of the examples all the spaces are combined together and the unit assumes a regular shape, usually rectangular. In the other type there is a distinct separation between the service facilities and the main living areas. The kitchen and toilet open off from tertiary spaces usually verandahs. (fig 3.3)



BCSIR FLATS
DHAKA 515 SFT.



AZIMPUR FLATS
DHAKA, 910 SFT.



FLATS FOR POLICE
OFFICERS, RAOUABAGH
DHAKA 913 SFT.

[1 sq m = 10.8 sq ft]

FIG. 3.2. GOVERNMENT HOUSING
EXAMPLES OF FLATS WITH EACH STAIRCASE SERVING
2 UNITS.

3. MULTI-STOREY BLOCKS WITH EACH STAIRCASE SERVING A NUMBER OF UNITS.

The examples from this type display maximum variety as far as plan arrangements are concerned. They range from two room flats to single room units with shared toilet and kitchen facilities. These flats are usually meant for small families and bachelors, but it is not uncommon to find fairly large families living in them. (fig 3.4)

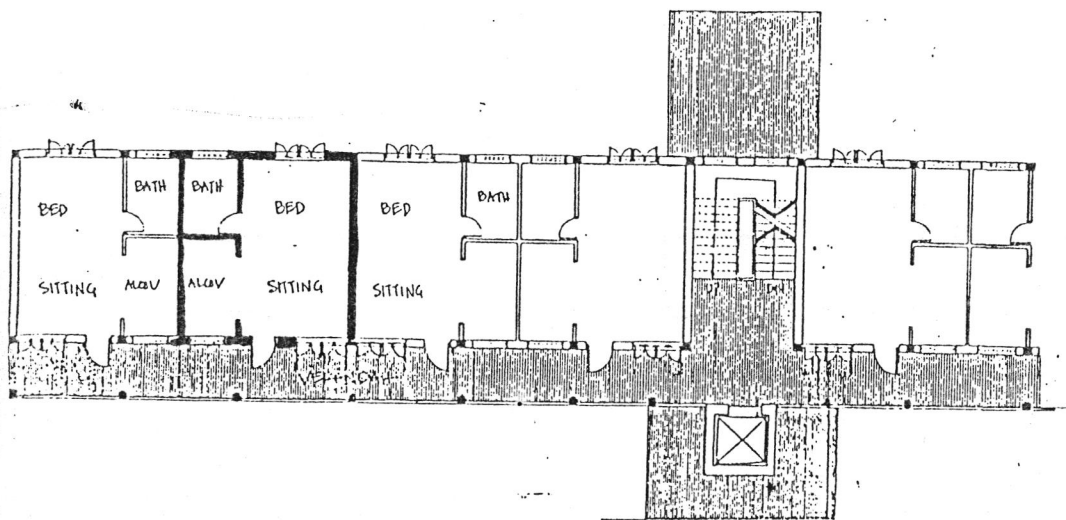
Some of the buildings containing these flats are taller than the examples mentioned earlier and have lifts provided in them. But generally the number of floors was about three when they were originally built, in most instances more floors have been added later on.

Access to the flats is from a common verandah running the length of the building in all cases. Some flats have separate entrances for adjacent rooms from this common verandah.

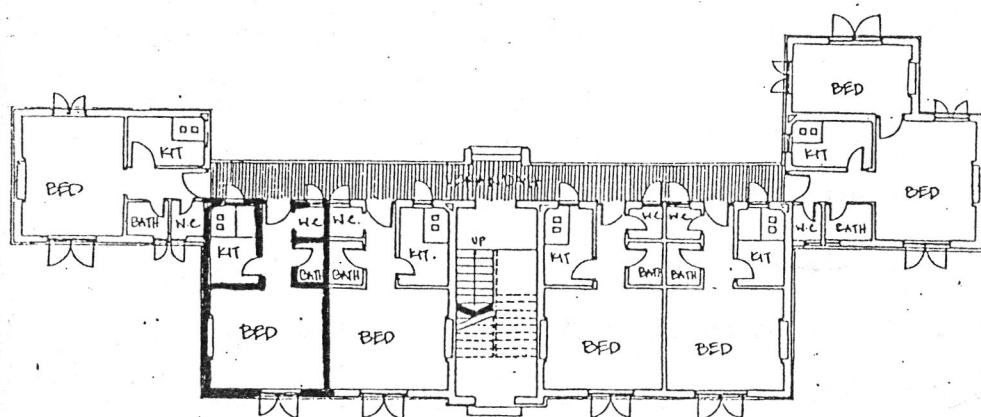
In most of the one room flats there is a general tendency to locate the service facilities, kitchen etc. at the entrance. Apart from a few exceptions this tendency is also present in two room flats.

The common element in all the flats is the provision of a verandah as has been seen in all earlier examples irrespective of size.

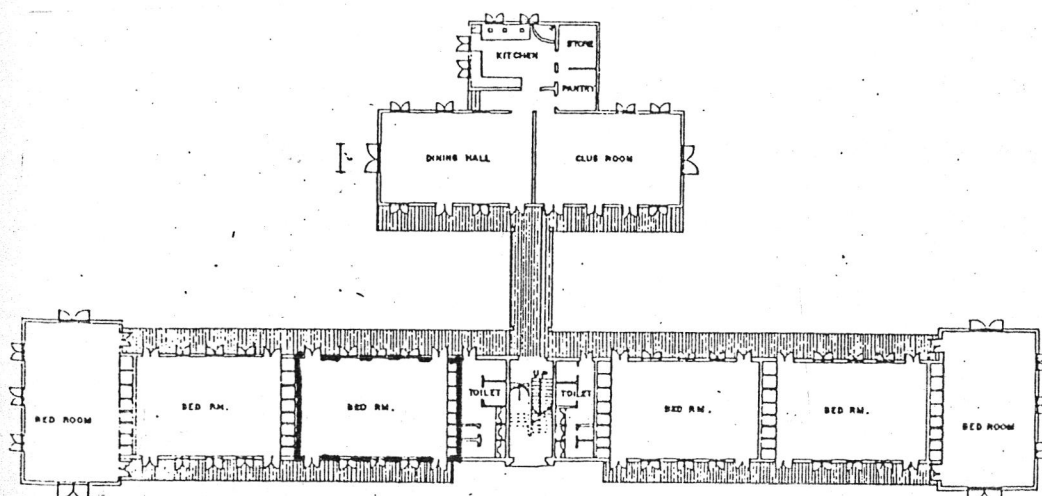
As in the previous examples building layouts are quite straightforward and the buildings are generally laid out along the



OFFICERS FLATS
MYMENSING ROAD
DHAKA 520 SFT.



FLATS FOR
CLASS III EMPLOYEES
HAZARI BAG. LEATHER
TECH. INSTITUTE
DHAKA 240 SFT.



BACHELORS' ACCOM.
GREEN ROAD
DHAKA 540 SFT.

[1 sq m. = 10.8 SFT.]

FIG. 3.4. GOVERNMENT HOUSING
EXAMPLES OF FLATS WITH EACH STAIRCASE SERVING
MORE THAN 2 UNITS.

east-west axis. Some of the examples belong to small sites where there are only two such buildings, while others form parts of larger estates with buildings of the type mentioned earlier.

3.2.2 SOCIO-CULTURAL ADAPTABILITY

1. SINGLE STOREY ROW HOUSES

The single storey row houses offer the best example of ability to respond to users needs.

The fact that the house is on an individual plot of land allows the occupants access to ground area adjacent to the house which they may use for any thing from gardening to building extensions to the house. Although the houses do not belong to the occupants extensions are common.

In example 1 the private open area provided is the backyard while the forecourt is actually public space fenced in by the occupants for private use (fig 3.6). In instances where this space has'nt been privatized it is usually uncared for. The backyard corresponds to the courtyard of the traditional rural homestead. This allows households to keep animals if they want to. This space also serves as an extension to the kitchen area and food preparation, and to a certain extent food production activities, can be carried out in this space.

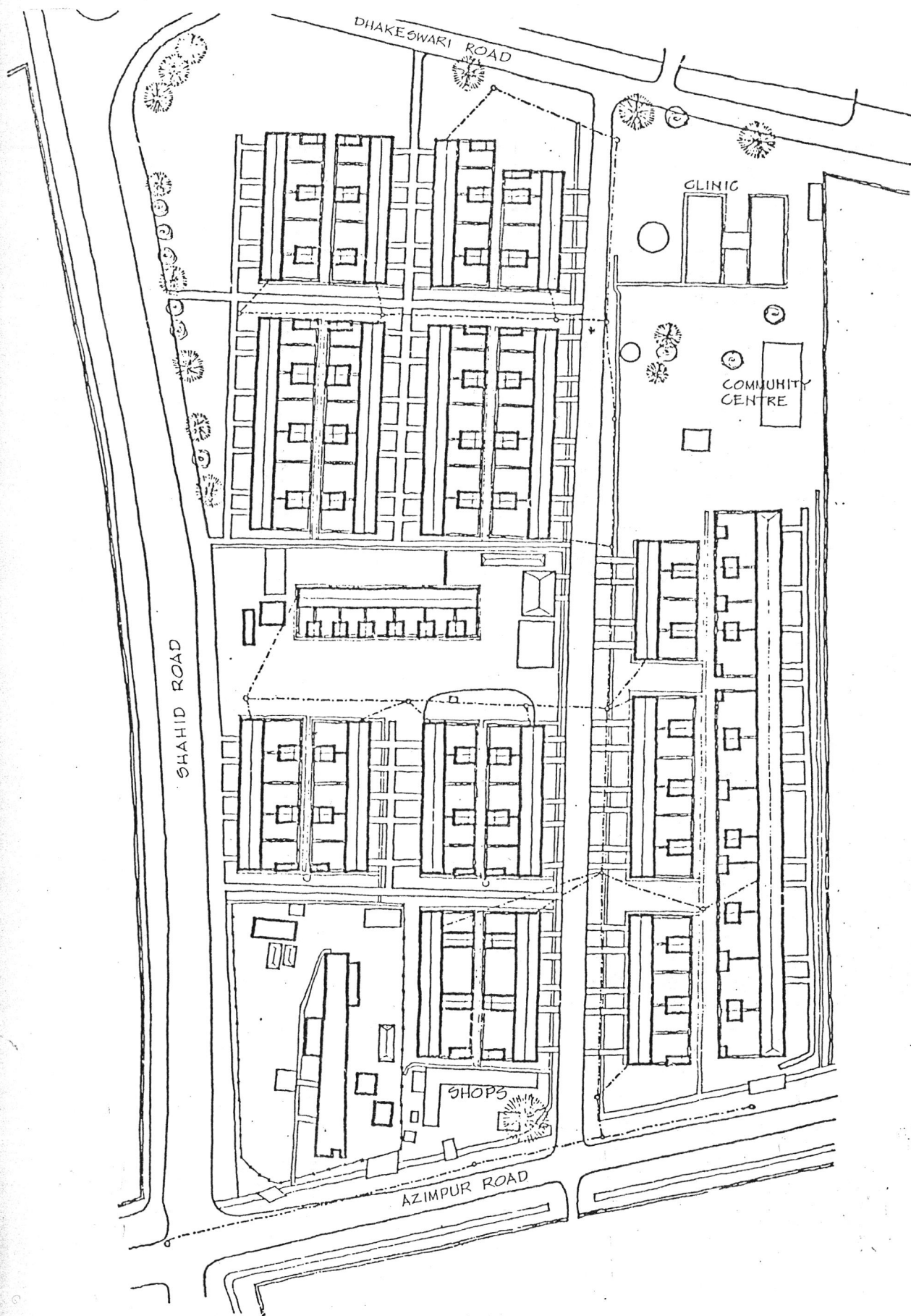
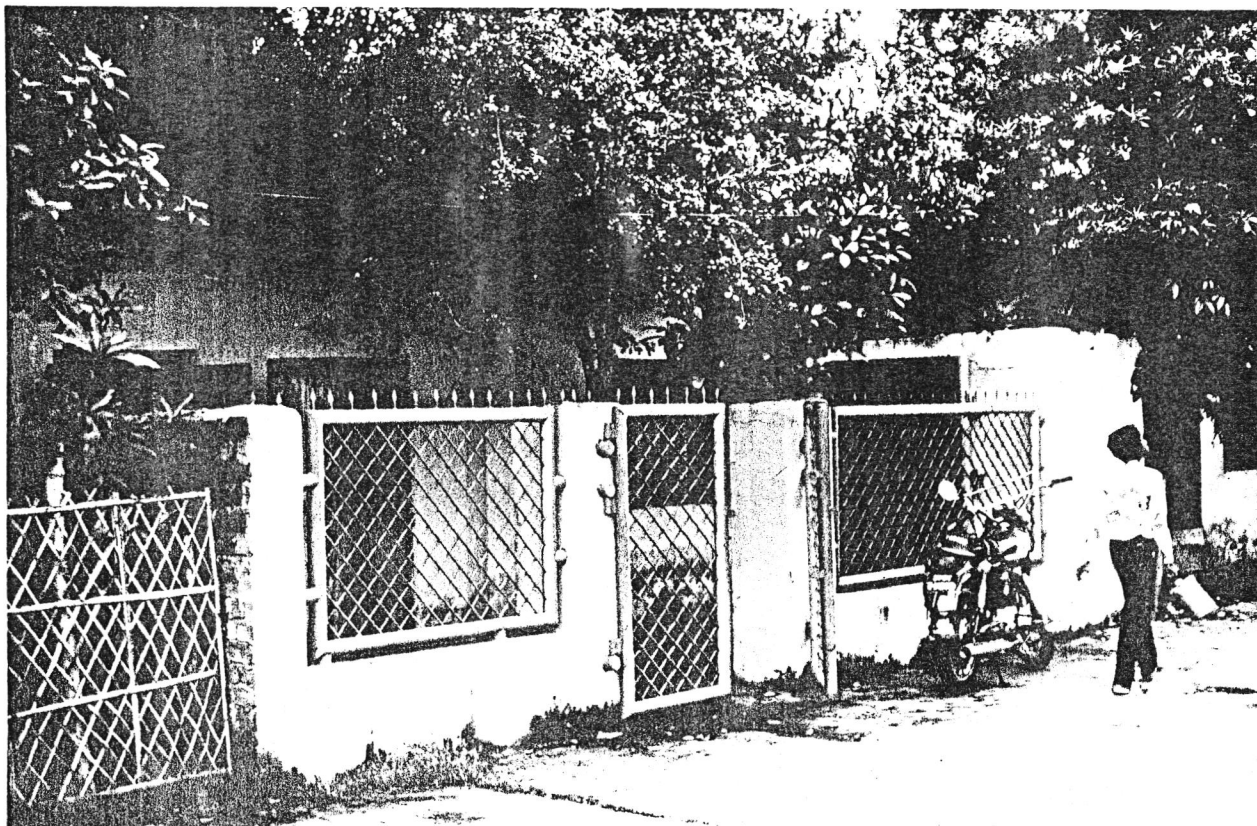


FIG. 3.5. HOUSING AT PLASSEY (SITE PLAN)



ENTRANCE (AREA IN FRONT, PRIVATEZED BY OCCUPIERS)



BEHIND THE HOUSES ; (COWS IN THE SERVICE LANE)

FIG 3.6 HOUSES AT PLASSEY

Internal space arrangements are simple and since there is no allocation of any specific activity to any space, usage can be flexible and the house can adapt to changing needs. The verandah at the back connecting the two rooms is almost five feet wide (3.3 feet = 1 metre) and can accommodate a number of functions. With the exception of example 2 the kitchen, bath and W.C. is separated from the main house and access is through the open backyard. Although this separation is desirable the fact that they are detached makes communication difficult when it is raining. Households are known to make their own undercover connections.

2. MULTI-STOREY BLOCKS WITH EACH STAIRCASE SERVING TWO UNITS.

The examples in this category represent a lower level of adaptability to user needs, compared to single storey row housing.

Because of the physical characteristics of these buildings there is no access from individual units to the ground. Ground floor flat occupiers may fence off a certain portion of land for private use, but this tendency is not very common.

Certain buildings of the Azimpur housing estate (see fig 3.7) are arranged in fours so that a quadrangle is formed at the back of the buildings, meant to be shared by the occupants of these buildings as a common space. This space does not function as intended, and is often used as a place for dumping garbage by the households. Open areas in these developments are the spaces left between buildings and

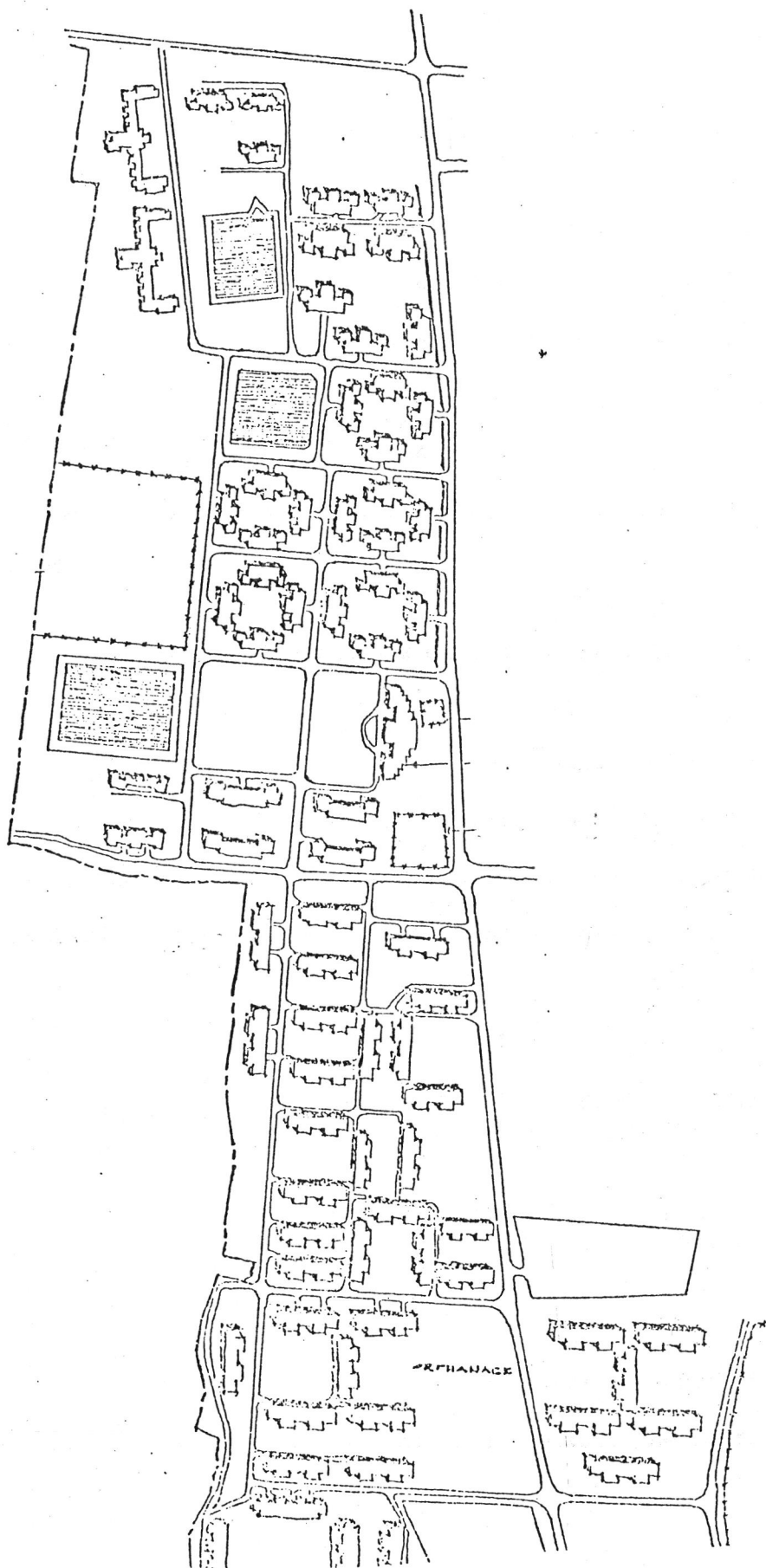


FIG. 3.7. AZIMPUR HOUSING ESTATE (PARTIAL SITE PLAN)

they usually suffer from problems of bad maintenance.

In the types of internal layouts exemplified, units, where the service facilities are separated from the main living areas function better than the other units. Direct view and approach to service areas are not desired in Bangladeshi households and these units meet this requirement. In units where this feature is absent the provision of two entries to the flat is useful, although it makes the flat less secure.

The use of verandahs depend on their size and location. Narrow verandahs serve no useful purpose other than to allow a person to get a breath of fresh air or as a space for a few potted plants. Wider verandahs are used as a dining space or a study area. Since extensions cannot be built wide verandahs are commonly converted to bedroom spaces by installing windows between the railing and the drop wall above.

3. MULTISTOREY BLOCKS WITH EACH STAIRCASE SERVING MORE THAN TWO UNITS.

Examples of this category are the farthest removed from socio-cultural adaptability.

Like the previous example the individual units have no access to any space on the ground and because the units are small and the buildings long the tendency of the ground floor occupants to privatize common open spaces are less.

Since access is from a common verandahs the privacy of each unit is reduced. The situation is more like houses opening off into a public street. In units where the service facilities are located near the entrance this is an added disadvantage as outsiders and visitors have a direct view of these rooms from the access verandah on their way into the house.

The provision of verandahs as a part of the internal arrangements is not as common as in the other examples. The extra space available in the form of verandahs is not present and this reduces the flexibility of use of the units.

Internal arrangements tend to combine public and private areas of the house female privacy is therefore reduced. The fact that these houses are smaller compared to previous types cannot be a justifiable basis for this as it is possible to separate public and private areas through proper design.

3.2.3 ENVIRONMENTAL PERFORMANCE

1. SINGLE STOREY ROW HOUSES.

Single storey row houses display a satisfactory response to local environmental factors.

The layouts are organized along an east west axis so as to get maximum benefit from the prevailing breeze direction. Spacing between rows of houses are adequate to ensure ventilation.(fig 3.5)

The houses facing south get the prevailing breeze directly and therefore have an advantage over the north facing houses which get the breeze only after it has passed over the south facing houses.

The houses themselves are of one room depth, which is ideal considering ventilation requirements in the hot humid climate of Bangladesh.(2)

The service facilities are so located that they are adequately ventilated on their own. Smells generated from cooking do not penetrate into the living areas because of the distance between them. The fact that these areas are separated from other living areas makes negotiations between them difficult when it is raining. Occupiers are known to build their own undercover connections though.

The open area in front of the house, in the example of Plassey Barracks, however, is well looked after where privatized; when left on its own, however, such spaces are generally ill maintained.(3)

The provision of service alley at the back of the houses in Plassey Barracks, however, causes some problems. Bad maintenance leads to the accumulation of waste and together with stagnant pools of water this becomes an ideal breeding ground for germ-carrying mosquitoes, thus making this alley a potential environmental hazard.

The general low rise character of row houses creates a pleasant residential environment, suitable for urban living.

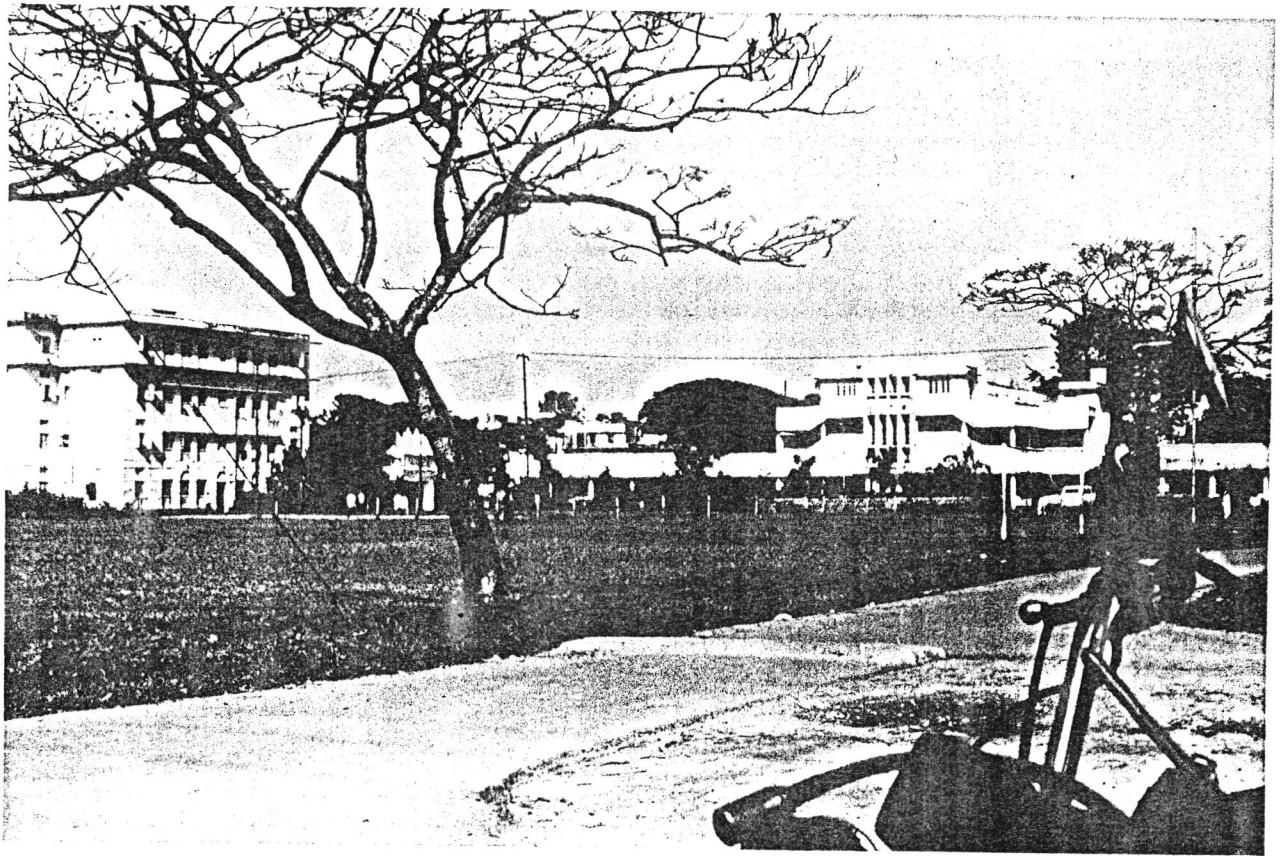
2. MULTI STOREY BLOCKS WITH EACH STAIRCASE SERVING TWO UNITS

Layouts of these blocks are generally along the east-west axis to take advantage of the prevailing breezes. The exception is in the case of layouts of the Azimpur housing estate, where four buildings are arranged around a open area (fig 3.8). Two buildings in this cluster get no breeze penetration the worst affected being the one facing west. The western facade gets the full impact of solar radiation in the afternoons. Time lag of 10" brick walls is about eight to ten hours and as result interior spaces get heated up at nighttime, where it is usually cool and comfortable outside.

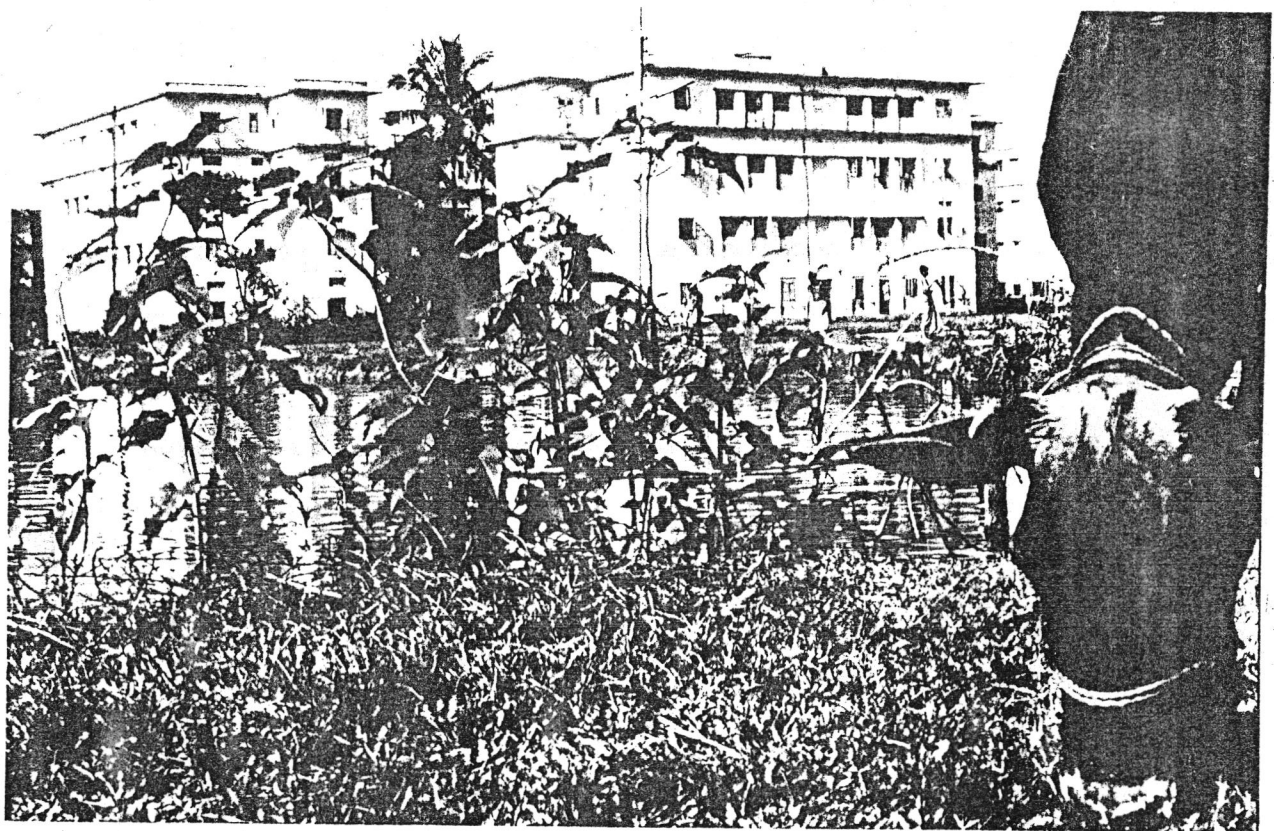
To ensure breeze penetration in all blocks the buildings have to be spaced a minimum distance apart from each other. Generally this distance is maintained in layouts. In doing so the density is reduced. The density of Azimpur is about 80 persons to an acre compared to 75 persons at Plassey Barracks (12 households assuming 6.2 persons per household). (4)

Units where the interior arrangement is such that window openings are to the exterior or to verandahs, perform better than units where the building envelope is wider and rooms are doubly banked. Lower flats do not get as much breeze penetration as upper storey flats.

The height of the buildings makes the upper storey windows more vulnerable to penetration by driving rain, a phenomenon common to Bangladesh. Lower flats are protected by vegetation to a certain extent.



COMMUNITY CENTER .



BLOCKS (POND IN FOREGROUND; HOUSES ARE ORIENTED AT RIGHT ANGLES TO EACH OTHER)

FIG 3.8 AZIMPUR HOUSING ESTATE .

Due to high humidity and heavy rainfall building surfaces suffer from problems of moss collection and discolouration and regular maintenance is needed to keep a building looking good. The fact these buildings are a number of stories high combined with the problem of unavailability of specialized maintenance equipment makes this difficult. Since the whole building is shared, individual attempts by households are non existent.

There are fixed garbage collection points in these housing areas and individual households are supposed to dispose of their wastes at these points for collection. Irregularity of collections and improper design of these collection points result in garbage lying about on the ground. Common stairhalls are also generally dirty, more so at the entry points.

3. MULTI STOREY BLOCKS WITH EACH STAIRCASE SERVING MORE THAN TWO UNITS.

Problems associated with the environmental performance of these types of buildings are generally the same as the ones mentioned in the previous examples. The difference lies only in the instances where these buildings are located in isolation i.e. one or two buildings to a site as is often the case.

When located in isolation the environmental problems are related more to the problems created by its existence rather than with the building itself. If the building is tall (six floors or more) the

lower structures to the north of it are cut off from the sun and wind and receive no ventilation and are usually damp.

The access verandahs on the upper floors suffers from problems of driving rain and circulation becomes difficult.

Units where toilets and kitchens are located at the front have ventilation problems. Kitchens generate smells which penetrate into the living areas, or to the access verandahs outside. Toilets and bathrooms at this location are likely to remain wet due to insufficient or no ventilation at all.

3.3 PRESENT DAY GOVERNMENT HOUSING STANDARDS

The types of government accommodation discussed in the previous sections represented a wide variety of buildings designed and built over a number of years. Each building was designed for a specific site or a specific government organization.

The Department of Architecture of The Ministry of Works, Government of Bangladesh has recently formulated a set of Residential Building Standards for government employees in general. (5)

They are designs for various types of flats for different levels of Government employees. They are standards to be repeated all over the country where accommodation for Government employees are required.

The smallest sized accommodation units which are dormitories for single persons and the largest ones which are 2500sft individual houses for top government officials are not considered in this discussion because they are very few in number and cannot be said to be representative of the general character of government accommodation.

The general implications of this standardization is that the variety in the types of accommodation types that have been exemplified earlier are done away with, instead all government accommodation are to be based on the same standards, wherever or whenever they are built. The discrepancies that existed between the sizes of accommodations for same level of employees in different organizations

will now be clear as all agencies are expected to follow these standards. Government organizations which would previously engage consultants to design their residential accomodation could now have the easier option of choosing from these standards.

So far the majority of housing provided by the government has been for employees only, but government is likely to expand its efforts to private housing as well. This standardization is likely to have a widespread effect on any such effort in the future.

3.3.1 FEATURES

The common feature about the Residential Building Standards are that they are all accomodated in multi-storied walk up blocks with each staircase serving two units. The numbers of floors may vary in each building but it is required for all buildings to have foundations suitable for construction upto four storeys high.(6)

The standards of foundation design (based on codes established by the American Concrete Institute) are such that construction could go up to five storeys. Where the soil conditions are good construction can go even higher without having serious structural implications.

The size of individual flats range from the smallest flat which has a floor area of 500 sft upto the largest which has an area of 1500 sft. The internal layout of spaces within the flats are also shown but are meant as recommendations and small changes or

alterations to these layouts can be made for particular requirements. These changes can only be made by authorized people and not by the occupants.

The internal layouts remaining the same, there is a choice in the construction system suitable for a particular need. The buildings may either be constructed on load bearing walls or on a concrete frame. The materials to be used are all of the permanent type i.e. brick and mortar walls, concrete floors, ceilings and lintels. Windows are glass on frames made from steel angles and doors are made of wood. Iron grills are provided for all window openings as well as for the large openings at the landings of the stairhalls.

The elevations of the buildings emphasize the verticality of the buildings with alternative bands of exposed ceramic bricks and plastered surfaces. It is not absolutely necessary to follow this in detail but are meant to be suggestions only.

The standards do not indicate how layouts of buildings should be arranged as this obviously depends on the qualities of a particular site.

3.3.2 TYPES AND DISTRIBUTION CRITERIA

There are six types of flats within the 500sft. to 1500sft. range. Each type is designed for either a load bearing or a frame structure. (fig 3.9 & 3.10)

The six types of flats are of the following sizes:

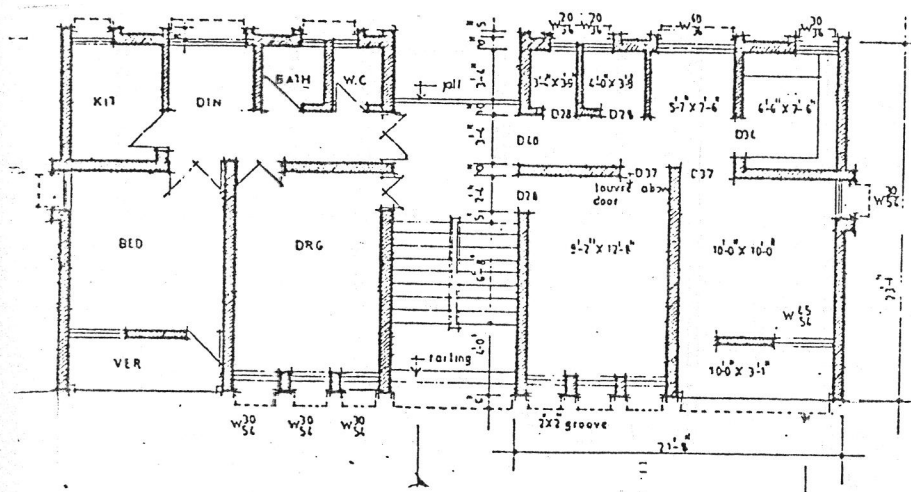
1. 500sft.
2. 600sft.
3. 800sft.
4. 1000sft.
5. 1250sft.
6. 1500sft.

The internal arrangements of spaces in all the flats are of a common character. The flats are two rooms deep and are generally put together to form a rectangular shape. The number of rooms in a flat increase with the increase in its size as does the size of the individual rooms. The number of facilities to a flat also increase with its size with the inclusion of functions such as dressing rooms and maid's rooms in the bigger flats. The individual features of these units and their implications are discussed in greater detail in the following sections.

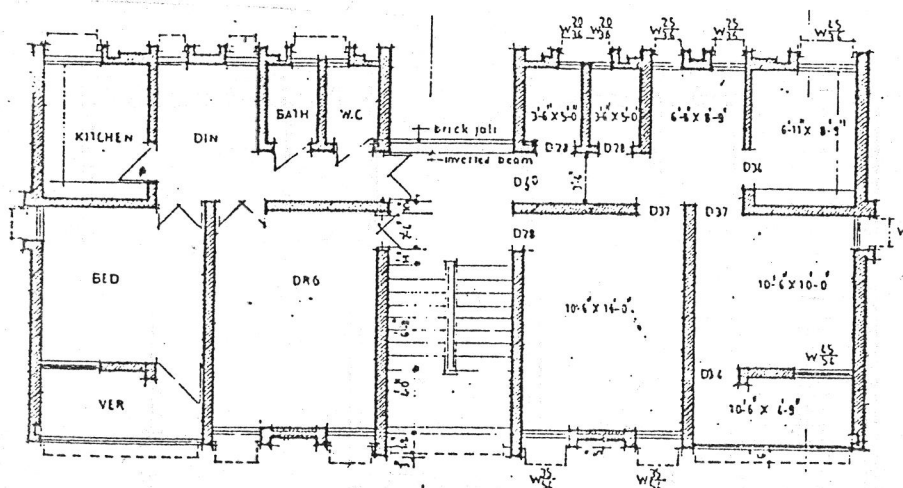
The basis of deciding the sizes of these flats and the criteria for their allocation to Government employees is the national pay scale. (7)

Which is to suggest that, lower the salary of the person the smaller the size of the flat allocated to him.

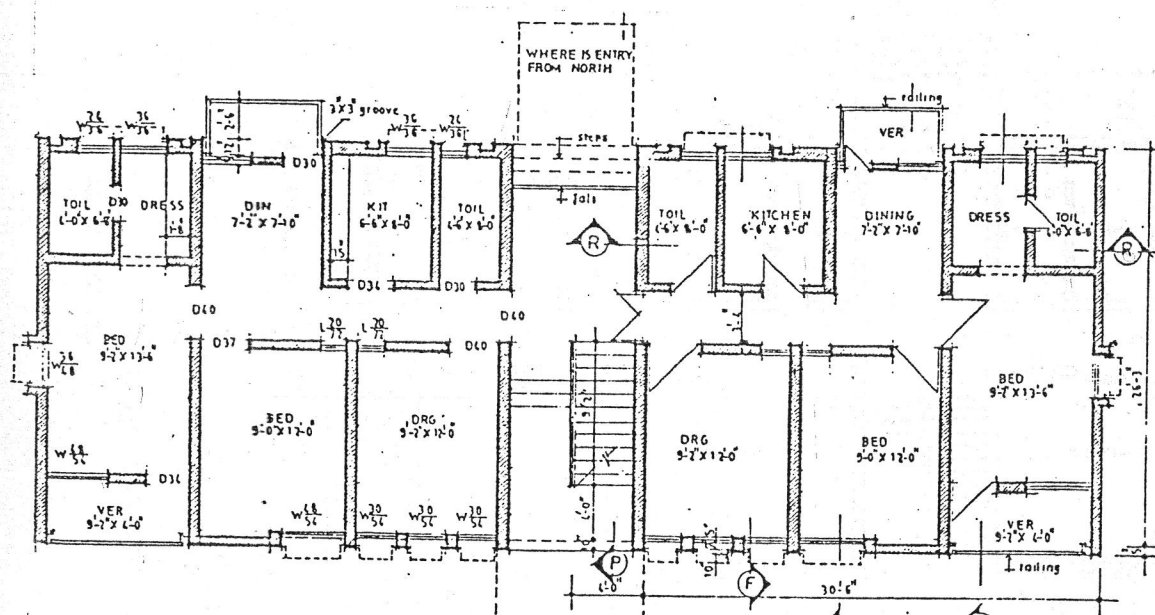
The national pay scale of 21 grades is divided up into 7 sections. The topmost two grades belong to the 1st section and are allocated the largest units of 2500sft. each. The other 6 sections are



500 sq ft.



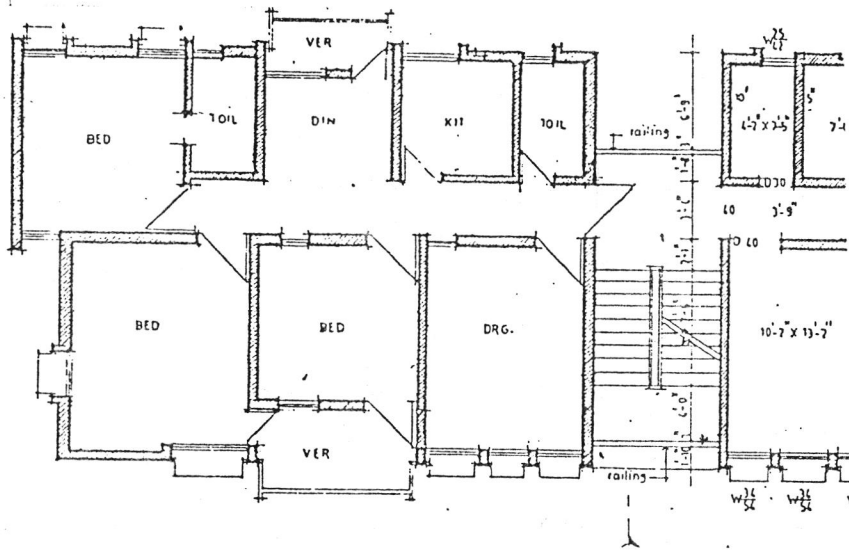
600 sq ft.



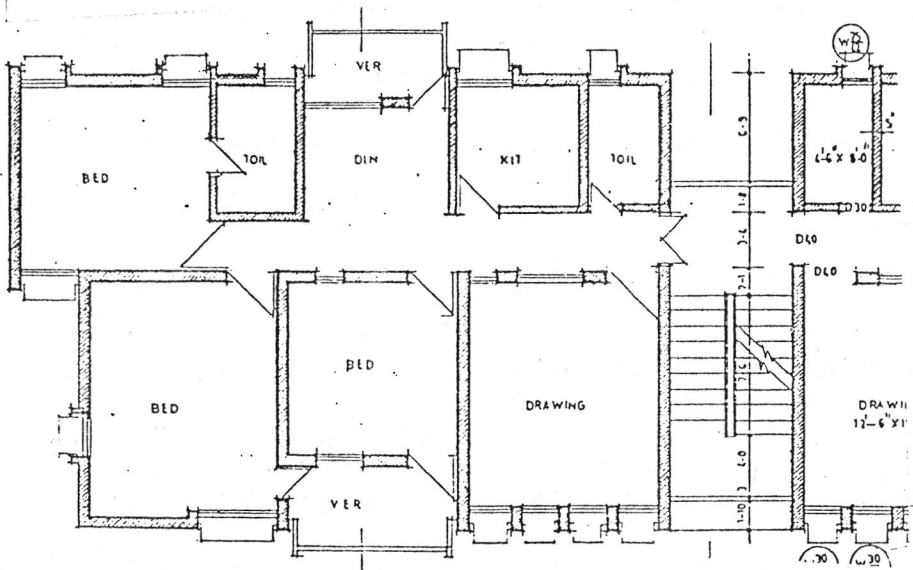
800 sq ft

[1 sq m = 10.8 sq ft.]

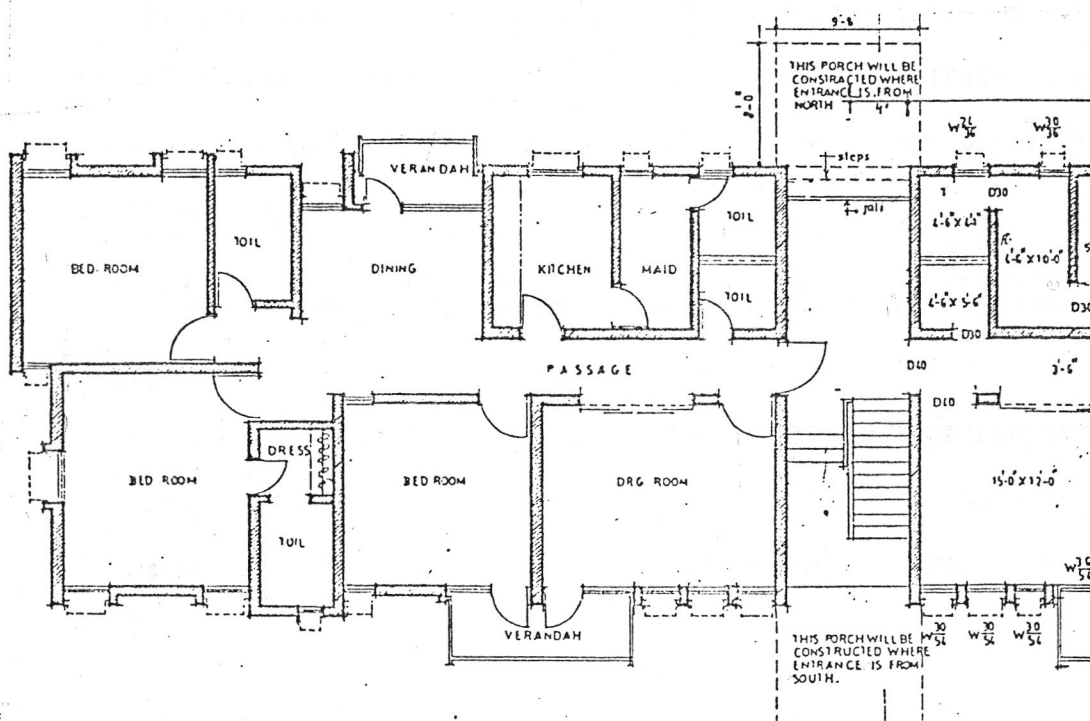
FIG. 3.9. GOVERNMENT HOUSING STANDARDS (CONTEMPORARY)



1000 sqft.



1250 sqft



1500 sqft.

[1 sq m = 10.8 sq ft.]

FIG. 3.10 GOVERNMENT HOUSING STANDARDS (CONTEMPORARY)

allocated the 6 different types of flats depending on their salary scale.

3.3.3 SOCIO-CULTURAL ADAPTABILITY

Like the previous example of multi-storey block with each staircase serving two units, the units in these examples have no connection to the ground and therefore have no private open areas. The common spaces between buildings are more easily used by ground floor occupants of buildings than upper flats. Layout plans often show childrens play equipments in the open spaces but such plans are rarely realized.

Internal layouts display a high degree of compartmentalization of functions and very little space is left to allow flexibility of use. The smallest flat of 500 sft. floor area is divided into seven different spaces and has two doors. A corridor like space runs through the centre of the flat laterally taking up a part of the space designated as dining thereby reducing its effective area to the extent that it cannot function as desired. This arrangement exists in all types of flats.

The sizes of bath and w.c. increases with the increase in size of the flat although the space requirements for these two activities remain the same. They are also combined together in the bigger flats. The flats which have an area of 800 sft. have, next to the bathroom a space designated as dressing area. There is no

significance of such a space in Bangladeshi society and its designation as storage space would have perhaps been more appropriate. With the increase in size of the flats this function is no longer present, yet one would assume dressing rooms to be associated with the larger houses.

Storage is an important function in Bangladeshi households and various things from non-perishable foodstuff to clothing and linen need to be stored. None of the flats have any facilities for storage.

The internal arrangements of spaces in the all types display a tendency to locate the service functions, kitchens, toilets etc. near the entrances, more so in the bigger flats. Locating a toilet near the entrance enables visitors to use it without having to pass through the rest of the house. Yet, on the other hand householders wanting to use the same facility can probably be seen by the visitor.

Verandahs are a common element in all types of flats. The two smallest types have one verandah each and all the rest have two verandahs each. Most of these verandahs have limited accessibility with the ones in the bigger flats being accessible from two rooms. The maximum width of the verandah is 5' -3" and the minimum is 3'-6". Alexander suggests that a balcony should have a minimum width of at least 6 feet. (8)

Staircases are common to all the flats in a building and suffer from the same problems as in the examples mentioned in the previous section. However the actual design of the stairhalls in these

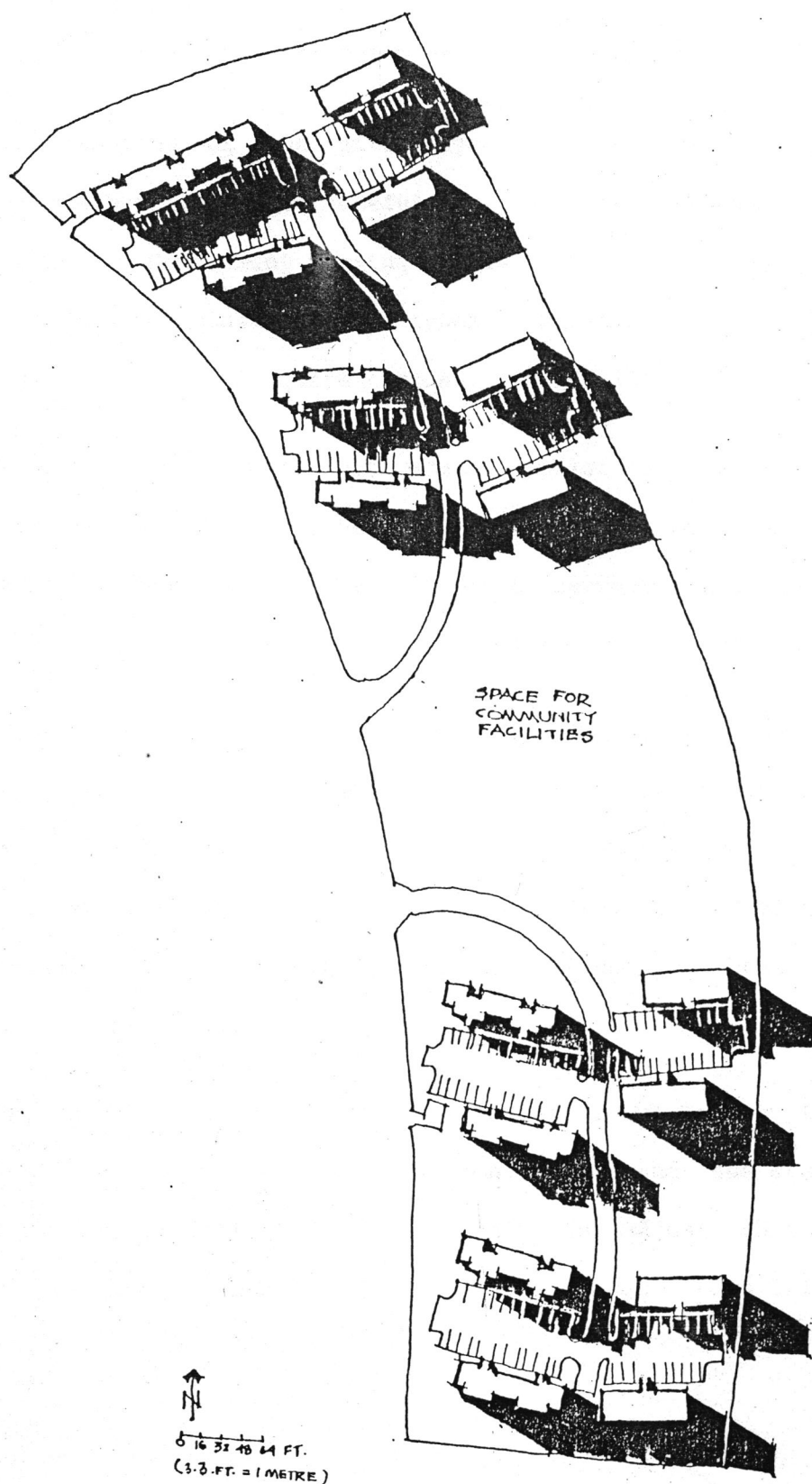


FIG. 3.11 SITE PLAN, BAILEY ROAD HOUSING.

examples, with both sides being open, make them more pleasant to use.

No examples of the site layouts using these buildings are available but it may be useful to take the example of another contemporary Government Housing estate. Although Bailey Road Housing scheme does not consist of the types of buildings exemplified here, the general layout is quite typical. (fig 3.11)

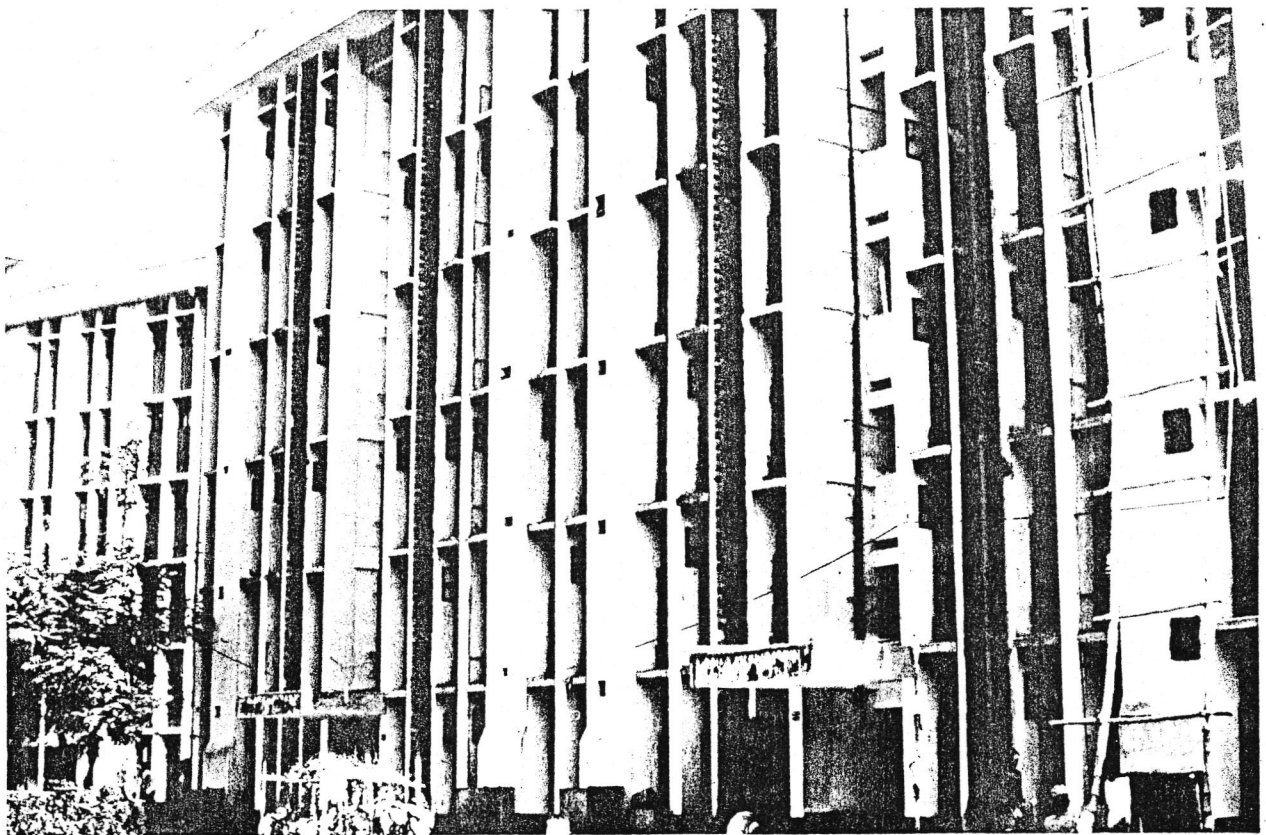
There is provision for bathroom and toilet facilities for servants within the layout. This is particularly useful considering the fact that all households are likely to have servants and social codes dictate that servants use separate bath and toilet facilities.

The layout of Bailey Road Housing scheme shows excessive consideration for cars in a place where car ownership is very low, more so considering the income group of the people who live there. The internal roads, made to high standards are normally deserted. There are parking spaces for about 120 cars and the total number of flats are about 340.

The vertical character of the buildings is enhanced by the use of vertical elements in the elevation. This, and the cream and red colours of the facade offer little help to adjust this group of buildings with the character of its surroundings. (fig 3.12)



VERTICANTY !!



INEFFECTIVE GARBAGE CHUTES BEING TAKEN DOWN

FIG 3.12. BAILEY ROAD HOUSING

3.3.4 ENVIRONMENTAL PERFORMANCE

Again, taking the example of Bailey Road Housing Scheme, there are a lot of paved surfaces considering the roads and the parking arrangements and only a few trees. Most of the trees that existed in the site had been cut during construction. Temperatures are generally higher in this area than that of the surroundings. It is difficult to walk along the internal roads during hot summer afternoons because of the glare from the surrounding surfaces.

The problem of discolouration and moss collection mentioned for some of the examples in the previous section would create maintenance problems for these examples as well.

If twice the height of buildings is to be the distance between them to meet ventilation requirements (9) then a number of buildings in this scheme do not meet this requirement.

Because the flats have a depth of two rooms along its shorter side cross ventilation of the internal spaces are difficult to achieve. The row of living spaces along the longer side all have inlets for breeze penetration but only a few have outlets at desired locations. The effectiveness of wooden louvered openings above lintel level, inside the flat is questionable. The functions on the leeward face of the building are deprived of ventilation. The kitchen is generally located in this side.

The openings at the landing levels of the stair halls, although pleasant, present problems of rain penetration.

3.4 SUMMARY

Government employees housing although unable to house all government employees represent a substantial portion of the overall efforts in built up housing provision in the country. The housing thus provided also serve as examples for private builders who take advantage of the government experience. It can also be assumed that any future efforts by the government to provide built up housing to the private sector will be influenced by the government housing standards. Government housing can, therefore be said to be representative of Urban Housing.

Government Housing is characterized by Multi-storey blocks of flats and the trend has been confirmed by the adoption of a set of standards by the government which will require all government accomodation to assume this character. However government housing in the past has known variety in terms of plan arrangements and overall form.

In trying to gather an understanding of how Government Housing performs in relation to their socio-cultural adaptability and environmental performance it is observed that certain types perform better than others. Single storey row housing that were built forty years ago are better suited to the Bangladeshi urban environment than

contemporary blocks of flat. Within the blocks of flats certain types of internal arrangements are more flexible than others. What is clear is that the present trends in government housing design are less successful in recognising social and environmental needs.

[An analysis of the function performance of the different examples of government housing is included in appendix A]

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CHAPTER FOUR

DESIGN DETERMINANTS
FOR
URBAN HOUSING.

CHAPTER FOUR

DESIGN DETERMINANTS FOR URBAN HOUSING

4.1 INTRODUCTION

Besides considering the various aspects of housing design in the traditional rural settlements of the country and the performance of urban housing as exemplified by government housing of the past and present, the features of urban life and the urban environment which influence the design basis of urban housing have also to be taken into account.

Rural housing although suited to the social-cultural and environmental factors of the villages cannot be a model for urban housing, at the same time the problems with the present day urban housing does not make them ideal solutions either. The design determinants of the following headings try to identify the factors related to design which are a result of urban influences on a people whose cultural roots are in the villages. Environmental conditions are different for the cities and along with considerations relating to services facilities form an important part of the design determinants for urban housing.

4.2 HOUSEHOLD STRUCTURES

Traditionally Bangladeshi families are extended with a large number of members. Jahangir identifies respect for the father and the father's father and solidarity between brothers as two common features of the traditional rural descent system which accounts for large families.(1) Although kitchen facilities may be separate, they are likely to live in the same compound, until the family size becomes too big for the homestead area to accommodate.

With colonialization and subsequent growth in urbanization, the concept of nuclear family began to emerge. Men from the village would come to work in the city, those who brought their families with them, set up home in the city and thereby the foundation for nuclear families were laid. The nuclear family was also a result of limited space in the urban areas and the inability of the house to extend.

"The norm of the nuclear family of parents, children and an occasional relative, resident in their own house, was an aspiration if not an established fact in the metropolitan society. "(2)

With time there are changes to the family structure. A family starts with a marriage, increases in size with the coming of children and gets smaller when they grow up and leave. In Bangladeshi families it is common for the son to live with his parents after marriage. The daughters are married off and go to live with their in-laws. It is only when a family gets too large and cannot be contained in the given space they split up. (fig 4.1)

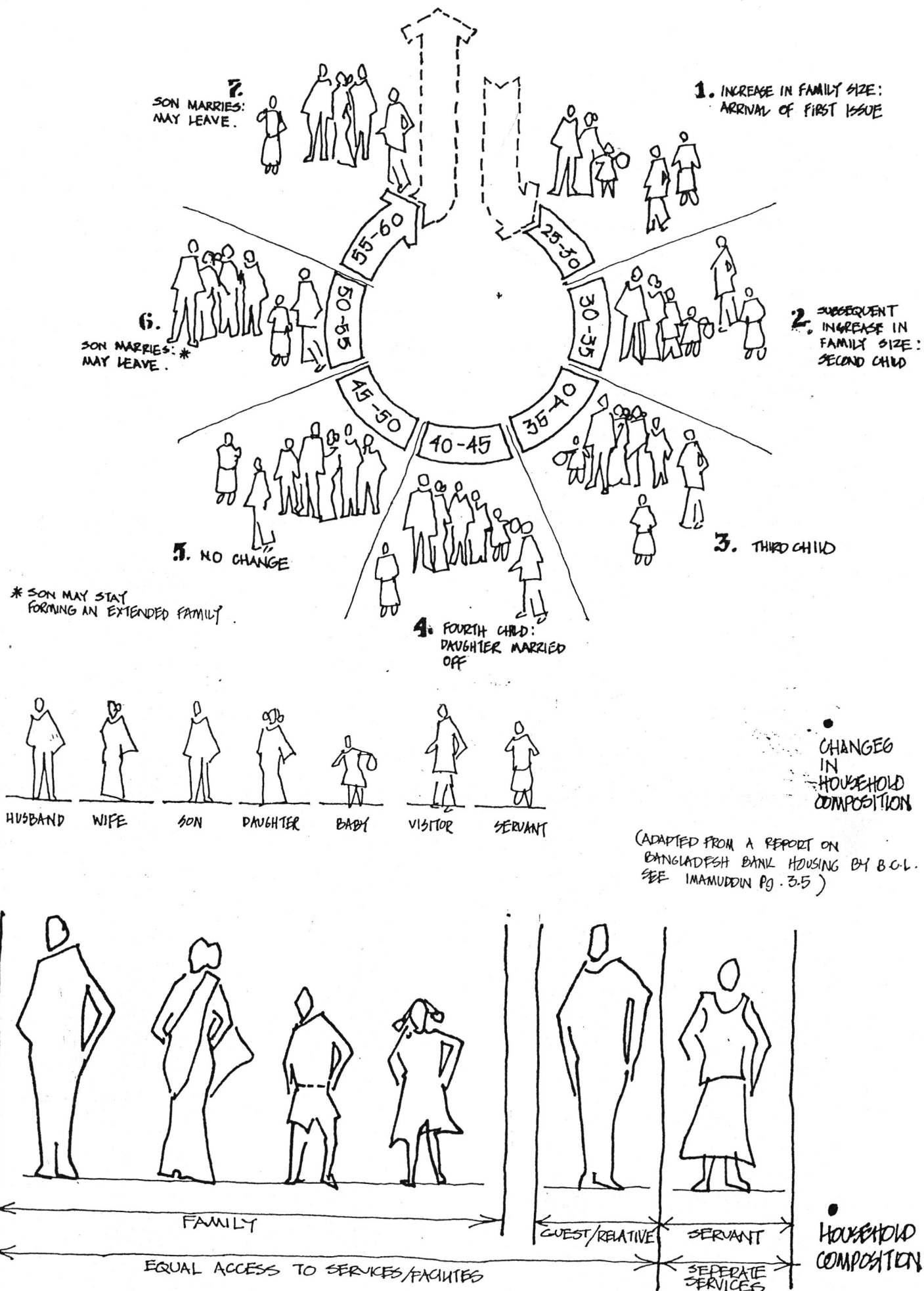


FIG. 4.1. HOUSEHOLD STRUCTURES

There are three basic kinds of family organizations in the urban context of Bangladesh.

1. Nuclear families where husband wife and children live independantly. Sometimes parents of either husband or wife may form apart of the nuclear family.
2. Joint families are where a number of families live together sharing common kitchen and facilities. The buget is common and usually the eldest member look after household matters.
3. Extended families are composed of a number of families but having seperate kitchens and bu^dgets. They are usually very large and consist of cousins and second cousins and so on. This type is not very common.

The average household size is 5.9 for the urban areas of Bangladesh, for the principal cities it exceeds 6.(3) In spite of the predominance of extended families it is rare for a family to be composed solely of parents and children only and for consideration in the design of houses the average household may be assumed to be composed of three different categories of persons.

1. The immediate family
2. Parents/Relatives/Temporary visitors
3. Servants

All three types may not be present in all households and numbers may vary, but for consideration in space allocation and division, they may be further categorised into two groups.

1. The immediate family, parents and visitors may be catagorized into

one group and as far as space usage is concerned they have equal access.

2. The servants represent a different social group and they are not in the same level as far as use of spaces and other behavioral aspects are concerned.

4.3 HOUSEHOLD ACTIVITIES IN THE URBAN CONTEXT

Household activities as performed in the urban context are different to the way they are carried out in the traditional rural houses. There is access to a service facilities in the urban areas which makes it easier. However, traditional influences are present in the way the domestic activities are performed. (fig 4.2)

The design of present day urban houses assume western standards in some of the household activities which are still, to a large extent tradition oriented. The common day to day activities of the urban household is examined to determine their design implications in the context of the urban house.

4.3.1 WORK

As opposed to traditional settlements, home and work place are separated in the urban situation. Therefore there are usually no consideration for creating a work environment in the home.

There are certain urban professions, however that may need considerations in design. The public nature of a doctor's

RURAL

URBAN

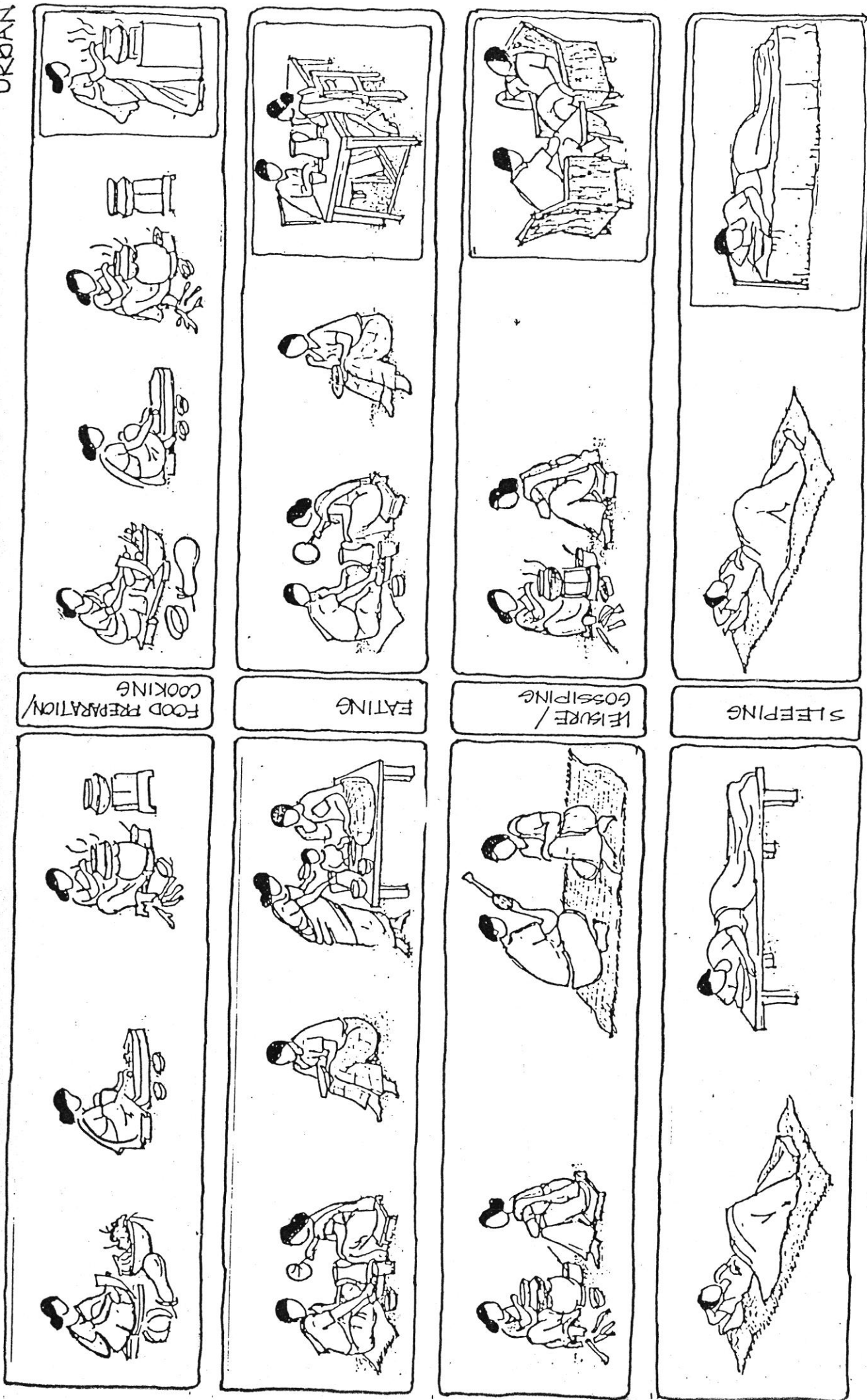


FIG. 4.2 COMPARISON OF HOUSEHOLD ACTIVITIES BETWEEN RURAL & URBAN SITUATIONS
(ADAPTED FROM A REPORT ON ENGLISH-ISH BANK HOUSING BY B.L.C., SOURCE: THE IMATUDIN)

consultation chamber if connected to his house will need careful design considerations.

Sometimes housewives do some work at home to supplement the family income. This may not always call for a separate space or room but may need only a specially located corner.

4.3.2 LEISURE

The urban environment offers wider scope for leisure activities at home. The presense of the television provides home entertainment on a daily basis. Televisions are also status symbols and have display value. It is usual to keep it in the living rooms where outsiders may see it and so can the family all together. Television programmes are broadcast in the evenings only.

Gardening is a popular leisure activity. This is however dependent on the availability of open space in the house. Some gardening enthusiasts may like to keep potted plants in the house.

One of the most popular ways to spend leisure time is by visiting friends and relatives. Society is close knit and people visit each other frequently and often without notice. In the city, these visits are more predictable to be during the time of the day when people are not at work, but then housewives may visit each other in the mornings.

One room in the house is allocated for receiving guests, traditionally called the "Baithok Khana" literally meaning meeting room but can be considered equivalent of drawing room or living room. Also it is not uncommon to entertain guests close to the family in the bedroom or the inner rooms of the house. The degree of privacy varies with the familiarity between host and guests.

Other leisure activities such as sewing, reading, table games etc. do not need special consideration for space layouts.

For children, playing is an important leisure activity. In the urban areas there are usually not enough open spaces with the house for playing compared to the courtyard of the traditional homesteads. They have to be either taken out by an adult to nearby open space or have to play inside the house.

4.3.3 EATING

In Bangladeshi culture eating activity is traditionally carried out while sitting on the floor and one eats with one's fingers. (fig 4.3). There is no fixed place allocated for eating in the house in traditional households. A person may eat in the kitchen floor, or on the verandah, or for that matter in the sleeping area. In traditional households the housewife is meant to eat after everybody else has finished. This practice is still carried out amongst city dwellers to a large extent.



•
COOKING
AT FLOOR LEVEL



•
EATING*
(IN OTHER CASES
A DINING TABLE IS
PREFERRED)

FIG. 4.3. .HOUSEHOLD ACTIVITIES .

Eating activity has undergone changes in the urban context. Very few families eat while sitting on the floor, instead people prefer to eat in tables and special places are allocated in each house as the place for dining. Servants, if resident in the house to eat separately after everybody else have^{*} finished, usually the traditional way on the kitchen floor. In spite of the "modernization" of eating process, people continue to eat with their fingers instead of spoons, forks or knives.

Eating is also a form of entertainment specially during festive occasions, special foods, requiring a lot of preparation are cooked and guests are entertained above the normal frequency.

4.3.4 COOKING

The process of cooking involves two separate activities.

1. food preparation and
2. cooking

Food preparation involves the preparation of raw food bought from the market for cooking. This means cutting and washing mixing of spices etc. Meat, chicken, fish are available in the market in raw form, chicken is usually live and has to be slaughtered first and like fish has to be cleaned, cut into pieces and mixed with spices before cooking.

A particular kind of fish, eaten by Bangladeshis contain a lot of scales and is very slippery the process of cutting it involves

dipping it in ash so that it doesn't slip and then it is cut on a fixed vertical blade using both hands. Food preparation may take a long time, generates organic wastes, and need a lot of water. Extra space besides the kitchen is useful for this purpose.

Food preparation also needs various kinds of utensils, mostly of traditional origin. One such common thing is the "boti" a curved blade fixed vertically to a wooden block on which a person rests a foot while sitting on the floor and uses both hands to cut meat, fish or vegetables. Spices are ground on a stone tablet with another piece of stone while sitting on the floor. Nowadays a lot of city dwellers use ground and dried spices available in the market in packets. A large number of pots and pans of various sizes and shapes are used for cooking.

Cooking itself is a lengthy process and generates a lot of smell. Because of amount of oil used, there is a kind of greasy deposit on the walls near the stove. The availability of gas in some urban areas is useful but where kerosene stoves and firewood are used, smoke is associated with cooking.

Some of the food items of the non perishable type are stored by some households in bulk quantities. Households having strong ties with their village homes receive rice or other grains from their fields which is stored in the house.

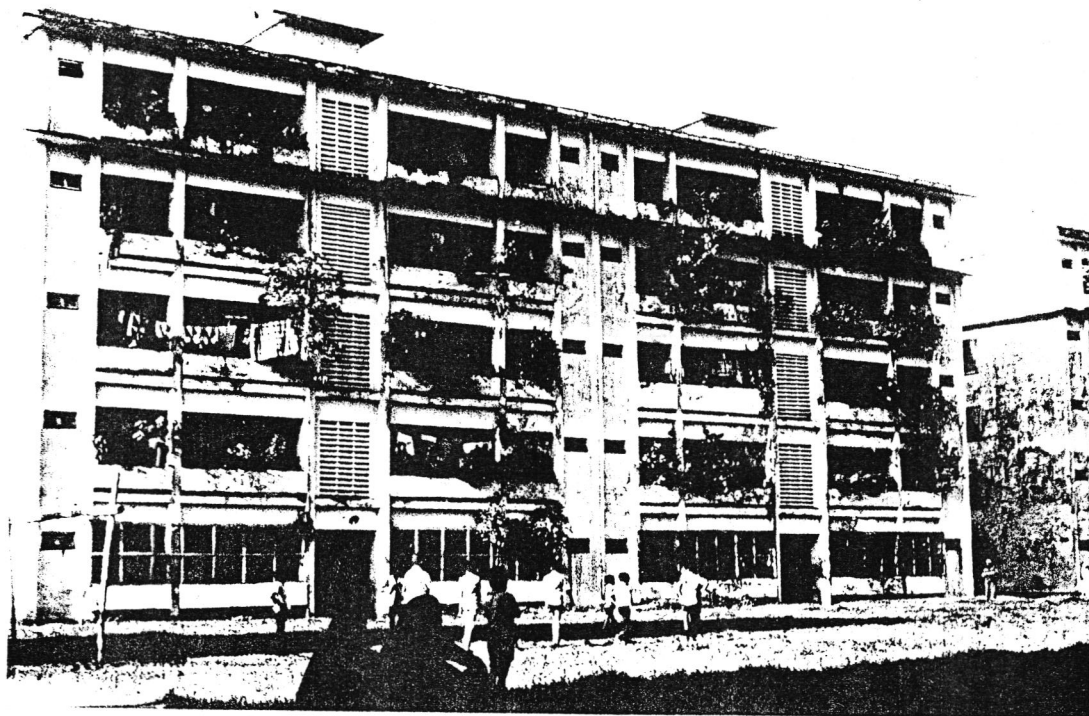
4.3.5 BATHING & WASHING

Bathing is essential for comfort in the hot climate of Bangladesh. It is common for one to bathe at least once a day. In the urban areas baths are usually taken in bathrooms instead of out in the open or in semi covered enclosures. If there is a provision, men and children may take baths out in the open areas within the house. The preferred way of taking a bath is by pouring water over one head with a mug from a bucket. Showers are becoming increasingly popular in the urban areas.

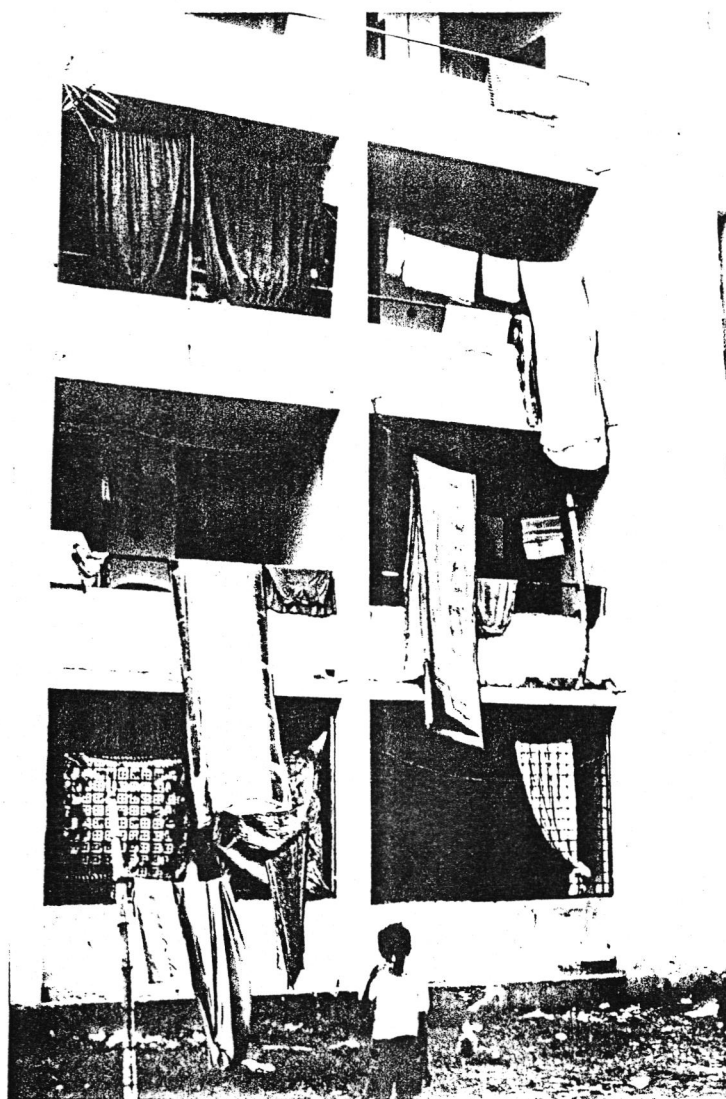
Bathing is also accompanied by washing clothes. This generates a large volume of waste water which keeps the area wet. The problem is worsened if the space is small as it usually is, in urban houses. Clothes washed need space for drying. The female garment "saree", six yards long and needs reasonable space to be left out to dry. Leaving clothes out to dry increases the chance of theft and requires vigilance. (fig 4.4)

4.3.6 PRAYING

It is customary for the muslims to pray five times a day and it has important design considerations for the urban house. "Namaz" or prayer has to be performed facing the direction of the "Ka'aba" in Mecca, Saudi Arabia due south-west from Bangladesh. Prayer is carried out on a rectangular mat about 3 1/2 feet by 2 1/2 feet. Another



GARDENS IN VERANDAS



DRYING CLOTHES.

FIG. 4.4. HOUSEHOLD ACTIVITIES

person is not supposed to pass in front of a praying person.

Direction of the ka'aba has other important considerations. Some people believe that while sleeping or lying down one's feet should not point in the direction of the Ka'aba. Facing or having one's back towards the ka'aba while using the toilet is also not allowed.

Hindu households on the other hand may keep a deity or an image of one of their gods or goddesses in the house. This may take the form of a picture in the wall with a low table for offerings or an entire room, depending on the availability of space and the extent of religious conviction of the household.

4.4 CLIMATIC CONSIDERATIONS

Climate has a great influence on built form. Houses in the urban environment will have to be designed keeping in mind the change in environmental conditions due to increased concentration of built form and its effect on climate. Also micro climatic conditions can vary greatly compared to the general climate of an area, and its effect has to be studied before designing a building. The climate of Bangladesh can be classified as "Hot-Humid".

An understanding of the effect of climate on building design can be had by considering each element separately. (fig 4.5)

TEMPERATURE

	J	F	M	A	M	J	J	A	S	O	N	D	
• DHAKA													
MAX °F	77.9	82.5	90.5	95.5	92.7	89.1	87.3	87.9	88.2	87.7	83.6	79.3	• DHAKA
MIN °F	53.1	56.1	65.9	74.2	77.7	78.6	78.8	79.1	87.5	74.7	63.6	54.9	
• CHITTAGONG													
MAX °F	78.7	81.5	86.8	89.6	89.7	87.9	86.9	86.4	87.7	87.4	84.5	79.4	• CHITTAGONG
MIN °F	56.8	60.5	68.3	74.3	76.9	77.4	76.7	76.6	77.0	74.6	65.9	59.7	
• DINAJPUR													
MAX °F	76.9	81.0	92.2	96.0	92.8	96.0	88.9	89.3	89.6	88.4	84.0	78.9	• DINAJPUR
MIN °F	58.4	54.0	61.7	69.9	74.6	77.4	78.8	78.7	77.8	72.2	60.8	52.9	

RELATIVE HUMIDITY

	J	F	M	A	M	J	J	A	S	O	N	D	
0600 HRS.	93	90	88	91	98	95	95	94	95	95	94	95	• DHAKA
1800 HRS.	61	48	44	54	75	81	82	83	83	79	71	70	
0600 HRS.	93	92	91	91	93	93	94	95	95	96	95	95	• CHITTAGONG
1800 HRS.	68	69	73	76	79	85	86	86	85	82	76	73	
0600 HRS.	92	86	78	75	85	92	93	93	92	93	91	82	• DINAJPUR
1800 HRS.	59	48	36	39	63	77	79	80	81	75	68	64	

RAINFALL

	J	F	M	A	M	J	J	A	S	O	N	D	
INCHES	0.70	1.23	2.29	4.04	7.65	12.67	17.20	11.58	9.28	6.64	1.00	0.09	• DHAKA
INCHES	0.41	0.30	3.50	2.67	11.17	22.41	24.57	22.23	12.04	11.45	1.97	0.41	• CHITTAGONG
INCHES	0.40	0.52	0.63	1.86	7.37	13.61	15.35	13.93	11.81	5.41	0.45	0.04	• DINAJPUR

FIG 4.5. CLIMATIC DATA FOR SOME SELECTED URBAN AREAS

[DHAKA IS CENTRALLY LOCATED, CHITTAGONG IS IN THE SOUTH, AND DINAJPUR IN THE NORTH OF THE COUNTRY]

[SOURCE: STATISTICAL YEARBOOK OF BANGLADESH]

4.4.1 TEMPERATURE

Summer months are hot in Bangladesh and maximum temperatures are reached around April. Summer temperatures are high and range between 90-95 degrees Fahrenheit rarely going above 100 degree Fahrenheit or below 70 degree Fahrenheit. High temperature occur during April and May followed by a slight decrease in June-August followed by another rise in September and October. Winter is between end of November till mid-February. Winter temperatures are moderate and rarely fall below 50 degree Fahrenheit. Diurnal ranges of temperature are low both in summer and winter with 30 degrees Fahrenheit being the maximum range during winter months. Winter is the most pleasant season, temperature is comfortable and the sky clear with bright sunshine.

Air flow through living spaces is important for cooling effect. Devices such as ceiling and exhaust fans are used to induce air flow in certain conditions.

4.4.2 HUMIDITY

The climate of Bangladesh is generally very humid all year round. The months of June and July are the most humid with relative humidity ranging between 80 to 90%. During September and October humidity is also above 80%. In the winter months the humidity varies from 70 to 80%. High temperatures combined with high humidity makes it very uncomfortable, and there is a damp sticky feeling, relief from which

is possible with air flow.

4.4.3 PRECIPITATION

Rainfall is generally high in Bangladesh, and its nature varies in different parts of the country, the western and northern part of the country having less rainfall than the southern part of the country. Annual rainfall varies from 60 inches to 120 inches in the extreme situation. But the periods of rainfall during the year are generally same for the whole country. There is one main rainy season, the monsoons, which runs from June to September. During monsoon months rainfall intervene and there may be heavy rainfall in short time periods. Upto 20 inches of rainfall have been reported in 48 hour time periods.

Rainfall is sometimes accompanied by hail storm, and in the last few years there has been occurrences of heavy hailstorm with unusually large hailstorms, which caused severe damage to buildings.

Rainfall accompanied by winds causes driving rain which can enter living spaces, window openings have to be protected from driving rain.

4.4.4 SOLAR RADIATION

Solar radiation is strong, particularly in the summer months when the sun is directly overhead. Due to the general cloud cover and moisture content in the air solar radiation is partly reflected and scattered. Cloud layers blocks the radiation reflected from the earth surface hence there is a lot of accumulated heat in the summer. As a result of direct radiation surfaces tend to get very hot quickly. The effect of solar radiation is largely counteracted by the effect of downpours of rain.

As with rainfall, openings have to be protected from solar radiation. Solar radiation also causes buildings to heat up and dissapate heat to the interior. Orientation of the building is particularly important in this respect. Too much paved surfaces causes the temperatures of the surroundings to go up.

4.4.5 WINDS

Winds are generally light to moderate in Bangladesh. Velocities are low around 1 to 2 miles per hour. It is partly higher in southern coastal regions. During the summer and monsoons seasons wind directions is generally from south, south-east. In the northern region of the country winds are more from the eastern direction.

During winter months wind direction changes to north, north-west direction. However from the point of view of building design, summer

winds are more important than winter winds. During storms, however, wind speeds can be a great deal higher and the directions may be haphazard.

To get maximum benefit from prevailing wind directions the main openings of the house have to be oriented towards the direction of the prevailing breezes.

4.4.6 SKY CONDITIONS

Skies are generally clear during the winter months, November to January. In the rainy season, the sky is almost always overcast, during this time the sky is dull and its luminance is less than 800 cd/m², but skies are very bright in Bangladesh with the luminance of 7000cd/m². (4)

Bright skies can cause problems of glare both from the sky and from reflection. Reflection from surfaces depend on the surface qualities, colour, texture etc.

4.4.7 OTHER FEATURES

Storms are frequent in Bangladesh, particularly during the summer and monsoon season. Some storms can be quite severe. The pre-monsoon months of May During the time of the Bengali new year, the time of the year characterized by violent nor'wester storms, called "Kal-Baishaki" after the month of "Baishakh" in Bengali.

These storm can last for long periods of time and can cause serious damage to structurally weak houses. The storms are marked by poor visibility.

To adapt a building in the best possible way to the climate of a particular region, one is often faced with conflicting requirements, on the one hand opening are important for breeze penetration but they let in rain and sun. Drew and Fry sums up the building requirements of hot-humid tropics as

"The humid zone demands shade externally by means of large overhangs and other devices which also give protection from driving rain so that the main walls of the building may be open as possible to allow air movement through the building."
(5)

4.4.8 URBAN CLIMATE

Deviations from the general climatic consideration occur at site level, and the physical characteristics of a site can influence the climate of a locality to a great extent. This is particularly true in the urban situation where the conditions of the landscape are different from the adjoining rural areas. Therefore for building design it is important to investigate the local climatic conditions.

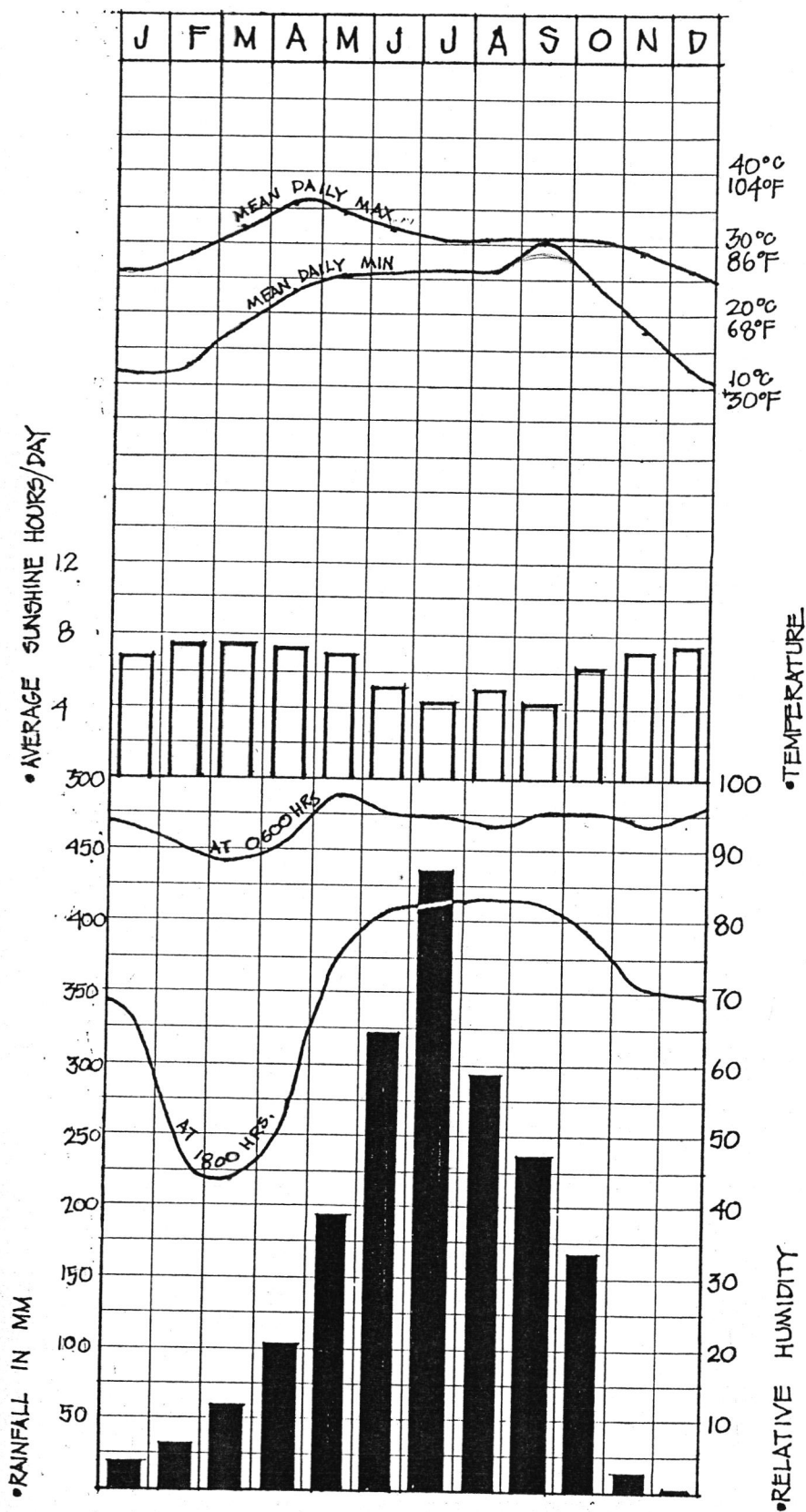
"knowledge of the climatic zone to which a town or settlement belongs and possession of published regional climatic data does not eliminate the need for the careful investigation of site climatic conditions". (6)

The climate in urban areas have shown marked changes from the general climatic data of a particular region. Factors which effect

building design such as air temperature can be 8 degrees centigrade higher than surrounding countryside in urban areas. Relative humidity is reduced by 5 to 10% due to quick run-off of rain water absence of vegetation and higher temperature. Substantial changes are noticed in wind velocities, increasing due to lack of openness and due to the funnelling effect of buildings. (7)

Koenigsberger outlines the following as the factors which cause deviations of climate in urban areas from the regional macro-climate.(8)

1. changed surface qualities: increased absorbance of solar radiation, increased evaporation
2. Buildings: casting a shadow and acting as barriers to winds, but also channelling winds possibly with localized increase in velocity or by strong absorbed heat in their mass and releasing it at night.
3. Energy Seepage: through walls and ventilation of heated buildings, the output of refrigeration plants and air conditioning, heat output of external combustion engines and electrical appliances, heat loss from industry, especially furnaces and large factories.
4. Atmosphere pollution: waste product of boilers and domestic and industrial chimneys, exhaust from motor cars, fumes and vapours which both tend to reduce direct solar radiation but increase the diffuse radiation and provides a barrier to outgoing radiation. The presence of solid particles in urban atmosphere may assist in



J	F	M	A	M	J	J	A	S	O	N	D
NW	NE/E	SE/SW	S/NW	SE	SE/S	SE/S	SE	SE	E		NW
↘	↙	↗	↖	↖	↖	↖	↖	↖	↖	↘	↘
	↖	↗	↘		↖	↖				↘	
2.8	3.2	5.0	7.1	8.6	7.3	7.5	6.4	6.5	4.8	2.8	3.0
05	45	52	74	95	38	38	15	09	15	05	05

WIND SPEED/DIRECTION

COUNTRY : BANGLADESH
 LOCATION : DHAKA
 ALTITUDE : 7 M , 23 FT.
 LATITUDE : 24° N
 LONGITUDE : 90.6 E

SUN ALTITUDES (AT 12 NOON)

DEC 22, MAR 21 / SEP 23, JUNE
 43.5° 66.5° 89.5°

FIG. 4.6. . CLIMATIC CHART FOR DHAKA.

[DATA: STATISTICAL YEARBOOK OF BANGLADESH]

the formation of fog and induce rainfall under favourable conditions.

4.5 MATERIALS

In the urban areas, building materials are quite different from the villages, mud and thatch are not used, instead there is a growing dependence on permanent materials. Brick, cement, steel are the materials commonly used for construction in urban areas.

Bricks are manufactured locally, and good quality soil ideal for brick making is available throughout Bangladesh. Bricks are fired in furnaces, coal for which is imported, natural gas is available in the country. Market price of bricks fired in gas and oil furnaces exceed that of bricks fired in coal furnaces. (9)

Bricks are mostly used for wall construction in housing. There are various categories of bricks used for construction purposes, 1st class bricks are of better quality and are used for walls, while 2nd and 3rd class bricks are used for breaking up into aggregate for concrete or for soling purposes. There exists another type called "Ceramic Bricks" which are well finished and can be left exposed on wall surfaces, however it is more expensive.

Reinforced concrete is used for roofs and lintels, cement and steel for which is mainly imported. Cement is manufactured in very small quantities in Bangladesh, not enough to meet local needs. Steel is imported in billet form to be melted down and formed into bars in

local re-rolling mills.

Timber is used for doors and windows, however, good quality timber is very expensive and fixtures made from cheaper, inferior quality timber warps easily. It is becoming increasingly popular to use steel frames for windows. Glass for glazing is available locally and its price varies with quality.

Corrugated iron sheets are very popular as building materials. They are mostly used for roofs in urban houses. In some cases they are also used as walling materials. It is much cheaper than concrete and requires little maintenance.

Frameworks for corrugated iron roofs are generally made of timber, nowadays steel sections are also used especially for longer spans.

Particle boards, plywood, asbestos etc. are also available in limited quantities. Plywood and particle boards are popular for temporary partitions only and they cannot be exposed to the weather.

Mud construction is not found in the cities and it would be impractical to have mud houses because of the elaborate arrangements needed for it. However research in mud construction may yield results which will make mud construction suitable for urban areas. Squatters sometimes live in mud houses.

Most urban houses have at least one component made of permanent materials. Government built housing is generally of permanent

construction using brick walls, concrete slabs.

The performance of a house, specially thermal performance is greatly affected by the use of materials. Damp penetration, leakages, corrosion, pest and insect control etc. are subject to the quality of construction besides being a function of the materials used. Inferior construction would mean poor condition of the house and excessive maintenance work.

Choice of materials for urban housing construction is limited. Experience has shown that the most expensive types are not always the best. Construction techniques used are also important.

4.6 CONSTRUCTION SYSTEMS

The most favoured structural systems for house construction in urban Bangladesh are the load bearing construction system and the frame construction system.

Load bearing system is more popular for low rise structures. Brick walls 10 inches [2.54 cms = 1 inch] thick take the load of the roof of the floor above. Slab thickness increases with span and large spans using this construction system is impractical and uneconomical.

Frame construction system uses R.C.C. frames and the infill is done with brick walls thickness of which can be 5 inches as they are

not load bearing. This sort of system is favoured for medium and high rise construction. Costs for frame construction are substantially higher than load bearing construction.

Frame construction allows flexibility of planning interior spaces, whereas in load bearing construction floor plans have to be repeated for upper floors due to structural reasons. Sometimes a mixed construction system is also used. Timber frame construction is totally absent, although the some old example remains. Bamboo frame construction is restricted to rural areas only.

Construction methods are labour oriented and except for large construction projects there is very little use of machinery. Concrete mixing, rod laying, brick work, shuttering are all done by hand and construction workers are classified as to the area of their skill. Labour is cheap and if properly utilized can be of advantage to the building process. Inspite of this the trend is towards machine construction as it is considered to be of superior quality. Prefabricated building components have a novelty value and a standardized aluminium window frame would cost more than a hand crafted wooden frame.

The successful use of materials in housing design must consider savings in building costs as well as performanance of the materials as a modifier of the environment. Most materials favoured for building construction in urban Bangladesh are imported and therefore expensive. Locally available building materials are only of the

temporary type. Design solutions which make use of both types so that useful properties of both are fully exploited will make large scale housing construction economically and environmentally sensible.

4.7 FACILITIES

The main advantage urban houses have over rural houses is the level of access to service facilities in the urban areas. Rural areas have no piped water supply public sewerage system, gas and only some have electric supply.

Urban housing design has to take into consideration the effect of service facilities over the design of household spaces, house forms and layouts of houses. Within the house itself the effect of facilities will change the qualities of internal spaces and their relationships to each other.

4.7.1 WATER SUPPLY

No separate considerations will have to be made for the possibility of storing water in the urban house. In traditional settlements water had to be brought from a separate source, usually from a well, tube well or the pond and stored in the house for domestic use. Washing of the large number of pots and pans used in cooking can be done within the house.

Water supply into the house make it possible to locate the bathing and toilet facilities in the house instead of being separate. The provision of plumbing fixtures such as the shower provide alternative means of taking a bath. On the other hand, clothes can now be washed inside the house and there has to be provision for that.

4.7.2 SEWERAGE FACILITIES

The presence of improved on site disposal systems such as the septic tank makes it possible to have the toilet in the house in the cities. The construction of septic tanks make it possible to locate them under the ground over built up areas therefore eliminating the need for extra space. Where there are conventional water borne sewerage systems it is even more advantageous.

Plumbing facilities for indoor toilets, however, need special considerations. Squatting pans used in the toilets are at floor level and the traps extend beyond it and need to be covered.

4.7.3 GAS

Not all urban areas have gas for domestic supply but the network is in the process of expansion. In the areas that have domestic supply of gas the process of cooking is greatly facilitated. In traditional houses fire wood is the main fuel used for stoves, and this generates a lot of smoke. Firewood has to be stored in dry

places and some homesteads had special structures for this purpose. In urban areas where there is no gas supply kerosene stoves are used.

The provision of gas stoves makes cooking a less smoke generating activity, heat and smells from cooking with gas, however remain the same as other stoves. The provision of gas is certain areas only and the design of urban housing in general should not take gas supply as a common feature.

4.7.4 ELECTRICITY

The supply of electricity allows urban households access to a lot of facilities that run on it. The social and domestic behavior of the people are also affected to a certain extent. Televisions and radios change the pattern of leisure activities of the urban household. The electric light allows people to stay up late in the evening in the cities whereas in the rural areas people retire early.

Electrical ^dgagets for household use including refrigerators are not common to all households in Bangladesh and cannot form any justifiable basis for design considerations.

Electricity allows the use of the ceiling fan thereby reducing the need for cross ventilation in all areas. The effect of cross ventilation is, however, more desirable than ceiling fans. Other environmental control devices, such as air conditioners cannot be considered in the design of urban housing because of cost factors.

Labour saving electrical gadgets are a luxury and can only be afforded by wealthier households.

4.8 SUMMARY

Although most of the urban population have rural roots and living habits and social attitudes are based on traditional ideas the urban environment is responsible in bringing about certain changes which have to be considered in the design of housing. The extended family of the rural areas have been replaced by the smaller nucleated families of the urban areas thus bringing about changes in the space requirements of the urban house. Because of the way of life in the cities, where nature of occupation of the people are different the day to day activities of urban households, although the same in content as their rural counterparts, are taking place within a different context calling for changes in the organization of household spaces. The physical characteristics of urban areas bring about changes in the elements of climate and the climatic determinants for urban housing sometimes show marked changes. The materials and construction methods of rural areas are more tradition oriented whereas in the cities materials have more imported components and construction technology is advanced. Lastly the level of access to facilities in the city has both important implications and restrictions on housing design.

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CHAPTER FIVE

THE DESIGN APPROACH .

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THE DESIGN APPROACH

Based on the discussions in the previous sections, the major factors influencing the design of urban housing are identified and their essential features interpreted as a design approach to urban housing.

The factors are organized into two groups concerning

- i) the interior spaces of the house and
- ii) the organization of the house as a combination of the interior spaces and other relevant features which concern the design of a dwelling unit

The last section discusses the cost implications of single storey houses on individual plots in relation to 4/5 storey blocks of flats in terms of materials and construction costs.

Each element of urban housing design is divided into a number of factors under a heading, each factor describes the qualities of the element and attempts to formulate a design suggestion relating to it at the end. The design of houses may not always include all the elements mentioned and can only be concerned with the ones relevant to the requirements or programme. Suggestions are not meant to be rigid interpretation of factors described but may be modified to suit particular situations.

As the design elements progress from the internal spaces to broader considerations of organization of the house design possibilities increase as external factors come into consideration. How the house is related to other elements of housing design such as roads, neighbourhood and the rest of the city in general should consider the implications of planning laws, urban design, infrastructural and transport networks amongst other things and are beyond the scope of this study.

5.1 INTERNAL SPACES

This section relates to the design of component spaces in relation to the various functions of the urban house. This does not necessarily mean the allocation of a particular space to a function but describes the qualities a space needs to serve a particular function, the result may be a independant space, a combination of spaces, or a part of one.

The elements considered relate to the essential functions of urban houses. Not all urban houses are expected to have all the elements and some may not have some (spaces for servants) and some may have more (garages). Particular requirements will relate to combinations of the elements.

The last element does not specifically refer to particular internal spaces but is concerned with extentions and alterations to existing spaces.

5.1.1 LIVING

The following factors will have to be taken into account when considering the design of livings spaces in the context of the urban house. (fig 5.1)

01. THE LIVING SPACE AS AN ENCLOSED AREA.

The living space, although a western concept is an established part of urban houses. It is primarily a space for receiving and entertaining guests and visitors in the urban house.

It corresponds to the "bangla ghor" or outhouse in the traditional homestead. This was in the form of an separate structure located near the entrance and it is usually also the living quarters for the unmarried male members of the household.

Privacy requirements do not allow female members of the family to come in contact with outsiders unless the person concerned is close to the family. The visitor should not also be able to see other spaces of the house from the living room. Any family member, specially females should not have to pass through or be seen from the living space on her way out of the house.

The combination of the living space with another household space like dining is likely to make the functioning of the other difficult. The presence of a visitor will not allow this to work properly. In some houses where the dining space is incorporated with the living

space it is seen that the family has arrangements for eating at another location in the house when there are visitors thereby creating a formal and an informal dining area.

The design of the living space should therefore consider;
IT AS AN INDEPENDANT AND ENCLOSED AREA IN THE HOUSE PREFERABLY IN THE FORM OF A ROOM. THE WALLS OF THE LIVING AREA SHOULD BE SOLID AND NOT ALLOW OTHER INTERNAL SPACES TO BE VISIBLE FROM IT.

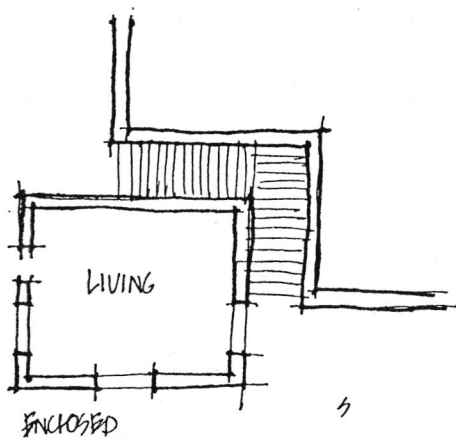
02. LIVING SPACE AS A SHOWCASE FOR THE HOUSE.

The living space is where the outsiders get their impressions of the house. As in the traditional house the front has important social connotations the living room of the urban house is representational of the house.

Urban households do their best to keep the living room in the best condition so that outsiders form a good impression about the house. More effort is given to keep the place neat and clean than the other spaces of the house.

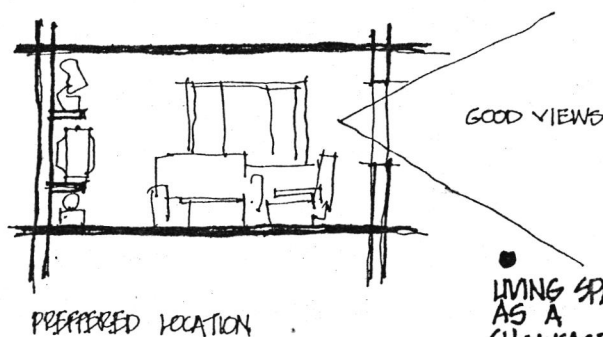
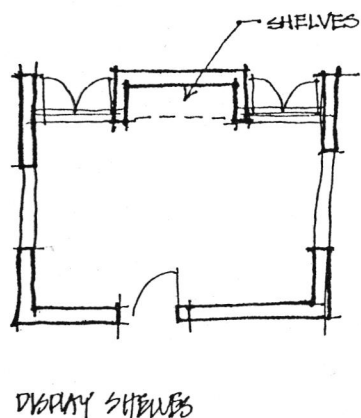
Household possessions of social and material value are kept in the living room for outsiders to see. The refrigerator although more at home in the kitchen or dining space is likely to be placed in the living area because it is related to the social status of the household (1). The living room in Bangladeshi households often have what is called a "showcase", a glass fronted cupboard, to display items of decorative value.

01.



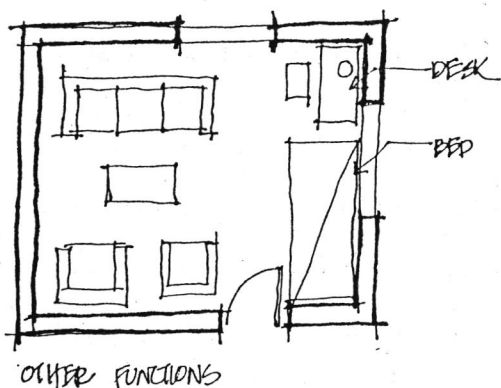
●
LIVING SPACE
AS AN
ENCLOSED AREA

02.



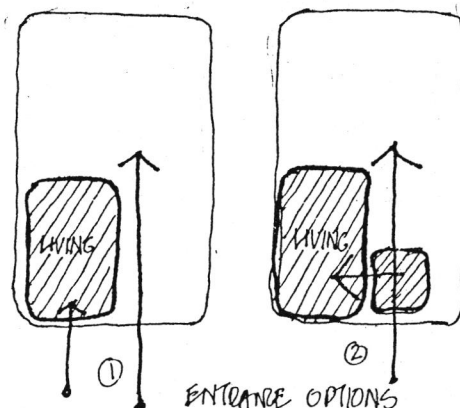
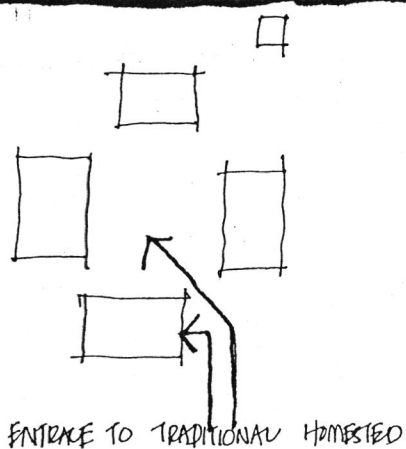
●
LIVING SPACE
AS A
SHOWCASE

03.



●
SECONDARY
FUNCTIONS

04.



●
RELATIONSHIP
TO
ENTRANCE

FIG 5.1. DESIGN OF LIVING SPACES .

The design of the living room should therefore consider;
THE LOCATIONAL VALUE OF THE LIVING SPACE AND THAT IT SHOULD NOT LOOK
OUT INTO OTHER AREAS INSIDE OR OUTSIDE WHICH ARE GENERALLY NOT
PLEASANT TO LOOK AT. THE WALLS OF THE LIVING ROOMS MAY HAVE BUILT IN
SHELVES FOR DISPLAY PURPOSES.

03. SECONDARY FUNCTIONS OF THE LIVING ROOM.

The main function of the living room is for receiving and
entertaining visitors. At any time this function gets predominance
over any other activity that may be taking place there.

The living space is also a space for the family to spend its
leisure time. If there is a television in the house it is likely to
be kept here for its social value as well as for use. The family
gathers here in the evenings to watch favorite programs, neighbours
without televisions may also join in.

The living space also doubles as a sleeping space in some
households. In traditional homesteads the outhouse is the sleeping
space for young unmarried male members of the family. In the urban
situation the household may have a young school going son or a
relative attending a educational institution in the city (see 4.3).
It is likely that if there is no other space in the house he would
sleep here at night. If he is a student which is most likely, there
would also be the need for a study table and a shelf. The living
space will only have nighttime use in such a situation.

The design of the living space should therefore consider;
POSSIBILITY OF IT SERVING AS A SLEEPING SPACE FOR A SINGLE PERSON AND
SHOULD BE ABLE TO ACCOMODATE A SMALL STUDY AREA.

04. RELATIONSHIP TO THE ENTRANCE OF THE HOUSE.

Because of reasons of privacy and social importance of the living space as mentioned earlier it has to be located in the front part of the house and yet should be able to allow householders to enter the house without being seen from it.

The traditional homestead provides the option of either entering the living room from the entrance point or bypassing it and going straight in to the rest of the house (see 2.1.5).

The design of the living space should therefore consider;
TWO DIFFERENT OPTIONS IN ITS RELATIONSHIP TO THE ENTRANCE TO THE HOUSE;

1. HAVING TWO ENTRANCES TO THE HOUSE, ONE OPENING DIRECTLY INTO THE LIVING SPACE, AND ANOTHER INTO THE OTHER PARTS OF THE HOUSE.
2. ENTRANCE INTO A TRANSITION SPACE FROM WHICH THERE IS ONE ENTRANCE TO THE LIVING SPACE AND ANOTHER TO THE REST OF THE HOUSE.

5.1.2 SLEEPING

The following factors will have to be taken into account when considering the design of the sleeping spaces in the context of the urban house. (fig 5.2)

01. CONNECTED SLEEPING AREAS.

In Bangladeshi cultures it is common for children up to the age of 10-12 years to sleep with their parents. There are no privacy restrictions between parents and the childrens sleeping areas and it is preferred if they are close together.

In traditional homesteads one single roomed hut is occupied by a man and his immediate family (see 2.1.4). It is a multifunctional space where the whole family sleeps.

Psychologically a mother feels safer if she is able to observe her sleeping child . Moreover bedroom doors are hardly ever shut in Bangladeshi households.

The design of sleeping areas should therefore consider them as;
AREAS OR ROOMS WHICH ARE CONNECTED TO EACH OTHER TO ALLOW MOVEMENT
AND VISUAL CONTACT BETWEEN THEM AT ALL TIMES. THEY CAN BE
DISCONNECTED BY CLOSING THE DOOR BETWEEN THEM.

02. STORAGE FUNCTIONS OF THE MAIN SLEEPING AREA.

The main sleeping area of the house also doubles as a storage area for

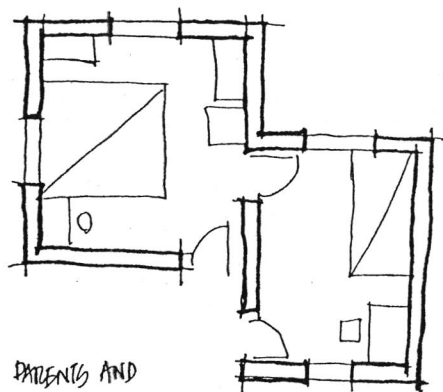
1. valuable items of the family which cannot be displayed in the living room such as jewelry.
2. some food items bought or received from the village home in bulk.

Almost all households have some jewelry as it is a part of all weddings. It is also traditional to pass on the jewelry from generations to generation. They are usually kept locked in a "steel almirah", a cupboard made of steel plates with a safe inside. This is always kept in the master bedroom. It is not common for a family to keep their valuables in the bank.

As most families have roots in the villages they get some food supply from their family farmlands. Some items are stored the bedroom usually in the space under the bed. The housewife sometimes wishes to have control over some of the items used by the servants so she keeps them near her.

The design of the sleeping space should therefore consider;
ITS USE AS A STORAGE SPACE FOR VALUABLES AS WELL AS BULK STORAGE OF FOODSTUFF. THERE MAY BE PROVISION FOR HIGH LEVEL SHELVES OR A LOWER CEILING SO THAT THE SPACE BETWEEN IT AND THE ROOF MAY BE USED AS EXTRA STORAGE SPACE.

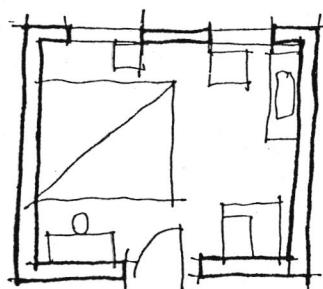
01.



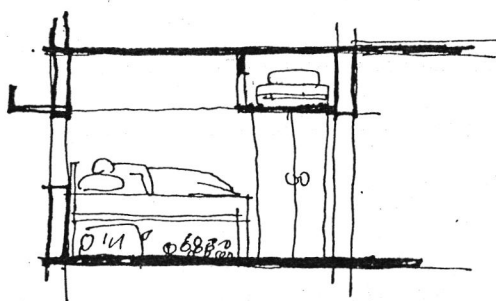
PARENTS AND CHILDREN'S BEDROOM

CONNECTED SLEEPING SPACES

02.



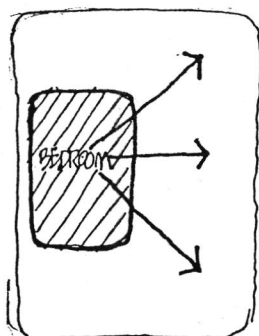
CONTAINER FOR CONTAINERS



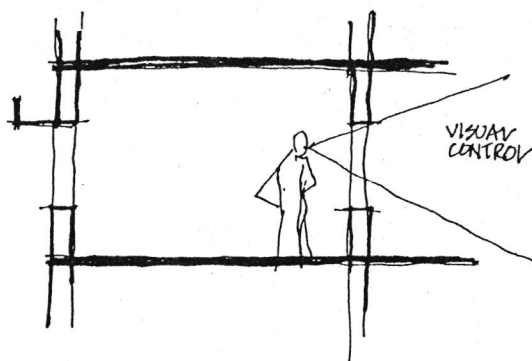
STORAGE UNDER THE BED AND ABOVE THE CEILING

STORAGE FUNCTIONS

03.



CENTRAL LOCATION OF BEDROOM

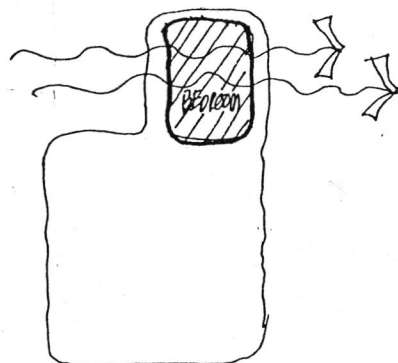


INTERIOR WINDOW

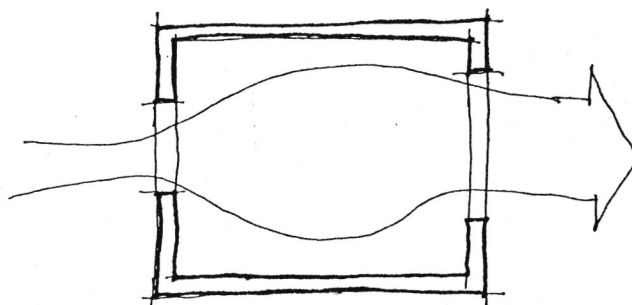
VISUAL CONTROL

CENTRAL LOCATION OF MASTER BEDROOM

04.



LOCATION TO ALLOW CROSS VENTILATION



EFFECT OF SMALL INLET AND LARGE OUTLET

THROUGH VENTILATION OF SLEEPING SPACES

FIG. 5. 2. DESIGN OF SLEEPING SPACES

03. CENTRAL LOCATION OF THE MASTER BEDROOM.

Unlike western cultures the master bedroom of the house is not a private place. It is from the master bedroom the lady of the house controls all domestic activity. Since it is also used as a storage space for food there is constant movement between the kitchen and the bedroom. Visitors close to the family may be received and entertained here.

Locating a master bedroom in isolation would make it difficult for the housewife to supervise the duties of the servants and to give instructions.

The design of the sleeping space should therefore consider; ITS LOCATION FROM WHERE IT HAS VISUAL CONNECTION WITH OTHER AREAS OF THE HOUSE SPECIALLY THE SERVICE SPACES. THE POSSIBILITY OF WINDOWS IN THE INTERIOR WALLS OF THE BEDROOMS MAY ALSO BE CONSIDERED IN PROVIDING THIS CONNECTION.

04. THROUGH VENTILATION OF THE SLEEPING SPACES.

The sleeping spaces are the most used spaces in the house. Besides being slept in at night the bedroom is also used during most of the day for reasons mentioned earlier.

Because of its high usage it is important for these spaces to maintain comfort conditions at all times.

The single most important criteria for comfort in Bangladeshi climate is the flow of air (see 4.4.5). The main direction of air flow in the summer months is from the south-south east and windows have to be oriented in this direction.

*

The design of sleeping spaces should therefore consider; ITS LOCATION IN THE HOUSE SO THAT ONE EXTERNAL WALL FACES THE DIRECTION OF THE PREVAILING BREEZE. BETTER VENTILATION IS ACHIEVED IF THE INLET IS SMALLER THAN THE OUTLET AND IF BOTH ARE ON THE SHORTER WALLS OF THE ROOM(2).

5.1.3 COOKING

The following factors will have to be taken into account when considering the design of spaces for cooking and food preparation in the context of the urban house. (fig 5.3)

01. COOKING AS AN ISOLATED FUNCTION.

The nature of cooking and food preparation activity in the Bangladeshi culture is such that it generates smells and wastes. It is generally quite a lengthy process. Food preparation for cooking is often cumbersome and may involve slaying of chickens and removing scales from fish.(see 4.3.4). It is not desirable for the smells generated from the cooking area to leak to other spaces.

Food preparation and cooking functions are carried out by the servants and the female members of the household, the males do not use these areas. It is also not desired for outsiders to have a view of the kitchen.

The cooking area also generates a lot of heat and this can be transmitted to adjacent spaces through the walls.

The design of cooking spaces should therefore consider;
IT EITHER AS AN AREA ISOLATED/SEPERATED FROM THE OTHER FUNCTIONS OF THE HOUSE OR LOCATING IT FARTHEST AWAY FROM THE ENTRANCE.

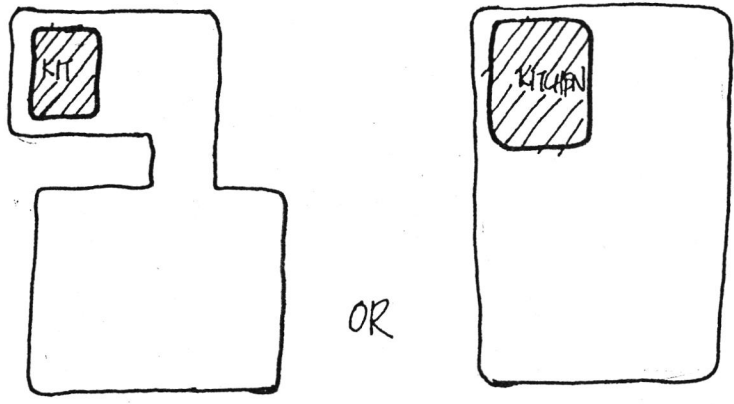
02. ADJACENT SUPPORTING SPACES

Food preparation is sometimes an elaborate activity, additional space for which is useful. In traditional homesteads this was provided by the courtyard and the general open area around the kitchen. (see 2.1.5). In some examples of urban housing there are open spaces where this can take place (see 3.2.2 and 2.2.2).

Some of the food preparation activities are less troublesome and can be carried out on the dining table or even in the bedroom. Cutting fish, for example, on the other hand requires a lot of space and is an elaborate and time consuming activity.

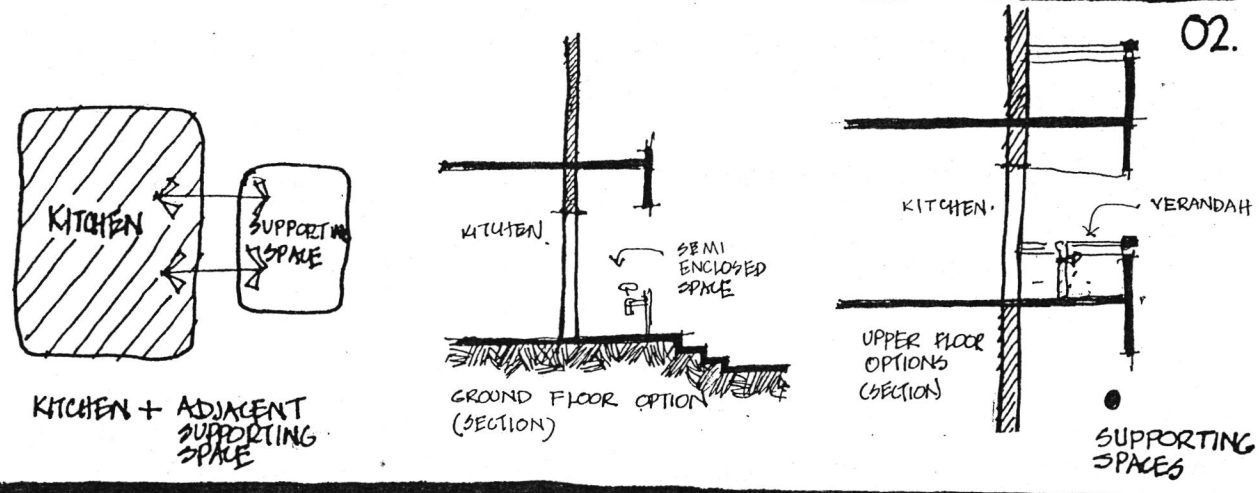
Washing up of pot and pans is usually done by the servants and needs a lot of water at floor level as some pots are very big and sinks cannot accomodate them. Ash and coal are used as detergent to

01.

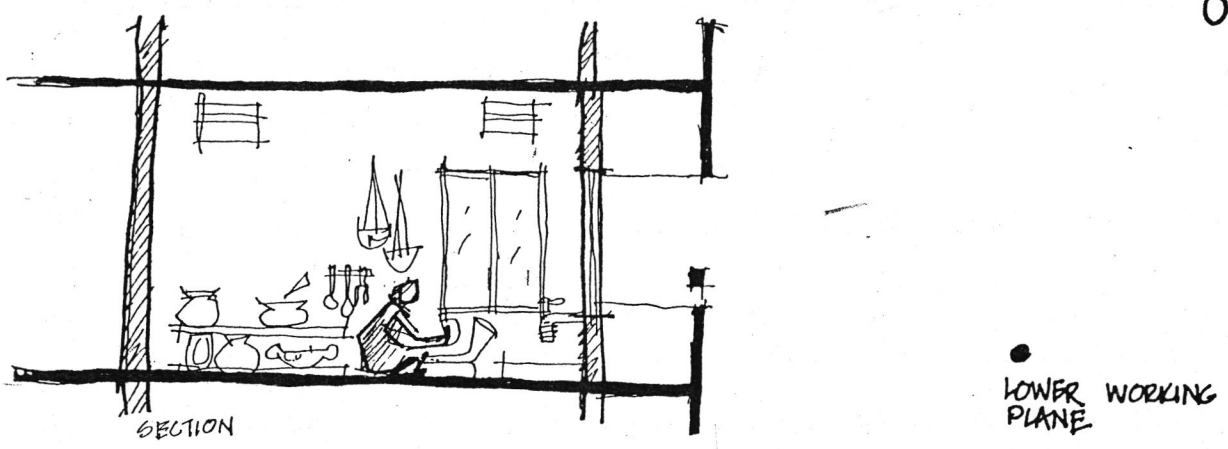


ISOLATED LOCATION OF COOKING FUNCTIONS

02.



03.



04.

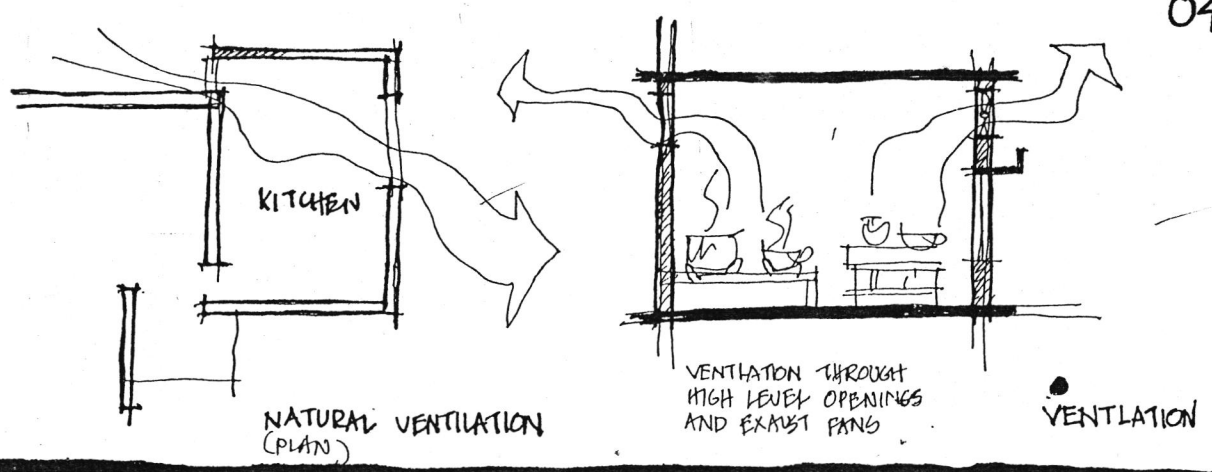


FIG 5.3.. DESIGN OF COOKING SPACES

remove grease and grime from the pots. Because of the nature of these functions they are best carried out somewhere else and not in the kitchen itself.

The design of the cooking space should therefore consider; THE PROVISION OF A SEPERATE SPACE FOR SUCH ACTIVITIES. ON THE GROUND FLOOR IT CAN BE AN EXTENSION OF THE KITCHEN FLOOR BUT OUTSIDE IT. ON UPPER FLOORS IT CAN TAKE THE FORM OF A VERANDAH NEXT TO THE KITCHEN ITSELF. THERE SHOULD BE A WATER SUPPLY SOURCE IN THIS SPACE AND THE FLOOR SHOULD HAVE ADEQUATE DRAINAGE.

03. LOCATION OF FACILITIES IN THE COOKING SPACE.

Traditionally all functions associated with cooking and food preparation take place on the floor. Kitchens in urban houses assume the working plane to be at waist level and facilities in the kitchen are located accordingly.

A lot of cooking activities in the urban areas are performed at ground level. Spices are ground on a stone slab on the ground, a lot of cutting is also done on the floor with the help of a "boti" a curved blade fixed vertically to a block of wood. (see 4.3.4) Washing as mentioned earlier is done to a large extent on the floor. It is not uncommon to find a lot of housewives doing their cooking on the floor inspite of higher shelves provided for keeping the stove.

The design of the cooking space should therefore consider; THE LOCATION OF ALL KITCHEN FACILITIES AT LOWER LEVEL SO THAT A

PERSON MAY BE ABLE TO WORK WHILE SITTING ON THE GROUND. TO CARRY THIS CONCEPT FURTHER THE WINDOW LEVEL IN THE KITCHEN MAY ALSO BE LOWERED TO CONFORM TO A LOWER WORKING PLANE.

04. ENVIRONMENTAL CONSIDERATIONS.

The cooking areas generates heat and smells which should not effect other areas of the house and is generally considered to be a dirty area. Urban houses, while incorporating the kitchen with other functions try to offset its bad effects by locating it in a corner(see 2.2.3. and 3.2.2). This actually creates further problems. Because of its negative location the kitchen does not ventilate well and the heat and smells escape to other areas.

Seperating the cooking space helps the situation to a certain extent, but importance should also be given to its ventilation. Because hot air rises, kitchens may be ventilated via high level openings.

Because kitchens get dirty the floor is frequently washed with water and for it to dry fast it has to be well ventilated. It may not always be possible to have natural ventilation in the kitchen because priority is for the sleeping areas.

The design of cooking spaces should therefore consider VENTILATION OF THE SPACE BY LOCATING OPENINGS AT HIGH LEVEL. ATTEMPTS SHOULD BE MADE TO VENTILATE THE SPACE NATURALLY OR PROVIDE EXHAUST FANS IF THE NEED BE.

5.1.4 EATING

The following factors will have to be taken into account when considering the design of eating spaces in the context of the urban house. (fig 5.4)

01. THE ROLE OF THE TABLE AS A PLACE FOR EATING IN THE URBAN HOUSEHOLD.

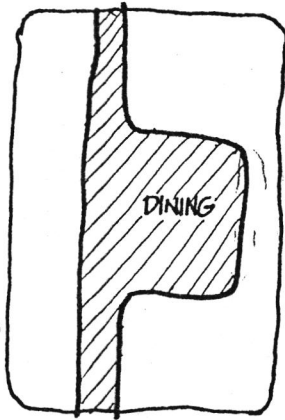
Traditionally the preferred position for eating is while sitting on the floor. A mat is laid out on the ground and one sits on it crossed legged. In rural homesteads there is no fixed space allocated to eating and people usually eat in the kitchen. The dining table is now becoming popular in the urban households and a separate space is allocated for it.(see 3.3)

The dining table is also used as place for the less cumbersome food preparation activities. In the evenings the school going children of the household use the dining table for studying.

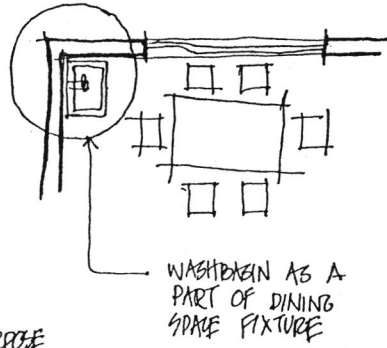
In larger households the whole family may not eat all together. It is common for the lady of the house to eat after everybody else has eaten. The servants do not eat on the dining table but usually on the kitchen floor. (discussed separately)

In Bangladeshi culture food is traditionally eaten with ones fingers and this requires the hands to be washed once before a meal and once after. Washing hands after the meal is also accompanied by

01.

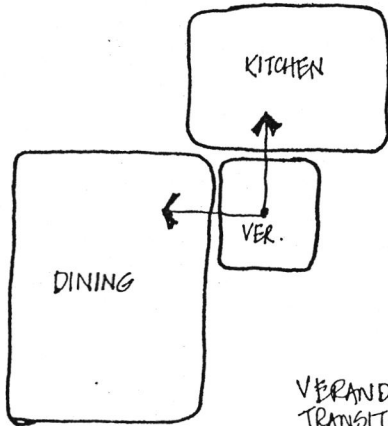


DINING AS A MULTIPURPOSE SPACE AND A PART OF THE MAIN CIRCULATION

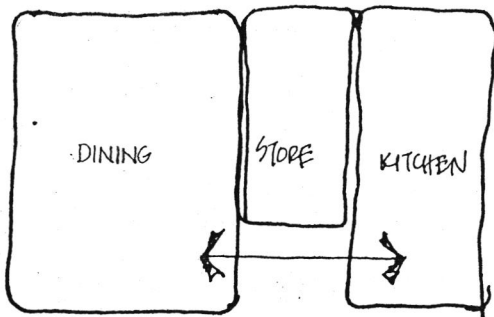
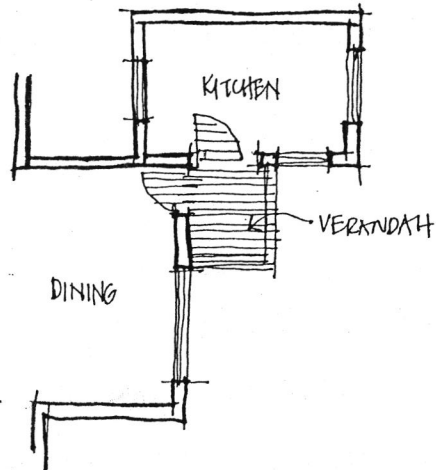


DINING SPACE IN THE URBAN HOUSE

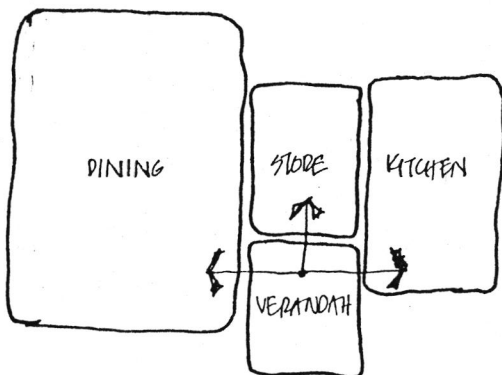
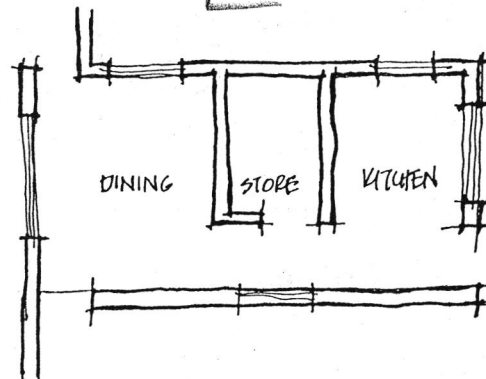
02.



VERANDAH AS AN TRANSITION SPACE



STORE AS A BUFFER



INDIRECT CONNECTION BETWEEN KITCHEN AND DINING USING A COMBINATION OF STORE & VERANDAH.

KITCHEN-DINING RELATIONSHIPS

FIG 5.4. DESIGN OF EATING SPACE

rinsing the mouth for oral hygiene.

The design of the eating space should therefore consider;
ITS QUALITY AS A MULTIPURPOSE SPACE FOR THE HOUSE. IT CAN BE
CONSIDERED AS PART OF THE CIRCULATION SPACE FOR THE WHOLE HOUSE SO
THAT IT IS EQUALLY ACCESSIBLE FROM ALL LIVING SPACES. FACILITIES FOR
WASHING HANDS SHOULD EITHER BE LOCATED IN IT OR IN CLOSE PROXIMITY.

02. KITCHEN-DINING SPACE RELATIONSHIP

Because of the obvious connection between the two functions, the kitchen and the dining space should be located near each other. Urban houses in Bangladesh tend to connect these two spaces directly although this may not always be desirable (see figs 2.10 and 3.17)

The dining space forms the link between the kitchen and the other household spaces. Because of the position of the dining space in relation to the rest of the house, heat and smells from the kitchen can easily be transmitted via the dining space. The connection between these two functions should therefore be indirect

The design of the dining space in its relationship to the kitchen should therefore consider;
THE POSSIBILITY OF USING A VERANDAH AS A CONNECTION BETWEEN THE TWO.
THE VERANDAH BECAUSE OF ITS EXPOSURE TO THE EXTERIOR WILL HELP TO
BLOW AWAY ANY SMELL OR HEAT TRYING TO ESCAPE INTO THE DINING SPACE.
STORAGE FACILITIES IF PROVIDED AS A PART OF THE KITCHEN MAY ALSO BE
USED FOR CREATING AN INDIRECT RELATIONSHIP BETWEEN THE TWO.

5.1.5 BATHING AND TOILET

The following factors will have to be taken into account when considering the design of bathing and toilet areas in the context of the urban house. (fig 5.5)

01. BATHING HABITS IN THE URBAN CONTEXT.

Bathing is an essential function in Bangladeshi households, because of the hot humid climate of the country bathing is associated with comfort and it is common for most people to take a bath at least once a day.(see 4.3.5)

The traditional way of taking a bath is by pouring water over one's head with a mug from a bucket and is preferred to a shower by many. Washing clothes is an activity associated with bathing and also requires the use of a bucket. In the winters bathing with warm water requires the use of a bucket as there are no arrangements for running hot water.

Younger children and males in the urban household may take their bath outside the house. On ground floors the area which acts as an extension of the kitchen can be used for such a purpose.

Chowdhury recommends a space requirement of 16 sft. (1.47 sq m) for bathing considering the use of a shower(3) but a more realistic assumption would be around 20sft(5 x 4) or 1.87 sq m. which takes traditional bathing habits into consideration. (4) [see appendix B]

The design of space for bathing should therefore consider;
THE TRADITIONAL BATHING HABITS AND SHOULD ALSO HAVE A TAP FROM WHICH
WATER CAN BE COLLECTED IN BUCKET. SPACE PROVIDED SHOULD BE
SUFFICIENT FOR WASHING CLOTHES.

02. TOILET HABITS.

Because of religious convictions one is not supposed to face or
have his back towards the west which is the general direction of the
holy city of Mecca while defecating.(see 4.4)

The preferred position for using the toilet is the squatting
position. A squatting pan with two footrests on either side is used.
Plumbing facilities for which extend below floor level and the design
of the toilet has to be organized to accomodate this.(see 4.7.2)

Water is used for anal cleansing and there has to be a water
supply source in the toilet.

The design of the toilet area should therefore consider;
A LOCATION SO THAT EAST-WEST ORIENTATION OF THE TOILET IS AVOIDED. A
TAP FOR WATER INSIDE THE TOILET. PLUMBING THAT EXTENDS BEYOND THE
FLOOR LEVEL AND HENCE INTO THE ROOM BELOW CAN BE HIDDEN BY A FALSE
CEILING OR ELEVATING THE FLOOR OF THE SQUATTING PLATE.

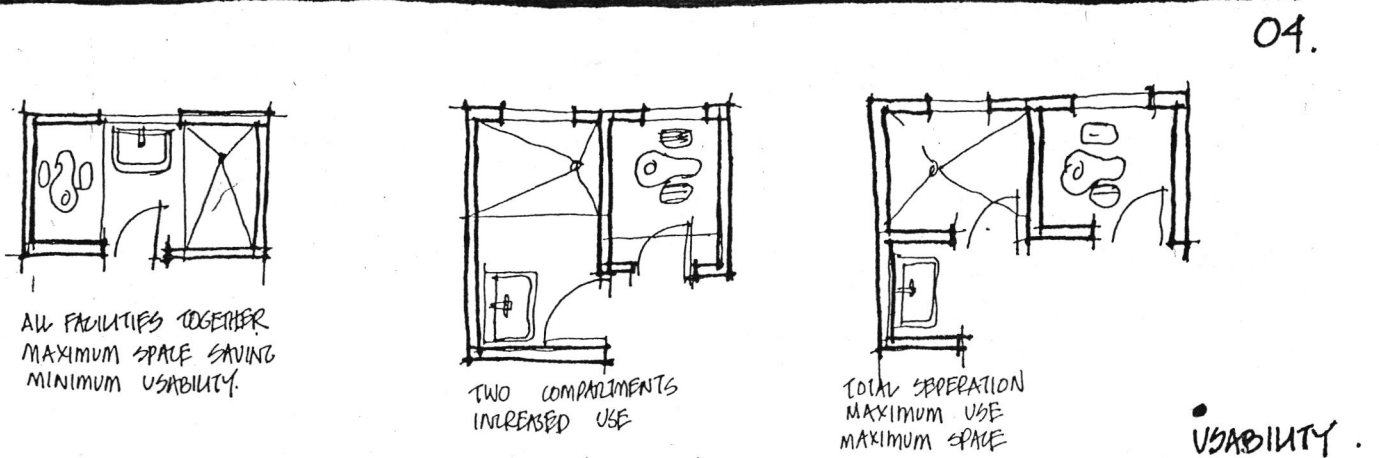
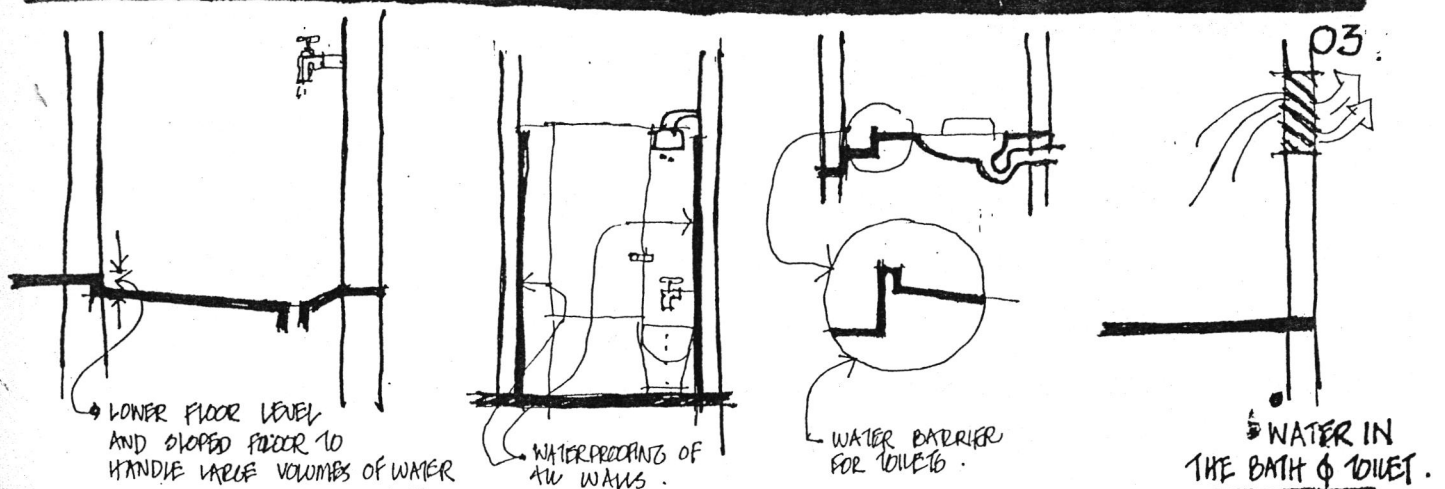
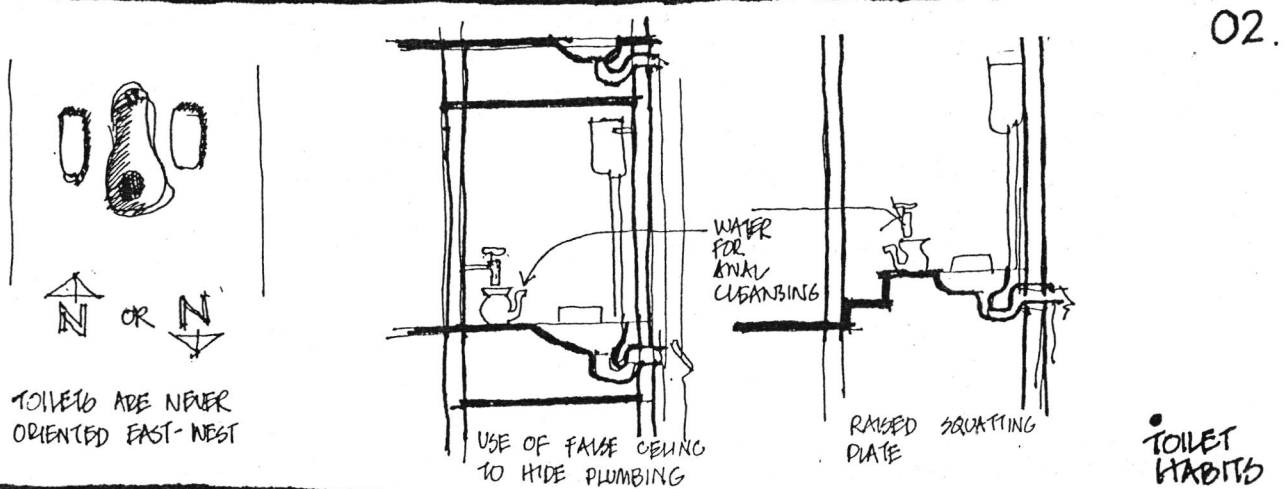
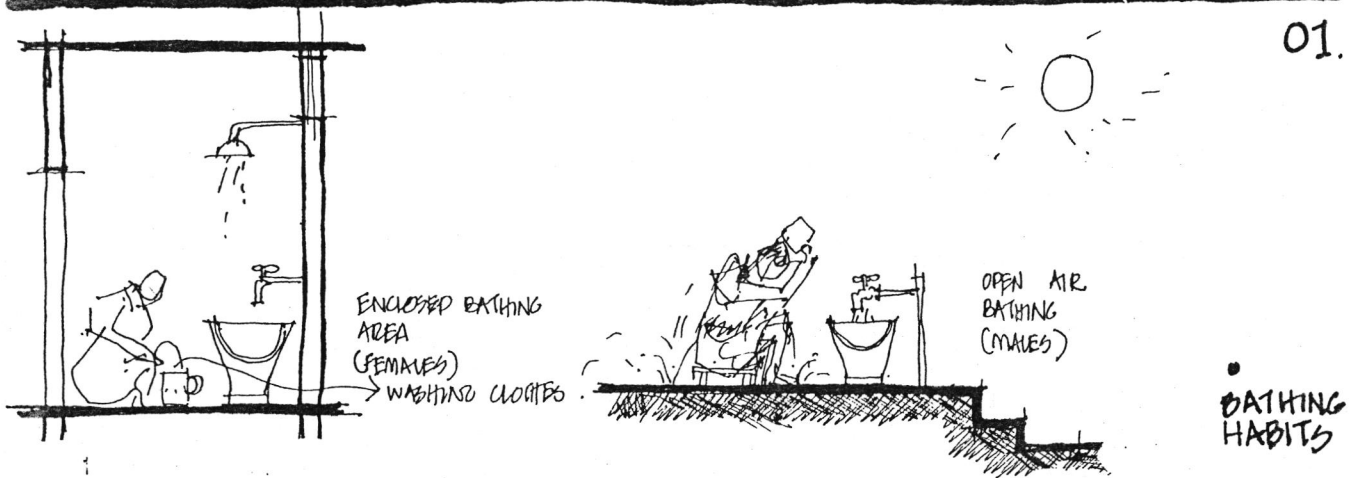


FIG 5.5. DESIGN OF TOILET & BATH

03. WATER IN THE BATH AND TOILET.

Bathing generates a lot of water and since it is poured over the head with a mug while sitting on the floor this causes a lot of water to splash against the walls. Water often leaks into adjoining spaces from under the door. Constant exposure to water also causes the wooden doors of the bathroom to rot.

The use of water in the toilet is also responsible for the general wetness of the toilet floor. Water is often the host for germs that are transmitted via human feces and this is a potential environmental hazard. (5)

For hygienic and environmental reasons it is important for the bathroom and toilet areas to be well ventilated and kept dry. The floors of these areas should not be allowed to accumulate water.

The design of toilets and bathrooms should therefore consider; KEEPING THE FLOOR LEVEL OF THE TOILET AND THE BATHROOM LOWER THAN THE SURROUNDING FLOOR LEVEL AND A SUFFICIENT SLOPE TO HANDLE LARGE VOLUMES OF WATER IN THE BATHROOM. WHERE THE SQUATTING PAN IS ELEVATED A SMALL BARRIER CAN BE CREATED TO STOP THE NATURAL TENDENCY OF WATER TO FLOW DOWN. THE SLOPE OF THE TOILET FLOOR SHOULD BE TOWARDS THE SQUATTING PAN. WALLS AND THE BATHROOM DOOR SHOULD BE WATERPROOFED UP TO A HEIGHT OF 7 FEET (2.5M) TO PREVENT DAMAGE CAUSED BY WATER SPILLAGE.

TOILETS AND BATHROOMS SHOULD HAVE AT LEAST ONE EXTERNAL WALL TO ALLOW NATURAL VENTILATION. OPENINGS IN THESE SPACES HAVE TO BE LOCATED

HIGH UP FOR PRIVACY AT THE SAME TIME THEY SHOULD BE AS LARGE AS POSSIBLE.

04. DESIGN OF BATH AND TOILET TO ALLOW MAXIMUM USABILITY.

More toilets and bathrooms will allow more usability. However for middle income houses it is impractical to think of more than one of each for the whole house.

The design of then toilet and the bath should therefore allow maximum usability. Besides being used by the members of the household the toilet is also used by visitors to the house.

There should be possibilities to allow simaltenous use of both facilities at the same time. Seperation of the washbain from the bathroom or the provision of another one outside the bathroom may be useful.

The design of toilets and bathrooms should ther^efore consider; SEPERATION OF THE TWO TO ALLOW MAXIMUM USE. DEPENDING ON THE SITUATION THE WASHBASIN AND THE BATHROOM MAY BE COMBINED TOGETHER AND THE TOILET SEPERATED. SEPERATING THE TOILET ALSO HAS ADVANTAGES CONSIDERING THAT VISITORS MAY HAVE EASIER ACCESS. SEPERATING THE WASHBASIN WILL INCREASE THE USE.

IT IS IMPORTANT TO NOTE THAT ALTHOUGH LOCATING ALL FACILITIES TOGETHER ALLOWS GREATER ECONOMY OF SPACE THE ADVANTAGES OF LOCATING THEM SEPERATELY OUTWEIGHS THIS CONSIDERATION.

5.1.6 SPACE CONSIDERATIONS FOR SERVANTS

Servants form an integral part of urban households. They may be living in the house as a part of the household or may work as part time domestic helps (see 4.2). Internal arrangements of the house should consider some space allocation for their personal use.

The following factors will have to be taken into account when designing spaces for use by the servants in the context of the urban house.

01. THE DIFFERENCE IN THE LEVEL OF USE OF HOUSEHOLD SPACES SERVANTS AND THEIR EMPLOYERS.

There is a difference in status between servants and their employers which stems from the class structure that exists in the traditional rural society in Bangladesh. Live-in servants are usually members of the lower classes of the same rural area as their employers while part timers may be from the lower income sections of the urban population.

The so called lower classes are not supposed to mix socially with the so called upper classes. This social stratification does not allow servants in the urban household same level of access to household spaces and facilities as their employers.(see 4.2)

There also exists certain social codes which guide the behavior of the servants in the house of their employer. Servants, for example

are not supposed to sit down in front of their employers and when they do it is at a lower level, usually on the floor.

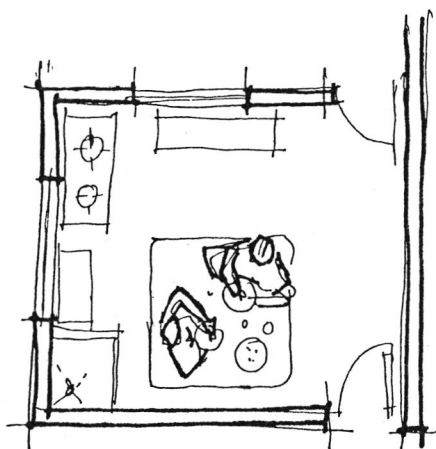
The design of urban houses should therefore consider;
THE IMPLICATIONS IN SPACE USAGE WHICH ARE A RESULT OF THE DIFFERENCE
IN SOCIAL LEVELS BETWEEN SERVANTS AND THE MEMBERS OF THE FAMILY.
SPACES RELATED TO THE INDIVIDUAL FUNCTIONAL NEEDS OF THE SERVANTS
SHOULD BE CONSIDERED SEPARATELY BUT WITHOUT ALWAYS DESIGNATING A
SEPARATE SET OF ROOMS FOR THEIR EXCLUSIVE USE.

02. SPACES FOR LIVE-IN SERVANTS. (fig 5.6)

Spaces for use by the servants for their basic functional needs have to be accommodated into the house keeping in mind the minimum requirements.

Servants and the other household members do not eat together neither do they eat in the same place. Normally servants would eat in the kitchen in the traditional manner, while sitting on the floor after everybody else has eaten.

Sleeping arrangements for servants vary depending on the age and sex of the servant. Younger servants and female servants would normally sleep on the floor of one of the bedrooms of the house on a mattress rolled up and kept somewhere else during the day. Older male servants would sleep on the floor of some other space, usually not used by anybody at night.

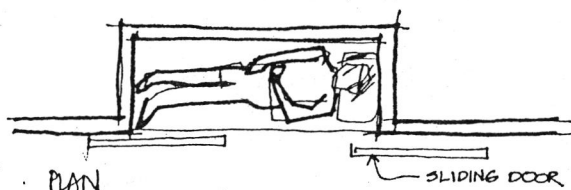


EATING ARRANGEMENTS FOR SERVANTS
IN THE KITCHEN

EATING

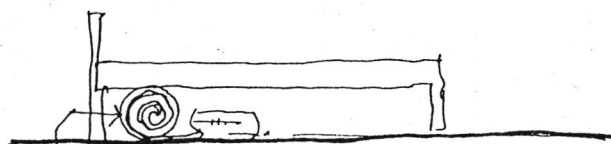


NIGHT



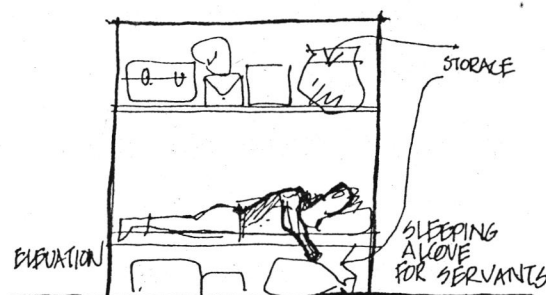
PLAN

SLIDING DOOR



ROLLED UP MATTRESS

DAY

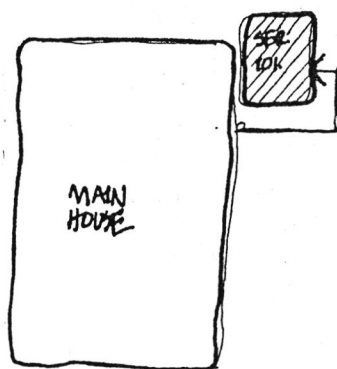


ELEVATION

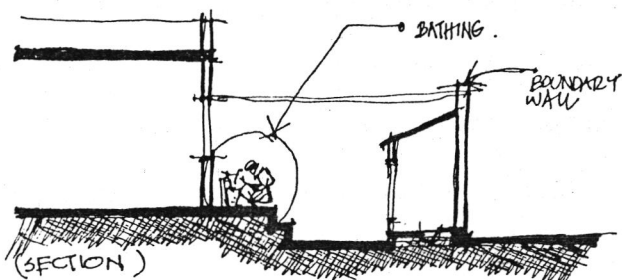
STORAGE

SLEEPING
ALCOVE
FOR SERVANTS

SLEEPING



INDIRECT LOCATION



(SECTION)

SERVANTS TOILET AS A LEAN TO CONSTRUCTION AGAINST BOUNDARY WALL



(PLAN)

INDIRECT APPROACH TO SERVANTS TOILETS ON UPPER FLOORS.

BATH &
TOILET

FIG 5.6. SPACES FOR SERVANTS.

Normally the servants do not use the same bathing and toilet facilities as everybody else. Servants may take their baths outside the house in the manner described in the previous section. Seperate toilet facilities for servants are desirable, but this is not always possible. It may however be possible to have some arrangements for servants toilets at the community level as is the case in some government housing estates.

The design of the house should therefore consider spaces for use by the servants by;

1. TAKING INTO ACCOUNT THE SPACE NEEDED FOR SERVANTS TO EAT ON THE KITCHEN FLOOR IN THE DESIGN OF THE KITCHEN ITSELF. THIS DOES NOT HAVE TO BE EXTRA SPACE BUT THE ARRANGEMENT OF FACILITIES IN THE KITCHEN CAN ALLOW THIS ACTIVITY TO TAKE PLACE IN RELATIVE EASE.
2. TAKING INTO ACCOUNT THE SPACE NEEDED FOR SLEEPING AND INCORPORATING IT WITH THE DESIGN OF THE OTHER SPACES OF THE HOUSE. THIS MAY BE ARRANGED IN THE FORM OF A SMALL ALCOVE IN THE DINING SPACE AND ITS DESIGN MAY BE SUCH THAT IT CAN BE PUT TO SOME OTHER USE AS WELL.
3. WHEREVER THE RESOURCES ALLOW, IT IS ALWAYS PREFERABLE TO HAVE SEPERATE TOILET FOR SERVANTS USE. THIS MAY BE DESIGNED AND LOCATED IN SUCH A WAY SO THAT IT DOES NOT HAVE A DIRECT RELATIONSHIP WITH THE OTHER PARTS OF THE HOUSE. OTHERWISE THEY MAY BE PROVIDED AT THE COMMUNITY LEVEL.

5.1.7 ALTERATIONS AND EXTENSIONS

As needs change with time, houses have to change as well to adapt to changes in family structures and status. Urban houses have to provide some scope to allow alterations, if not extensions, to be made to them from time to time.

The following factors will have to be taken into account when considering alterations and extensions to the design of the urban house. (fig 5.7)

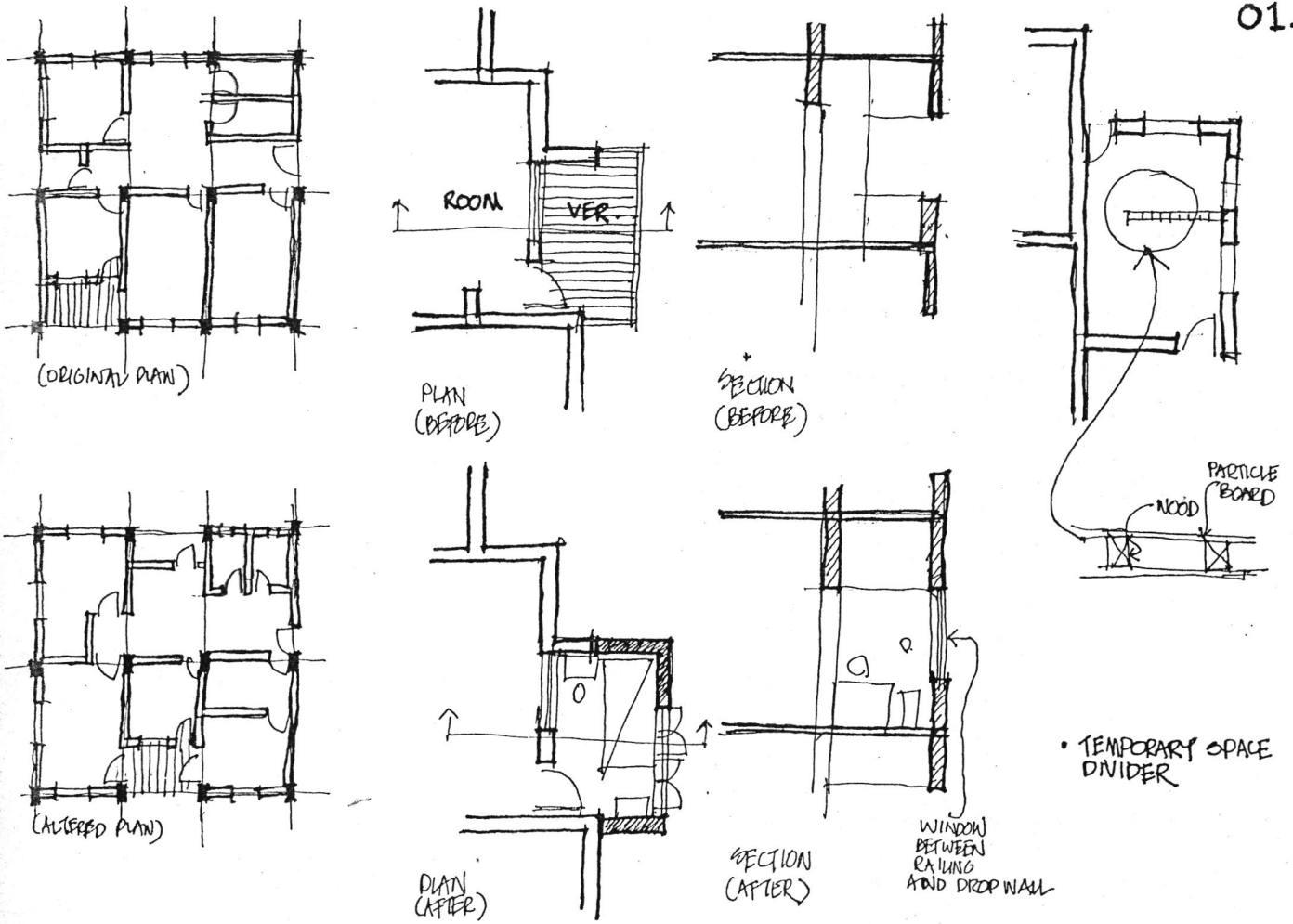
01. INTERNAL SPACES WHICH ALLOW ALTERATIONS.

{ Changes in family status need alterations to the internal spaces of the house, internal spaces may be brought to new or alternative uses if the need be. Verandahs are useful in this regard and are often converted to rooms.

Alterations may involve the putting up of temporary partitions to divide up a space or in more complicated cases putting up of permanent walls with doors and windows or tearing them down. The walls of houses in urban areas are usually of masonry construction and often have structural implications and cannot be taken down.

Flexibility of use of the internal spaces of the urban houses is an important consideration. The size and shape of the rooms and their relative locations determine flexibility to large extent.

01.

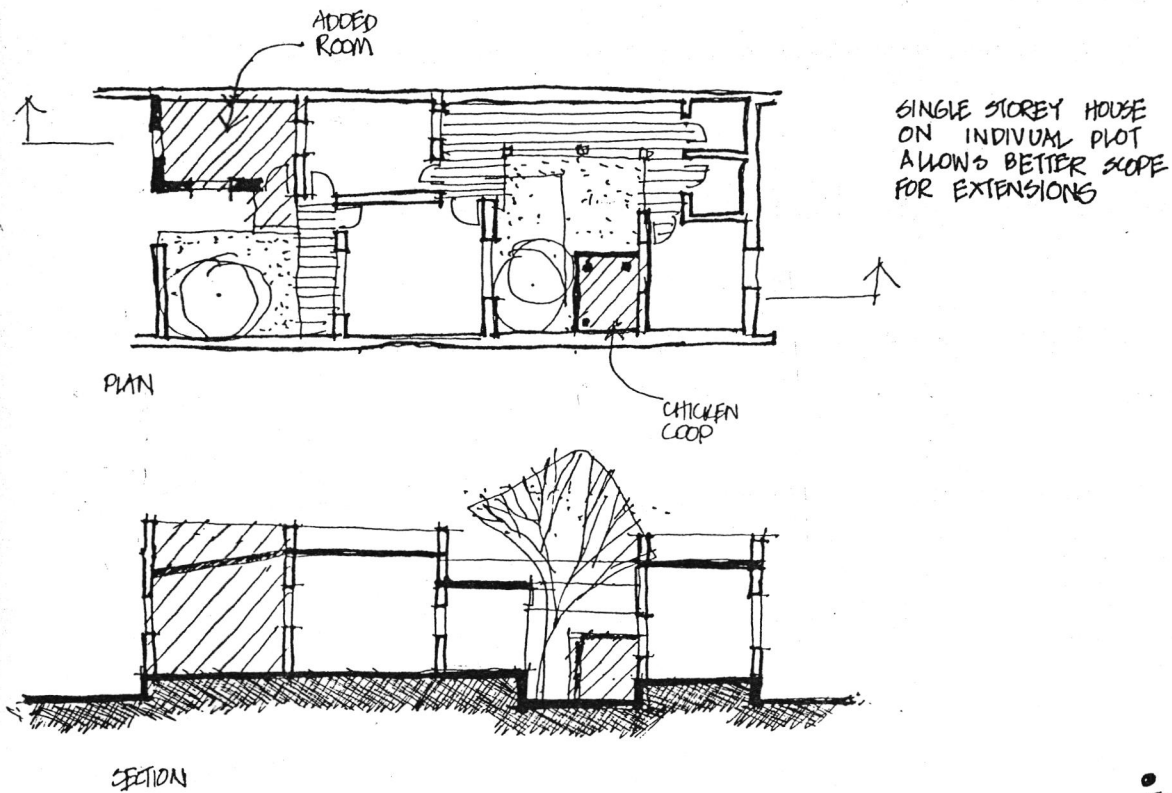


STRUCTURAL SYSTEM THAT
ALLOWS ALTERATIONS

VERANDAH CONVERTED TO ROOM .

ALTERATIONS

02 .



EXTENSIONS

FIG. 5.7. ALTERATIONS & EXTENSIONS

From the point of view of the possibility of alterations to be made to the internal spaces, the design of the urban house should consider;

STRUCTURAL SYSTEMS WHICH ALLOW THE WALLS TO BE SHIFTED. MATERIALS WHICH ALLOW EASIER DISMANTLING AND RECONSTRUCTION MAY BE CONSIDERED FOR WALL CONSTRUCTION.

DESIGN OF RAILINGS AND DROP WALLS IN THE VERANDAHS SHOULD ALLOW EASY CONVERSION TO ROOMS.

02. EXTENSIONS TO THE HOUSE.

The arrangements of traditional homesteads allowed additions to be made to it whenever needed. Usually with the marriage of a son a new hut would be needed for his family. These extensions would be fairly easy to do as the homestead area had plenty of space to spare.

With time, as the children grow up there is demand for additional space in the house. There are also increases in family size with births and marriages.

Extensions are needed if the family wants to keep animals. The examples of single storey row houses at Plassey (fig 3.1) allow extension to be built because there is some ground area associated with the houses.

Extensions are a function of the type of house and it is easier to build extensions to ground floor housing. Extensions to upper storey flats are possible as seen in Helwan, Egypt and the

possibilities may be explored. (6)

The design of urban houses should therefore consider;
THE POSSIBLY OF EXTENSIONS TO BE BUILT TO A HOUSE AS MORE OF A
FUNCTION OF THE TYPE OF HOUSE THAN THE DESIGN OF THE INTERIOR
SPACES.

INDEPENDANT HOUSES ON SEPERATE PLOTS OF LAND PROVIDE THE BEST SCOPE
FOR EXTENSIONS TO A HOUSE IN WHICH CASE THE OPEN SPACES INSIDE THE
PLOT SHOULD BE SHAPED AND SIZED TO ALLOW MEANINGFUL EXTENSIONS.
BUILDINGS WITH TWO HOUSES IN IT WILL FIND IT EASIER TO SHARE OPEN
AREAS FOR EXTENSIONS THAN MULTI STOREY FLATS.

5.2 ORGANIZATION OF THE HOUSE

The design of the urban house should contain the internal spaces in their correct relationship to each other. The overall design of the house will also have to take into consideration certain other elements which in combination with the internal spaces is relevant to its overall organization.

For the urban house to fulfill its role as a container of household and social functions it has to conform to the socio-cultural patterns of the urban society and at the same time satisfy environmental needs;

" is that the house form is not simply the result of physical forces or any single casual factor, but is the consequence of a whole range of socio cultural factors seen in their broadest term. Form is in turn modified by climatic conditions. "(7)

A large number of factors guide the organization of the urban house. In the following sections, attempts have been made to identify the ones that have major influences on its design.

5.2.1 ZONES IN THE URBAN HOUSE

The following factors will have to be taken into consideration when relating the internal spaces with each other in the context of the urban house. (fig 5.8)

01. THREE ZONES IN THE HOUSE.

The location of the various spaces of the house are determined on the basis of zones within the house. The zones are divided on consideration of privacy and the nature of the use of the interior spaces of the house. The spaces in each zone are guided by the sort of functions it contains and the degree of accessibility desired.

The organization of interior spaces in zones originates from the rural concepts of organization of the homestead spaces.(see 2.1.5). The idea of zones were also present in the early urban houses though present day urban houses do not always carry the idea successfully. (see 2.2.3)

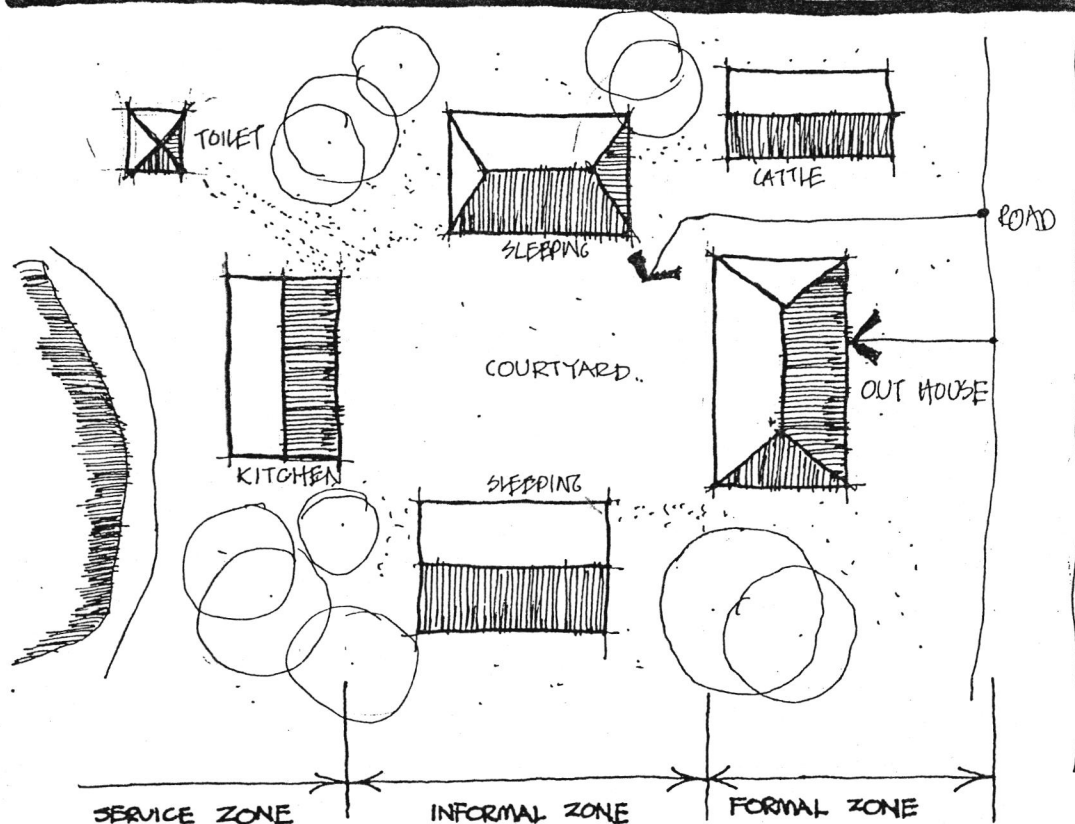
For the purpose of organization of the internal spaces, the urban house may be considered to be consisting of three zones.

1. The formal zone
2. The informal zone
3. The service zone

The formal zone is associated with the front part of the house and is most accessible to the outsiders. This is the least private area of the house in its relationship to the outside. This zone and the spaces in it have a direct relationship to the entrance.

The informal zone is essentially for use by the family and accessibility for outsiders is limited. From the point of view of male female separation the informal zone is the female part of the house. In certain situations parts of the informal zone overlaps

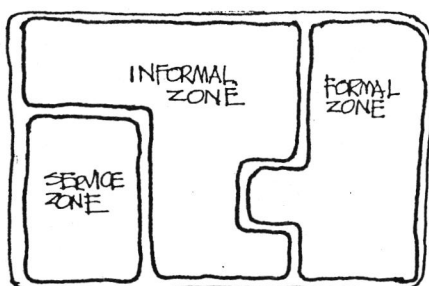
01.



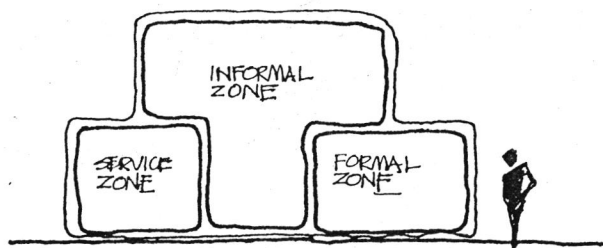
ZONES IN THE TRADITIONAL HOMESTEAD

3 ZONES
IN THE HOUSE

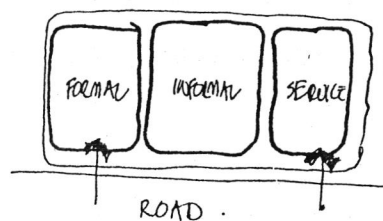
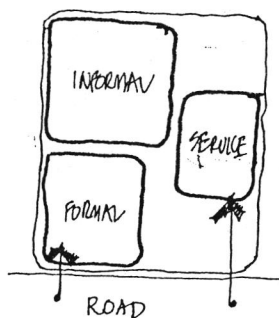
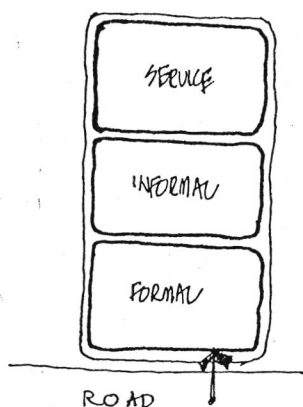
02.



HORIZONTAL ARRANGEMENT.
(SINGLE STOREY HOUSE)



VERTICAL ARRANGEMENT
(TWO STOREY HOUSE)



ORGANIZATION OF ZONES DEPEND ON HOUSE SHAPE

RELATIONSHIPS
BETWEEN ZONES

FIG 5.8 . CONCEPT OF ZONES IN THE URBAN HOUSE

with the formal zone or perform the functions of both zones.

The service zone contains service facilities, the kitchen and other affiliated functions. Servants have their spaces in this zone. Imamuddin refers to the service zone as a house in itself for the servants who work and sleep in this zone(8). This zone has an indirect relationship to the rest of the house and sometimes entry to this zone is separate.

Each zone may not always consist of internal spaces only and may combine the use of both internal and external spaces.

The design of the urban house should therefore consider;
THE ORGANIZATION OF THE SPACES OF THE HOUSE IN THE THREE ZONES MENTIONED. THE DESIRED LOCATION OF A SPACE WILL BE DETERMINED BY THE TYPE OF FUNCTION IT SERVES AND THE DEGREE OF ACCESSIBILITY DESIRED.

02. RELATIONSHIPS BETWEEN THE ZONES.

In relation to their relative locations in the house the formal zone is usually in the front part of the house the service zone at the rear and the informal zone between the other two.

The relationship between the three zones in the house is also a function of the overall shape of the house. A long and narrow house will have the three zones arranged linear, a wider shape will yield a triangular relationship, very wide shapes may result in the three zones being arranged side by side.

There doesn't have to be rigid demarkations between the zones of the house and the formal and informal zones often have common functions. It is preferable, though, to separate the service zone from the others. Open spaces, verandahs, corridors and staircases may be used to create separations between zones.

The design of urban houses should therefore consider;
THE SHAPE OF THE HOUSE IN DECIDING THE RELATIVE LOCATION OF THE ZONES
OF THE HOUSE AND TRY TO LOCATE THE FORMAL ZONE NEAR THE FRONT AND THE
SERVICE ZONE AS INDIRECTLY AS POSSIBLE
THE USE OF OPEN SPACES, VERANDAHS, CORIDORS AND STAIRCASE TO CREATE
SEPERATION BETWEEN ZONES.

5.2.2 ORGANIZATION OF HOUSEHOLD SPACES IN THE THREE ZONES

The following factors will have to be taken into account when organising the interior spaces in relation to the three zones in the context of the urban house. (fig 5.9)

01. INTIMACY GRADIENT. (9)

The interior spaces in the urban house have to be arranged in the zones in varying degree of intimacy. Certain spaces are more accessible to outsiders than others and their location in the zone they belong will have to be arranged in that order.

The zones themselves have varying levels of access in, the formal zone being the most accessible and the service zone the least.

Between the interior spaces that make up a zone there exists another level of intimacy, for example the entrance verandah is more accessible than the living room and both of them belong to the formal zone.

The design of the urban house should therefore consider;
LAYING OUT OF SPACES SO THAT THEY ARE ARRANGED IN A
SEQUENCE IN THE ZONES SO THAT THE MOST PUBLIC ONES ARE NEAR THE
ENTRANCE AND THE PRIVATE ONES FARTHEST AWAY.

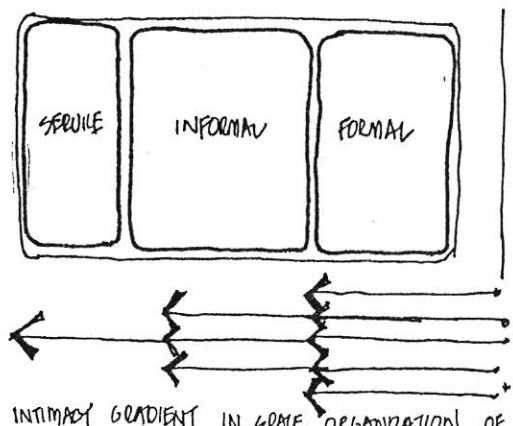
02. SPACES IN THE FORMAL ZONE.

The formal zone may contain a number of functions depending on the type of house. The living space is definitely a part of the formal zone. If there is a guest room in the house then it is also a part of the formal zone. Some houses where the owner has his workplace in the house, it forms the most public part of the formal zone.

Depending on the type of functions in the formal zone, some may be used to establish its link with the other zones. For example the guest room can be common to both formal and the informal zone.

The design of the urban house should therefore consider;
THE LIVING SPACE AS A PART OF THE FORMAL ZONE. IF THE HOUSE CONTAINS
SPACES WHICH ARE MORE PUBLIC THAN THE LIVING SPACE THAN THEY SHOULD

01

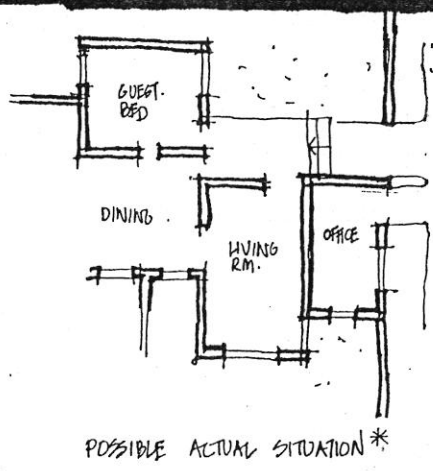
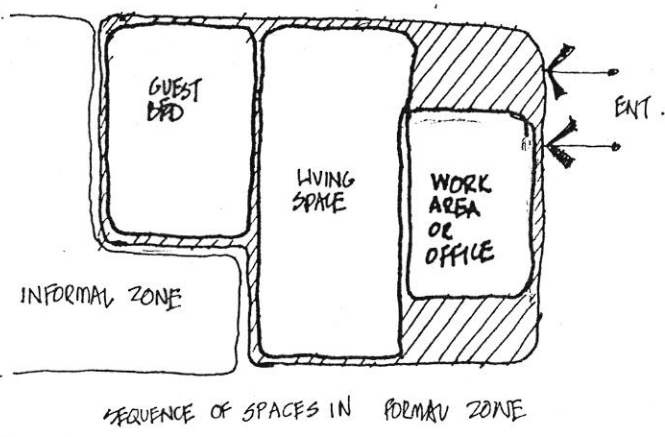


INTIMACY GRADIENT IN SPACE ORGANIZATION OF THE ZONES

(ADAPTED FROM "A PATTERN LANGUAGE" BY CHRISTOPHER ALEXANDER Pg 610)

INTIMACY GRADIENT

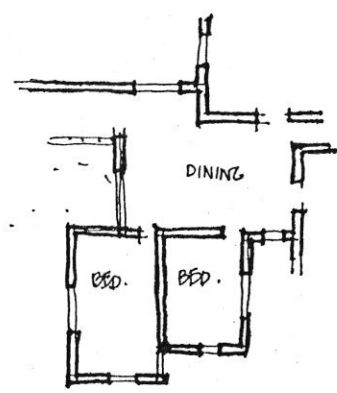
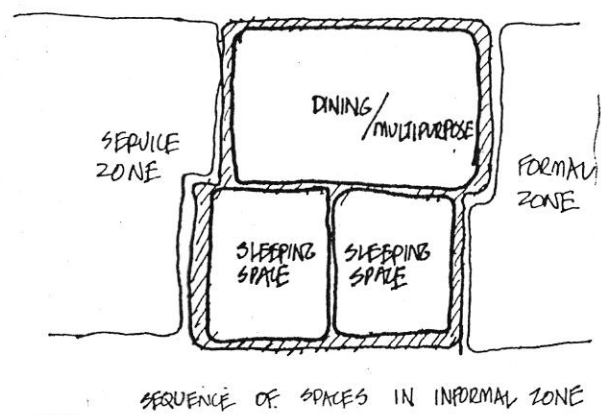
02



POSSIBLE ACTUAL SITUATION *

SPACES IN THE FORMAL ZONE

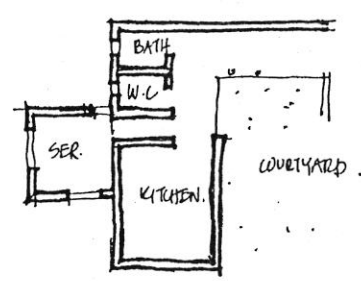
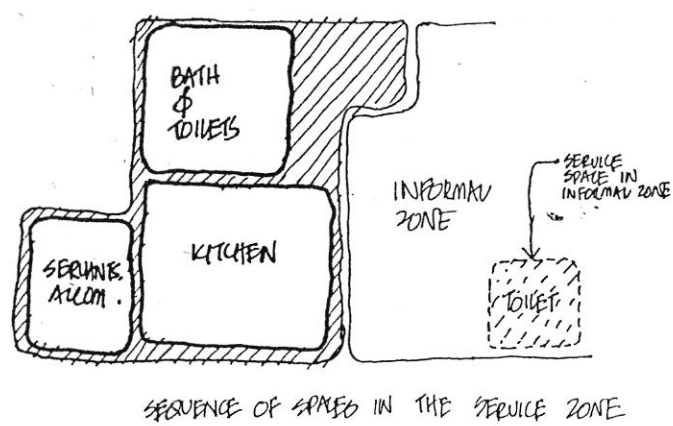
03



POSSIBLE ACTUAL SITUATION *

SPACES IN THE INFORMAL ZONE

04



POSSIBLE ACTUAL SITUATION *

SPACES IN THE SERVICE ZONE

FIG 5.9. ORGANIZATION OF HOUSEHOLD SPACES IN THE THREE ZONES.

* ACTUAL SITUATION MAY NOT HAVE ALL FUNCTIONS / THE THREE PLANS ARE NOT NECESSARILY PARTS OF THE SAME HOUSE.

BE LOCATED NEARER TO THE ENTRANCE. LESSER PUBLIC SPACES SHOULD BE LOCATED IN THE INNER SIDE OF THE FORMAL ZONE AND MAY FORM THE LINK WITH NEXT ZONE.

03. SPACES IN THE INFORMAL ZONE.

All spaces for use by the family are a part of the informal zone. Generally they would include the bedrooms and the dining space, the bedrooms being more private. As mentioned earlier the guest bedroom, if any, would be on the informal part of the formal zone.

In traditional homesteads the courtyard is usually a part of the informal zone. Similarly urban houses may have some private open spaces in them and it may be associated with the informal zone of the house. Private open spaces in the informal zone should not be visible from outside.

Private open spaces in the house may also be used by as a part of the service zone in which case they may be form the link between the two spaces.

The design of urban houses should therefore consider;
BEDROOMS AND DINING SPACES AS A PART OF THE INFORMAL ZONE. ALL OTHER SPACES RELATED TO FAMILY ACTIVITIES FORM A PART OF THE INFORMAL ZONE. PRIVATE OPEN SPACES IN THE INFORMAL ZONE MAY BE ITS LINK TO THE SERVICE ZONE.

03. SPACES IN THE SERVICE ZONE.

Unlike the formal and the informal zone the spaces in the service zone do not have to be located all together, instead they may exist in separate locations within the house, although rarely in the front of the house.

The service zones mainly consists of the kitchen, the servants accomodations and the toilet and the bathing facilities. Toilets and baths in some houses may exist as services associated with the bedrooms in the informal zone. Servants accomodations although a part of the service zone, forms an indirect relationship with the other spaces.

In the smaller urban houses where bathing and toilet facilities are limited to one of each and there are no separate arrangements for servants it is preferable to have all service spaces together and at the rear end of the house. It is an added advantage to have a separate entrance for the service zone.

The design of urban houses should therefore consider;
THE KITCHEN, SERVANTS ACCOMODATIONS AND THE TOILET AND BATHING FACILITIES AS THE MAIN COMPONENTS OF THE SERVICE ZONE. ATTEMPT SHOULD BE MADE TO KEEP THESE TOGETHER FOR EFFICIENT FUNCTIONING OF THE HOUSE.

5.2.3 ENTRANCES

The following factors will have to be taken into account when considering the design of the entrance in the context of the urban house. (Fig 5.10)

01. ENTRANCE AS A TRANSITION.

"There is no doubt that houses that provide a graceful transition space between the street and the house, are nicer than those which open abruptly off the street. If the transition is too abrupt there is no feeling of arrival, and the house fails to be an inner sanctum. "(10)

Entrances to Bangladeshi houses are never direct. The transition from the street to the interior of the house follows a sequence of spaces with varying levels of control for each. These are guided by concepts of privacy and social relationships.

The entrance to a house in terms of the spatial sequence is from public space to a semi-public space to a semi private-space and eventually to the private spaces inside the house. It is not absolutely essential for all urban houses to have this sequence, but never should the main door of the house open directly on to the street.

It has been observed at Plassey Barracks housing in Dhaka city that the occupants privatized a part of the public open space in front of the house which provided an entrance transition. (see 3.2.2)

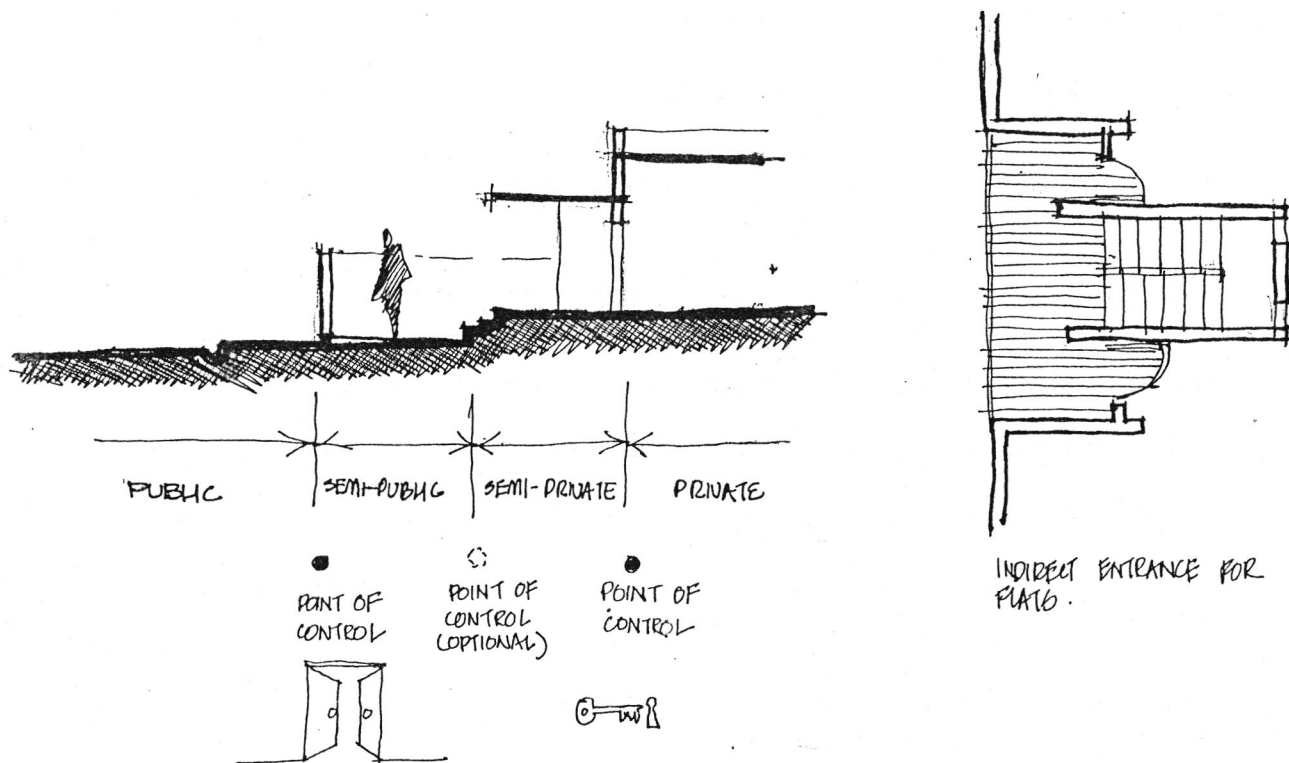
Transition spaces have different spatial qualities and levels of control. The entrance into the plot through an opening in the boundary wall is the first level of control. One is then inside the plot and in private open space and there is a change of the surface quality, depending on the design of the house there may or may not be overhead protection. The next stage, although not present in all houses is the semi-private space which is marked by a change in level and another change in surface quality. This is usually a verandah. The main door to the house opens into this verandah inside which are the private spaces of the house. This the second level of control and is the important one. There is sometimes a third level of control in some houses where the verandah is enclosed with a iron grill.

The levels and the degrees of control at the entrance transitions depend on the traffic content of the street outside and the attitude of a household towards privacy and security.

Where more than one family share a building (flats), the main control is exercised at the front door of the flats and the common stairhall is the semi public space. More the number of people sharing the building more public the character of the stairhall.

The design of entrances in urban houses should therefore consider; IT NEVER AS A DIRECT LINK BETWEEN PUBLIC AND PRIVATE SPACE VIA A DOOR. IT HAS TO BE ORGANISED AS A SEQUENCE OF SPACES FOLLOWING A PARTICULAR ORDER FROM PUBLIC TO PRIVATE SPACE. THE ENTRANCE

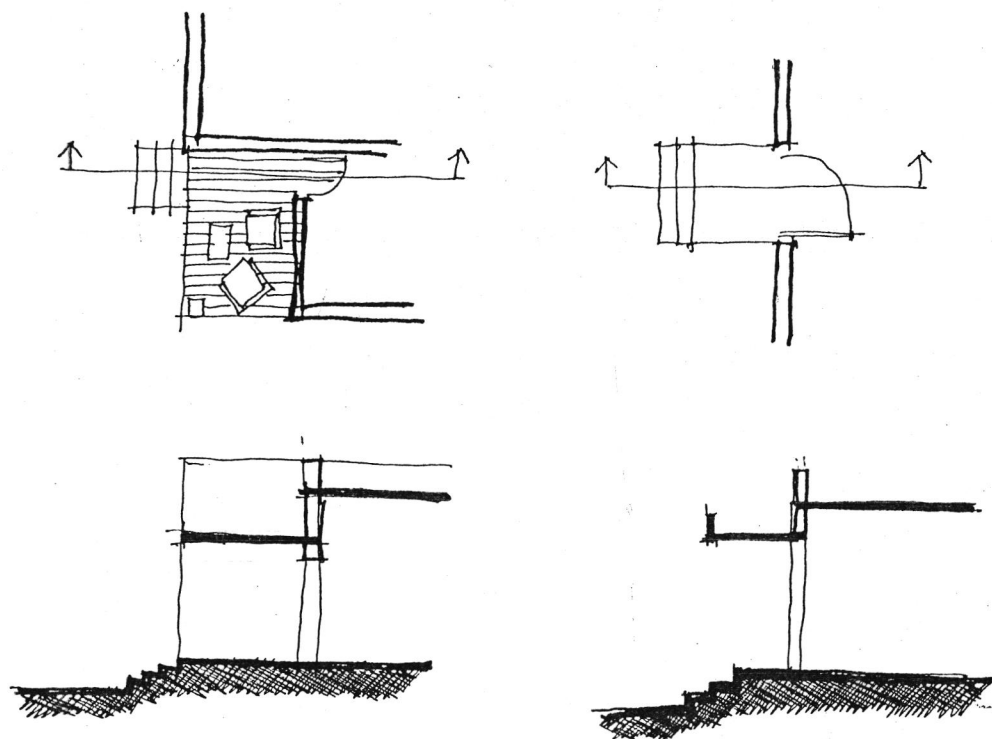
01.



SEQUENCE OF SPACES

ENTRANCE TRANSITION

02.



ENTRANCE VERANDAH AS A FUNCTIONAL SPACE

SMALL ENTRANCE VERANDAH

ENTRANCE VERANDAH

FIG 5.10. ENTRANCES :

TRANSITION OF ALL URBAN HOUSES DO NOT HAVE TO FOLLOW THE SAME ORDER AND THE STAGES OF OF TRANSITION WILL DEPEND ON THE DEGREE OF PRIVACY DESIRED.

02. THE ENTRANCE VERANDAH.

One of the elements in the transition sequence is the entrance verandah. This is a semi-private space where the entrance door to the internal spaces is located. It may only be projection of the roof and the floor slab.

The entrance verandah may have other uses. Hawkers are common in Bangladesh and the housewife may negotiate with him at the entrance verandah. Other tradesmen may also be entertained here. Sometimes guests to the house may be entertained here by choice as this is may be a pleasant space in the evenings.

The design of the entrance verandah in the urban house should therefore consider;

IT AS A SPACE WHICH HAS CERTAIN FUNCTIONAL USES OTHER THAN BEING A PART OF THE ENTRANCE TRANSITION. IT IS NOT COMPULSORY REQUIREMENT FOR ALL URBAN HOUSES BUT IT IS USEFUL IF INCLUDED AS A PART OF THE HOUSE.

5.2.4 VERANDAHS

The following factors will have to be taken into account when considering the design of verandahs in the context of the urban house. (fig 5.11)

01. THE VERSATILITY OF THE VERANDAH.

Verandahs have traditionally been an integral part of Bangladeshi houses. In the urban situation also, no house is complete without a verandah. Verandahs have multiple uses, they may be used in household functions or may exist by themselves. Almost all domestic functions except toilet can be partially or wholly carried out in the verandah.

The uses of a verandah depends on its location in the house. Verandahs in the formal zone can be used to receive and entertain guests and visitors. Informal verandahs can be used to eat in. Service verandahs are an extension of the kitchen. Verandahs can be altered to become a room, depending on the type of verandah all one may have to do is install windows. On the other hand verandahs can just be a place to stand in.

The design of the urban house should therefore consider;
THE POSSIBILITY OF THE VERANDAH AS A FUNCTIONAL SPACE IN THE HOUSE.
IN BANGLADESHI HOUSES WHERE THE INTERNAL SPACES ARE MULTIFUNCTIONAL,
VERANDAHS INCREASE THE USABILITY OF THE HOUSEHOLD SPACES.

02. VERANDAHS ANYWHERE AND EVERYWHERE.

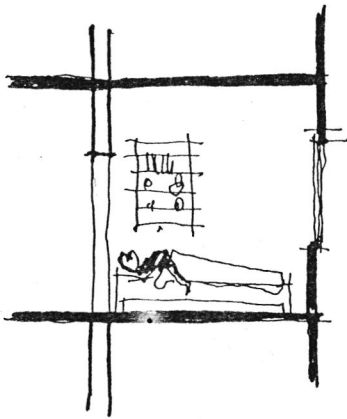
Ideally a there should be a verandah with every room of the house. The colonial bungalows had verandahs running along the perimeter of the house as there were no constraints of space. Since urban houses cannot afford to have many verandahs they have to be located in a way to get maximum benefit.

The usability of a verandah depends on the number of spaces that have access to it. A verandah approachable from more than one room is more useful than one which is connected to one room only.

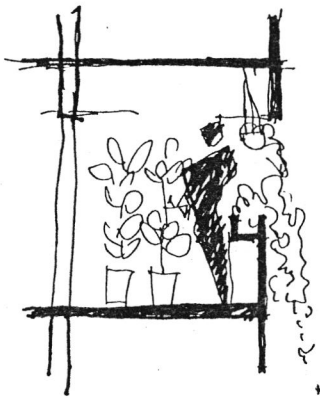
Verandah are useful a transition spaces between zones in the house. The entrance verandah is a part of the transition sequence into the house from outside. One verandah inside the house can successfully separate the three zones from each other. Verandahs also create a transition between the interior spaces and the private open spaces if any.

The design of urban houses should therefore consider;
LOCATION AND OF VERANDAHS SO THAT THEY ARE ACCESSIBLE FROM A MAXIMUM
NUMBER OF INTERIOR SPACES. THE SIZES OF THESE VERANDAHS WILL DEPEND
ON THE USES AND IS THEREFORE A FUNCTION OF ITS LOCATION.

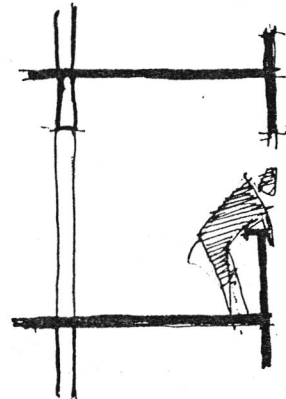
01



VERANDA AS A SLEEPING SPACE



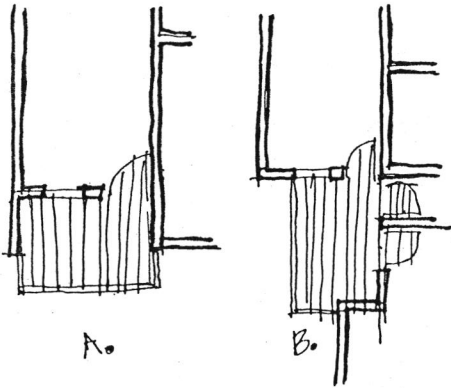
AS AN INDOOR GARDEN



AS IT IS

VERSATILITY
OF VERANDAS

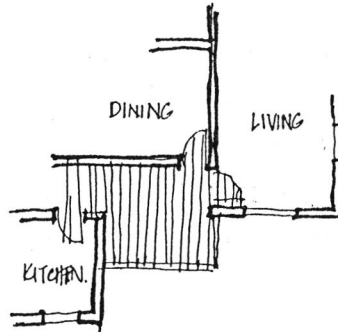
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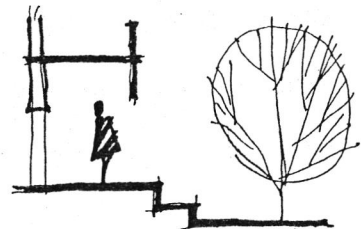
A.

B.

B IS MORE USEFUL THAN A



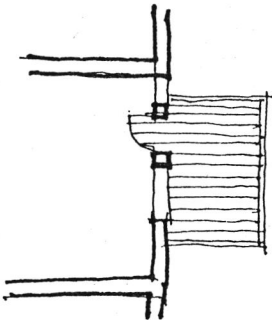
VERANDAH AS A TRANSITION BETWEEN ZONES



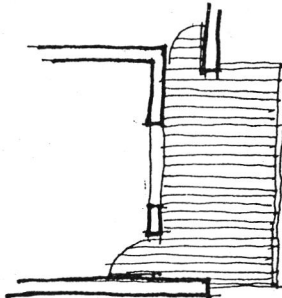
TRANSITION BETWEEN
INTERIOR & EXTERIOR
SPACES

VERANDAS
EVERYWHERE

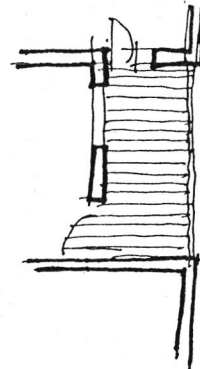
03



PROJECTED
(FORMAL ZONE)



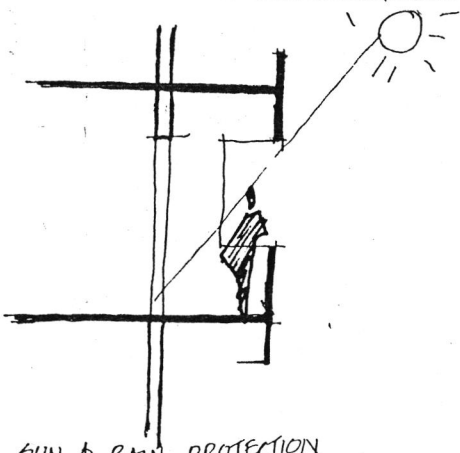
SEMI-ENCLOSED
(INFORMAL ZONE)



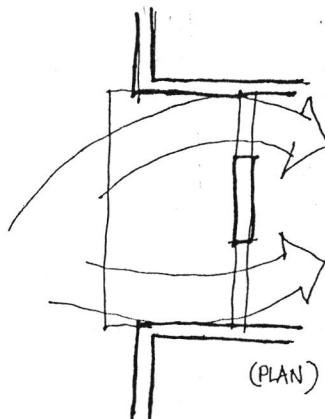
ENCLOSED
(SERVICE ZONE)

TYPES
OF VERANDAS

04.



SUN & RAIN PROTECTION



(PLAN)

DIRECTS AIR FLOW *
(SOURCE)

VERANDAS
AS
MODIFIER OF
CLIMATE

FIG. 5.11. VERANDAS

03. TYPES OF VERANDAHS.

There are three types of verandahs in terms of their relationship to the house.

1. Projected verandahs extend out of the house. On ground floors they are a projection of the floor slab usually with a projection of the roof slab above. In upper floors this is a cantilever. This type of verandah is least private in its relationship to the exterior. According to Alexander this type may not be the most popular type because of the lack of privacy and the insecure feeling of the cantilever (11). In Bangladeshi houses the entrance verandah can have this character.
2. Semi exposed verandahs are partially projected and partially enclosed. The amount projected and the amount enclosed depends on individual preferences. These are the most useful because, as Alexander points out, they have the properties of both projected and enclosed verandahs (12). The verandahs in the informal zone may be of this type.
3. Enclosed verandahs are enclosed on three sides by the walls of the house and only one side is open. This has almost a roomlike quality and such types are often converted to rooms. It is preferable to have this type associated with the service zone.

The design of urban houses should therefore consider;

VERANDAHS IN VARIOUS LOCATIONS OF THE HOUSE IN TERMS OF THE FUNCTIONS OF THE SPACES THEY SERVE AND THE TYPE OF VERANDAH THAT BEST SATISFIES THE NEEDS.

04. VERANDAHS AS A MODIFIER OF CLIMATE.

In traditional rural houses the verandahs protected the walls from heating up by keeping them in shade. The colonial bungalows had verandas all around, one of the purposes of which was to keep the interiors cool.

In Bangladesh the hot afternoon sun in summer heats up the southern and western walls which later heat up the interior spaces. For ventilation requirements inlet windows have to be located on the southern wall as well. A verandah on this side can protect the wall and the window from solar radiation.

Verandahs can also be effectively used to direct air flow in towards the room behind it (13).

The design of urban houses should therefore consider;
THE USE OF THE VERANDAH AS A MEANS TO MAINTAIN COMFORT CONDITIONS IN
THE INTERIOR SPACES BY USING IT TO CONTROL SOLAR RADIATION AND DIRECT
AIR FLOW.

5.2.5 BOUNDARY WALLS

The following factors will have to be taken into account when considering the design of the boundary wall in the context of the urban house. (fig 5.12)

01. THE FUNCTIONS OF THE BOUNDARY WALL IN THE URBAN HOUSE.

Along with the requirements for the inner parts of the house the privacy requirements of the whole house in its relationship to the outside will have to be considered. In urban areas the extent of the plot area of a house has to be identified.

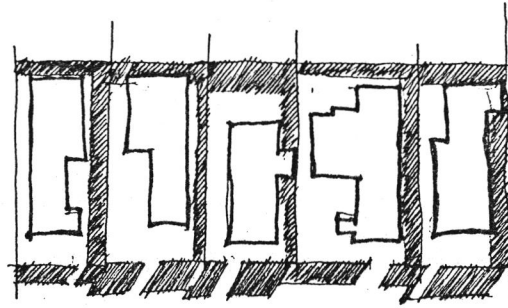
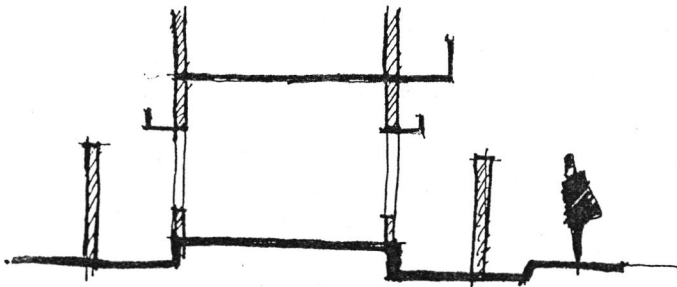
In the urban areas the boundary wall is a common element used to give privacy to the house and demarcate the plot area. The houses in the urban areas of Bangladesh are characterized by boundary walls. The boundary wall is often the first thing to be built and the roadside is lined with walls of various heights and textures.

Security of the house is also an important consideration and the boundary wall protects the house from thieves. The tops of a boundary walls often have barbed wire or pieces of broken glass stuck to it to prevent climbing over. The height of the wall is a function of the degree of privacy and security desired.

Boundary walls usually exist as independant elements in its relationship to the rest of the house, although sometimes small service structures may be constructed against it. The design of the boundary wall in the context of the urban house should therefore consider;

THE BOUNDARY WALL AS AN DESIGN ELEMENT AND INCORPORATE IT WITH THE DESIGN OF THE HOUSE AS A WHOLE. THE BOUNDARY WALL DEMARCATES THE PLOT AREA AND CREATES A VISUAL BARRIER BETWEEN THE STREET AND THE HOUSE. A WELL DESIGNED WALL CAN BE AN INTER^ESTING VISUAL EXPERIENCE.

01

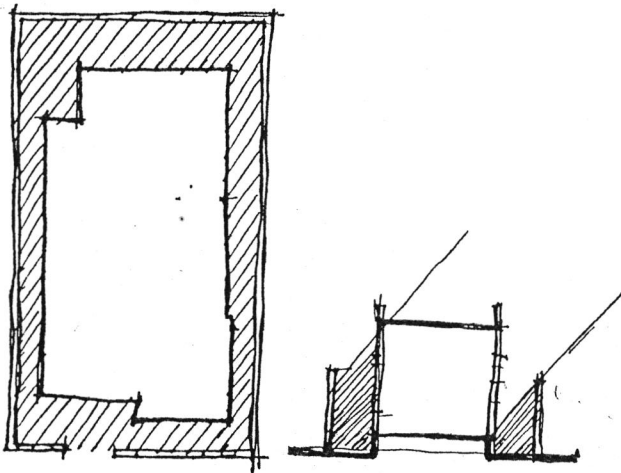


BOUNDARY WALLS FOR PRIVACY & SECURITY

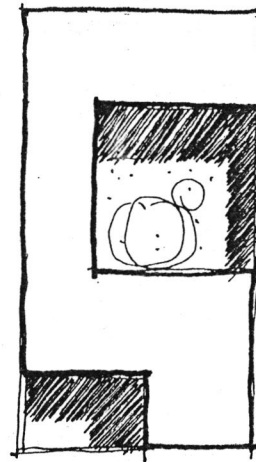
VARYING HEIGHTS OF BOUNDARY WALLS

FUNCTIONS OF BOUNDARY WALLS

02



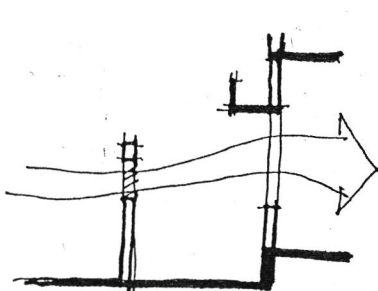
NARROW SPACES WITH NO MEANINGFUL USES



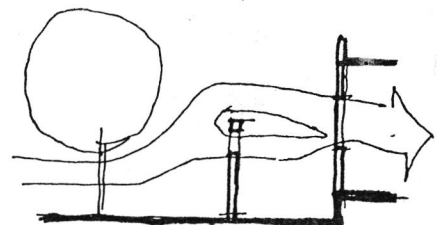
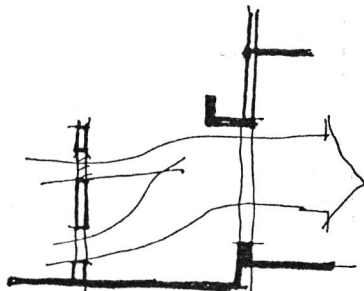
MANIPULATION OF HOUSE SHADE TO CREATE USEFUL SPACES

SPACES BETWEEN THE HOUSE AND THE WALL

03.



OPENINGS IN WALLS TO ALLOW AIR FLOW



VEGETATION TO GUIDE AIR FLOW.

AIR FLOW THROUGH WALLS

FIG 5.12. BOUNDARY WALLS

02. THE SPACES BETWEEN THE HOUSE AND THE BOUNDARY WALL

In trying to utilize maximum space for the house, the minimum allowable space is left between the boundary wall and the house itself. The result is a narrow strip of land between running along the perimeter of the house. This is also guided to a certain extent by the building codes of the city planning authorities which requires a certain setback from the sides in certain instances.

The narrow spaces have little or no use, and is always in the shadow of the surrounding buildings. Nothing grows in these areas and it is usually a damp place without sunlight. It may be possible to create meaningful gaps between the building and the boundary walls so that these spaces can be put to use as inner courtyards.

The design of the urban house in its relationship to the boundary wall should therefore consider;

THAT PLOTS ARE USUALLY RECTANGULAR IN SHAPE AND AS A RESULT SO ARE THE BOUNDARY WALLS. THE SHAPE OF THE HOUSE HAS TO BE MANIPULATED TO CREATE SPACES BETWEEN ITSELF AND THE BOUNDARY WHICH ARE USABLE.

03. DESIGN OF THE BOUNDARY WALL TO ALLOW AIR FLOW.

Boundary walls, though an important consideration in the design of urban houses, blocks the passage of air to the house. For privacy, the height of the wall is usually above eye level and window openings are almost completely covered by it.

The design of the wall itself can be manipulated to to allow a certain amount of air flow through it. The walls can be made of perforated materials or if that hampers privacy, a combination of perforated and solid parts. An opening running contiously along the top part of the wall allow sone air flow through it, another one along the bottom will improve the situation. Trees can be used effectively to direct the flow of air in the desired direction. (14)

The design of the boundary wall should therefore consider;
GAPS IN IT TO ALLOW FLOW OF AIR THROUGH IT. THESE CAN BE MANIPULATED TO DIRECT AIR FLOW IN A DESIRED MANNER. TREES AND SURROUNDING VEGETATION MAY ALSO BE USED TO DIRECT AIR FLOW.

5.2.6 PRIVATE OPEN SPACES

The following factors will have to be taken into account when considering the design of design of private open spaces in the context of the urban house. (fig 5.13).

01. PRIVATE OPEN SPACES AS AN EXTENSION OF HOUSEHOLD FUNCTIONS.

In traditional homesteads the open spaces within the house, specially the courtyard played an important part in the carrying out of household activities (see 2.1.5). In the urban areas as well, private open spaces if present are useful in many ways. Households wanting to keep animals can use this area. Activities related to cooking and food preparation can be carried out in these open areas.

If they serve no other useful purpose they can be used as leisure spaces or as a children's play area.

Present day urban housing is characterized by 4/5 storey blocks of flats which by virtue of its physical characteristics provide no scope for private open spaces. Open spaces in these developments are common public spaces, not meaningful to individuals. (see 3.3.3.)

The design of urban houses should therefore consider;
THE UTILITY OF PRIVATE OPEN SPACES AS A PART OF HOUSEHOLD SPACES.
THE DESIGN OF HOUSING IN THE BROADER SENSE SHOULD HAVE SOME SCOPE TO
PROVIDE OPEN SPACES AS A PART OF EACH HOUSE FOR PRIVATE USE.

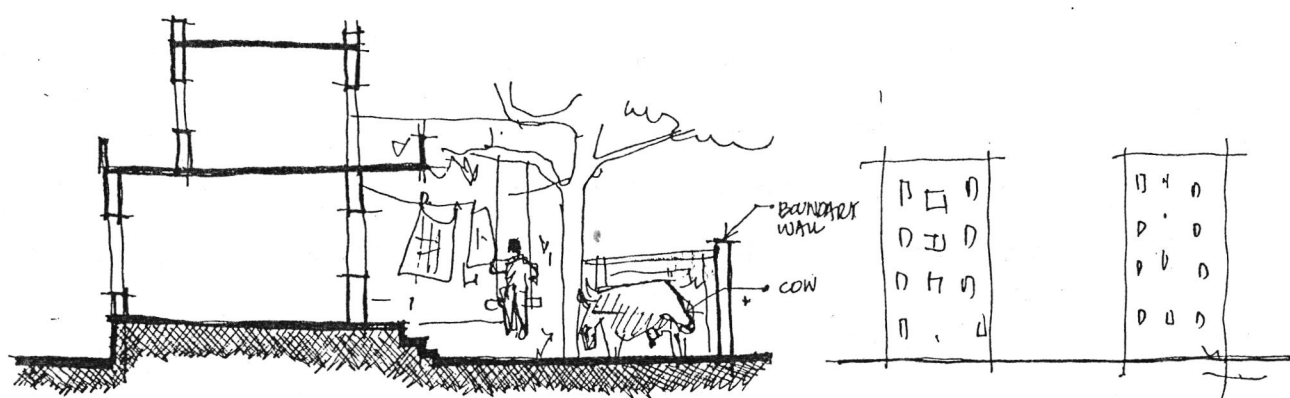
02. TYPES OF PRIVATE OPEN SPACES.

There is a direct relationship of private open spaces with the zones in the house in terms of their uses. The quality of open spaces and the relationship between them depend on the zone and the household function they are associated with.

Open spaces in the front of the house are associated with the formal zone and are more useful in providing a entrance transition into the house. It also has decorative value and small scale gardening activities can take place here. Since no regular household activity is carried out here it can be of relatively small size.

Open spaces associated with informal and service zones should be fairly large as they are a regular part of household activities. In

01

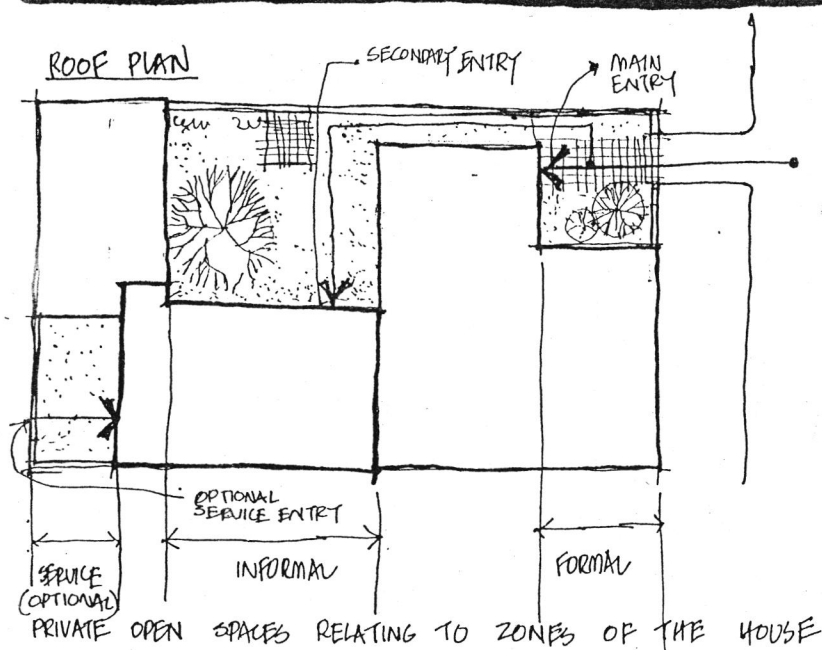


USES OF PRIVATE OPEN SPACES

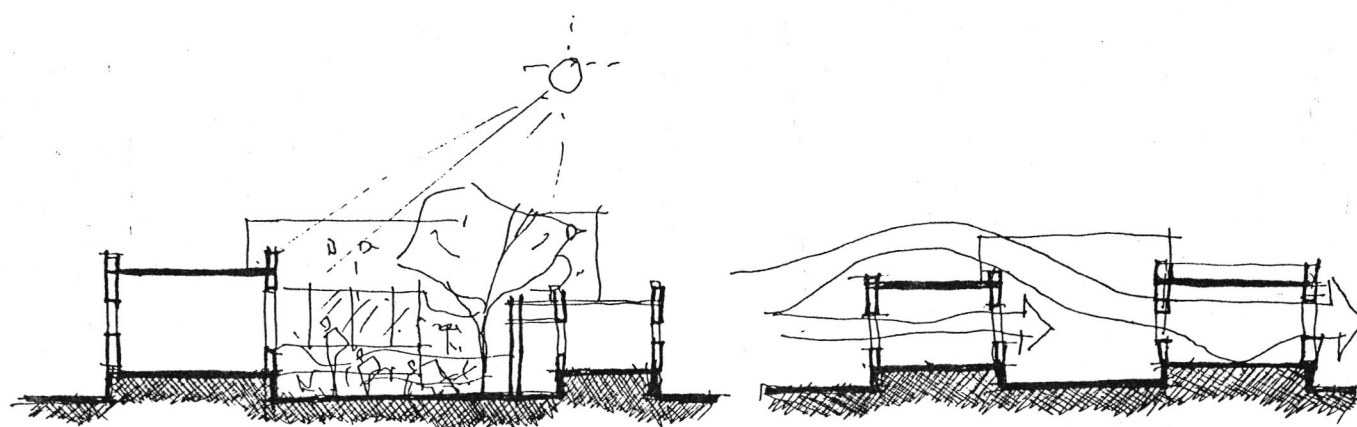
NO PRIVATE OPEN SPACES

OPEN SPACES
FOR PRIVATE USE

02

TYPES OF
PRIVATE OPEN SPACES

03



LIGHT & AIR IN PRIVATE OPEN SPACES

PRIVATE OPEN SPACES TO
FACILITATE VENTILATIONENVIRONMENTAL
CHARACTERISTICS

FIG 5.13. PRIVATE OPEN SPACES

the informal zone it can be a place where the family can sit down in the evenings to cool off during the hot summer days or a playing space for small children. As a part of the service zone it can be place for outdoor cooking or bathing. It is the equivalent of the courtyard in the rural homestead. *

Open spaces associated with the informal and service zones can exist together and should preferably be towards the interior away from public view. open spaces, if any, at the rear end of the house is usually always associated with the service zone.

The private open spaces may be linked with each other. Linking the formal open space with the inner one will provide the scope for a secondary service entry to house

The design of the urban houses should therefore consider;
THE ASSOCIATION OF THE PRIVATE OPEN SPACES WITH EACH OF THE ZONES OF THE HOUSE. THE OPEN SPACE ASSOCIATED WITH THE FORMAL ZONE IS AT THE FRONT OF THE HOUSE. THE OPEN SPACE FOR THE INFORMAL AND THE SERVICE ZONES CAN BE A SINGLE SPACE AND IS BIGGER. SPACES AT THE BACK IS ASSOCIATED WITH THE SERVICE ZONE. LINKS BETWEEN THEM MAY SOMETIMES BE DESIRED.

03. ENVIRONMENTAL CHARACTERISTICS OF PRIVATE OPEN SPACES.

In whatever form open spaces are provided they should receive adequate sunshine and air flow for them to "live". Instead of having open spaces all around the house if they are concentrated together than the environmental condition will be better. In low rise structures open spaces can be gainfully utilized for ventilation of the parts of the house not in the direct path of the air flow. (15)

The design of private open spaces in urban houses should therefore consider;

THEIR PHYSICAL QUALITIES SO THAT THEY RECEIVE ADEQUATE SUNSHINE AND AIR FLOW. THE SHADOWS CAST BY SURROUNDING STRUCTURES ARE AN IMPORTANT CONSIDERATION IN THIS RESPECT.

THE LOCATION AND SIZE OF OPEN SPACES MAY BE MANIPULATED TO VENTILATE THE INTERIOR SPACES OF THE INNER PARTS OF THE HOUSE.

5.3 COSTS

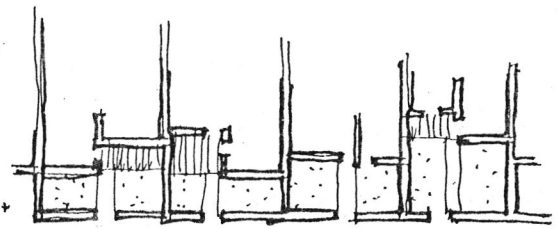
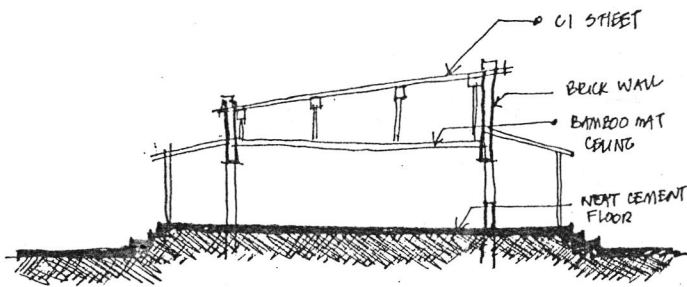
The cost factors in urban housing include construction, materials, land costs, costs related to infrastructure etc. The objective of this section is to determine the cost implications of the single or double storey houses suggestive of the factors mentioned in the previous sections compared to the costs of building 4/5 storey blocks of flats which are representational of today's urban housing. (fig 5.14)

The comparison of costs are based on general considerations of materials and construction and to a certain extent costs of infrastructural networks. The factors concerned with land and other costs are not considered because of their references to particular areas as opposed to the general nature of the design suggestions.

5.3.1 MATERIALS

4/5 storey blocks of flats have to rely on permanent building materials for construction. Cement and steel are relatively expensive materials and are needed for these buildings. There are a limited number of local materials available and they are hardly suited for multi storey constructions.

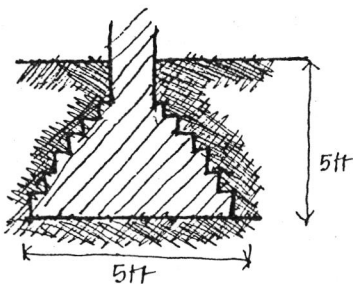
Brick walls are common for both single and multi storey construction only in multi storey construction the walls have to be thicker. Single storey constructions can be built on five inch brick



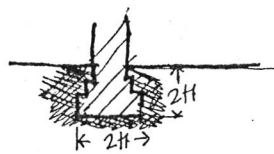
MATERIALS USE IN SINGLE STOREY HOUSES

COMMON WALLS; LESS EXPOSED SURFACES.

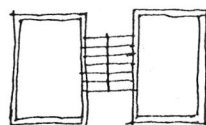
MATERIALS



FOUNDATION FOR 5 STOREY BUILDING.



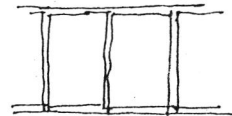
FOUNDATION FOR SINGLE STOREY HOUSE



1 FIVE STOREY BUILDING
CONTAINING 10 FLATS

RUNNING LENGTH OF
FOUNDATION = 180ft

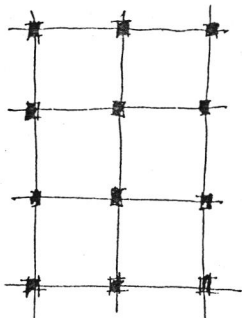
VOL OF EARTH EXCAVATION
FOR FOUNDATION
= $180 \times (5 \times 5)$
= 4500 cft



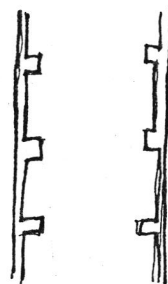
10 SINGLE STOREY
ROW HOUSES

RUNNING LENGTH OF
FOUNDATION = 675ft

VOL OF EARTH EXCAVATION
FOR FOUNDATION
= $675 \times (2 \times 2)$
= 2700 cft *



EXPENSIVE FRAME CONSTRUCTION

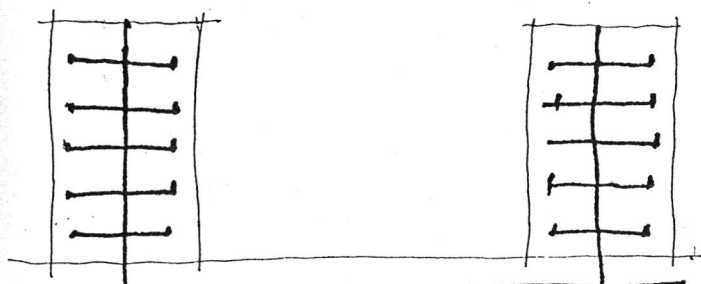


OR

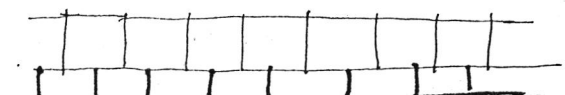


FIVE INCH BRICK WALL
FOR SINGLE STOREY CONSTRUCTION

**CONSTRUCTION
&
INFRASTRUCTURE
NETWORKS.**



SERVICE CONNECTIONS IN BLOCKS



SERVICE CONNECTIONS IN ROW HOUSING.

FIG. 5.14. COSTS (MATERIALS & CONSTRUCTION)

* (2.54 cms = 1 inch)

walls with thicker sections at certain locations only.

Multi storey constructions have to have reinforced concrete floor and roof slabs which are expensive both in terms of labour and cost of the materials. Multi storey frame constructions are even more expensive than load bearing wall constructions. Single storey constructions can be of the semi-pucca type with corrugated iron roofs, the undesired heat gain by the interior spaces due to this can be avoided by providing a lower ceiling made of local materials such as bamboo matting. (see 4.5)

Costs of painting walls and carrying out maintainance work on multi storey buildings are also higher. Single storey row housing with common walls between them have less exposed wall surfaces and therefore require little or no maintainance.

5.3.2 CONSTRUCTION TECHNIQUES AND INFRASTRUCTURAL NETWORKS

Multi storey construction need deeper foundations. Although the foundation length of a single multi storey building having 10 flats is much less then that of 10 single storey houses of the same size the total volume of earth excavation is more, the difference can be allocated to boundary wall construction. The fact that depth of foundations are less for single storey construction makes it cheaper because cost of excavation increases with depth.

Single storey construction can totally avoid reinforced concrete components and thereby have no cost allocations towards steel and shuttering work. The roofs can be made of corrugated iron sheets as mentioned earlier. There is no need for frame construction in single storey houses and five inches walls* with thicker ten inch sections at strategic locations. There is also scope for using local materials for ceilings and internal partitions in single storey construction.

Cost of labour and construction equipments are also less for low rise buildings. As Bangladeshi construction industry is labour oriented the use of sophisticated equipment in multi storey construction is not only expensive, they offer less employment opportunities.

The pipe and connection works for infrastructural networks such as water and sewerage facilities are more complicated and expensive for multi storey construction. And compared to single storey developments in the same area the running pipe length is more.

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3. CHOWDHURY, I.M. "Space Standards for Urban Dwellings in Bangladesh", unpublished M.Phil.dissertation, University of Newcastle upon Tyne (1976), fig.24.
4. Indian Standards Publication number IS:5533-1969 UDC 721-05, "Recommended dimensions of spaces for human activities", New Delhi (1979).
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8. IMAMUDDIN, op.cit. p.2.24
9. ALEXANDER, CHRISTOPHER. "A Pattern Language". Oxford University Press (1977), p.610.
10. ALEXANDER, CHRISTOPHER, "Houses Generated by Patterns" Center for Environmental Structure, Berkeley (1970) p.164
11. ALEXANDER, CHRISTOPHER. "A Pattern Language".op.cit. p.783
12. Ibid. p. 164
13. ALI, M.M. "The Problem of Ventilation in High-density Low-rise Housing in Bangladesh". Unpublished M.Phil dissertation, University of Newcastle upon Tyne (1976). p.51
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DISCUSSIONS

If all the recommendations relating to the elements of housing design of the previous sections are to be considered, together then they clearly indicate a preference for low rise housing (low rise here means ground floor housing).

Elements such as "Boundary Walls" and "Private Open Spaces" can only be incorporated in ground floor housing. Others such as "Entrances" and factors relating to extensions are suggestive of ground floor housing although they may be used in other forms of housing. All other elements are concerned with the design of the house as a unit irrespective of the type of building they are accommodated in, single storey houses or multi storey blocks.

Although it has been mentioned in the introduction that the design approach is formulated keeping in mind the relative advantages of ground floor housing over 4/5 storey blocks of flats. It is possible to use the recommendations for designing flats in 4/5 storey blocks as alternatives to the types that exist in the examples of present day government standards.

There is the possibility of offering a wide variety of house designs through the use of the recommendations. Firstly through the various combinations of design elements in their relationship to each other, secondly through the combinations of the factors relating to each element, and thirdly by using elements and factors that are not included but are derived from the ones that are.

Within all the possibilities that these recommendations offer in terms of house design, three types of housing forms may be exemplified where they may be used in various combinations as alternatives to urban housing design.

1. Ground floor housing on individual plots
2. Two storey blocks of flats sharing ground area.
3. Flats in 4/5 storey blocks.

[AN EXAMPLE OF EACH OF THESE TYPES IS INCLUDED IN APPENDIX D]

Ground floor housing on individual plots is obviously the most desirable form of urban housing from the point of view of user requirements. They offer the possibility of incorporating all the recommendations in their design in various combinations. Again, the number of elements of design that can be used depends on the size of the houses. The relative merits of ground floor housing over taller blocks in terms of costs have already been mentioned.

Two storey blocks provide the scope for access to ground area not present in taller blocks. Less number of flats to a building make it easier for the occupants share the ground area which broadens the scope of the use of household spaces. This type of houses will allow the recommendations relating to the organization of the house to be used to a certain extent in their designs.

In the design of flats in 4/5 storey blocks only the elements relating to the internal arrangements of houses can be used to offer alternatives to the design of flats of the present day housing standards. The design

possibilities of these flats will depend on the size of the flats the bigger they are, more possibilities they offer. Within the smaller flats the emphasis should be on allowing flexibility of use of the internal spaces rather than relating individual space to particular activities.

The designs do not have to consider all the factors relating to a particular design element as this will depend on the programme. Smaller houses will have lesser elements and greater flexibility of use between them.

The design recommendations relate only to the design of individual houses and to a certain extent its relationship to its immediate surroundings.

The overall form of urban housing design depends on how houses are organized in their relationship to each other, taking into consideration the design of layouts, road networks, services, and other elements relating to the design of urban environments as a whole. This is within the scope of further research in the field of urban housing design.

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Appendix A

FUNCTIONAL ANALYSIS OF EXAMPLES OF GOVERNMENT HOUSING

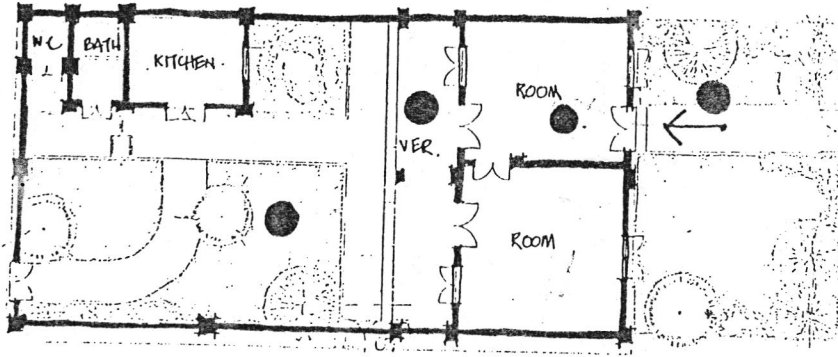
An analysis of the examples of government housing presented in Chapter three is carried out in this section. The objective is to compare the flexibility of uses offered by the different types. The analysis also compares the degree to which extensions and alterations can be made to them.

The examples are categorized into three groups;

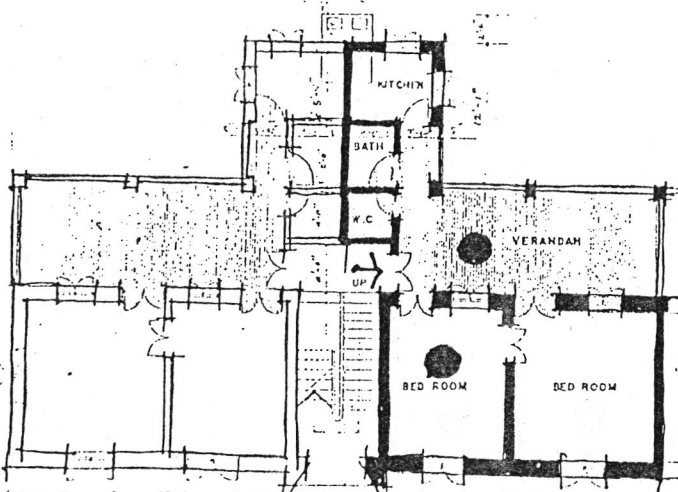
1. Single storey row houses
2. Multi storey blocks with each staircase serving two units.
3. Multi storey blocks with each staircase serving a number of units.

There is one example each of the first and the third category. The examples in the second category are further divided into two groups one where the services are separated from the main living areas and the other where they are together the second, is also representational of the examples of present day government housing standards.

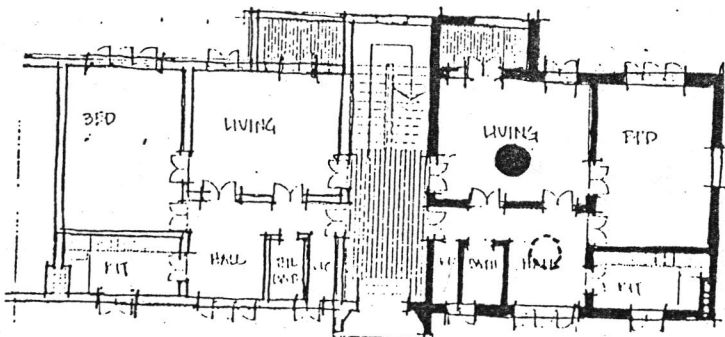
POSSIBLE LOCATIONS OF AREAS FOR LIVING/RECEIVING GUESTS



• SINGLE STOREY
ROW HOUSES

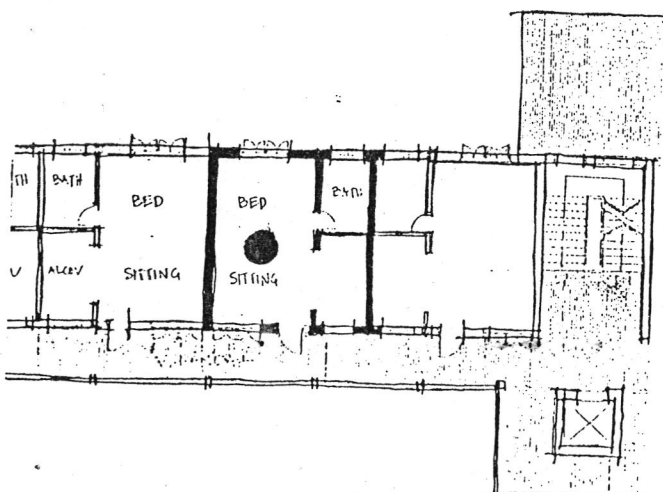


• SEPARATED
SERVICES
ZONE



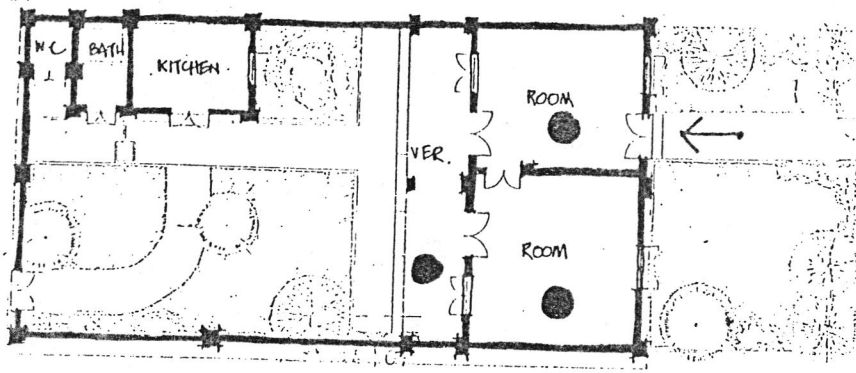
• SERVICES
TOGETHER

• MULTI STOREY
FLATS WITH
EACH STAIRCASE
SERVING TWO UNITS

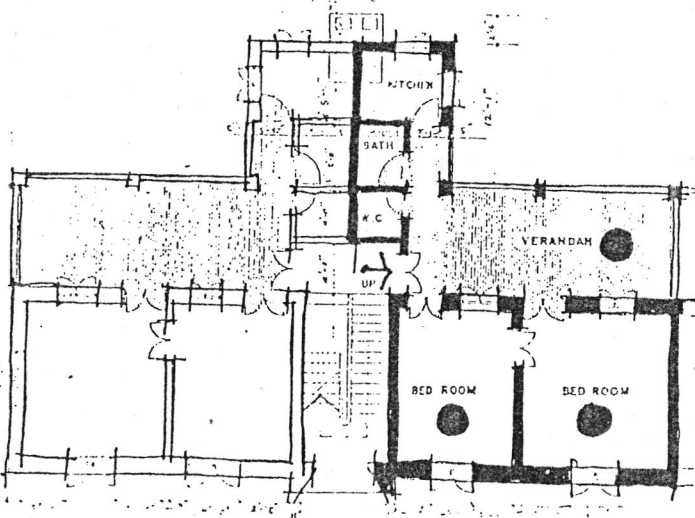


• MULTI STOREY
FLATS WITH
EACH STAIRCASE
SERVING A NUMBER
OF UNITS

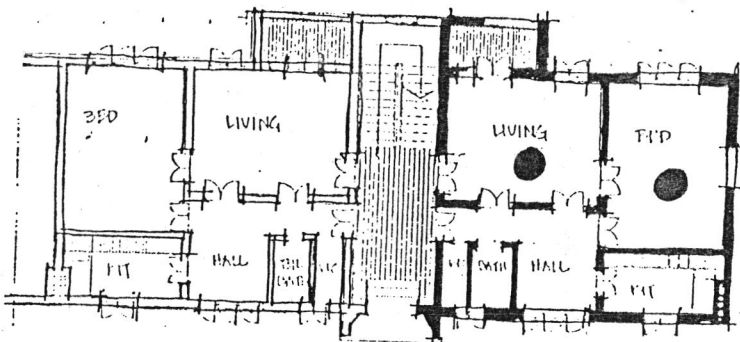
POSSIBLE LOCATIONS OF SLEEPING AREA



●
SINGLE STOREY
ROW HOUSES

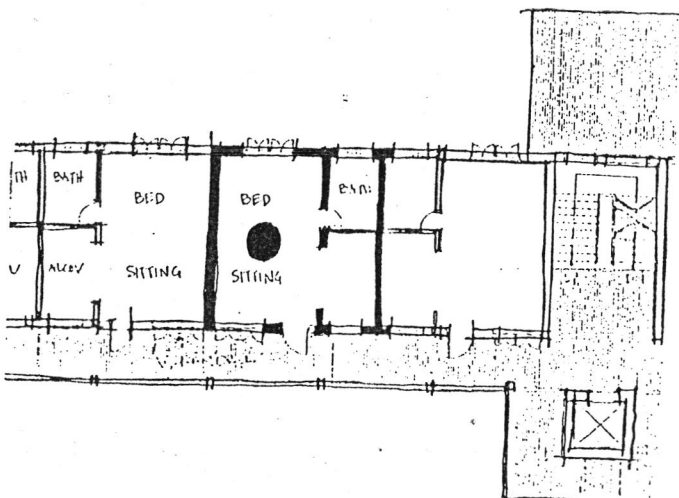


●
SEPARATED
SERVICES
ZONE



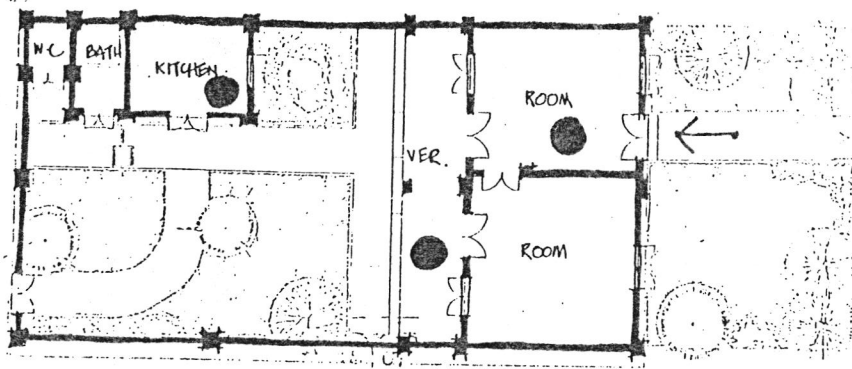
●
SERVICES
TOGETHER

●
MULTI STOREY
FLATS WITH
EACH STAIRCASE
SERVING TWO UNITS

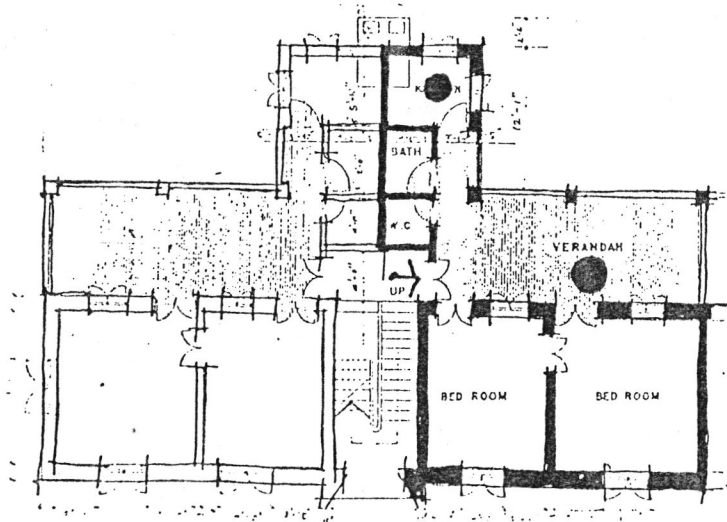


●
MULTI STOREY
FLATS WITH
EACH STAIRCASE
SERVING A NUMBER
OF UNITS

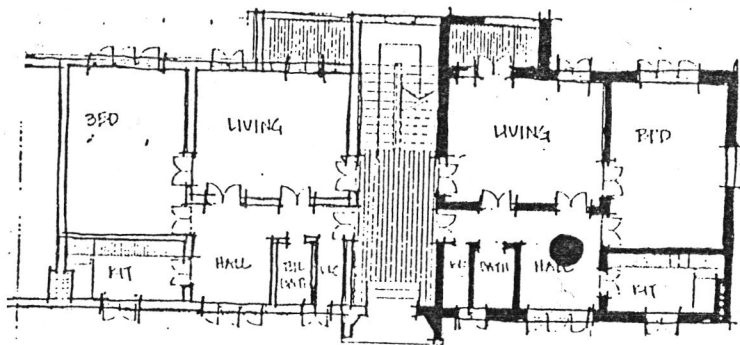
POSSIBLE LOCATIONS OF EATING AREA



• SINGLE STOREY
ROW HOUSES

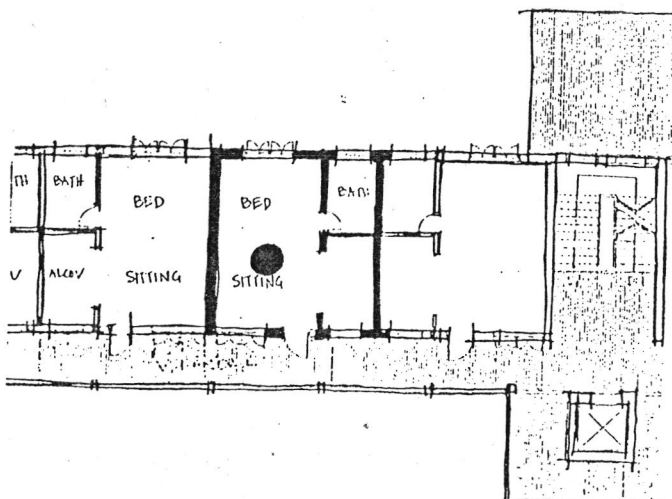


• SEPARATED
SERVICES
ZONE



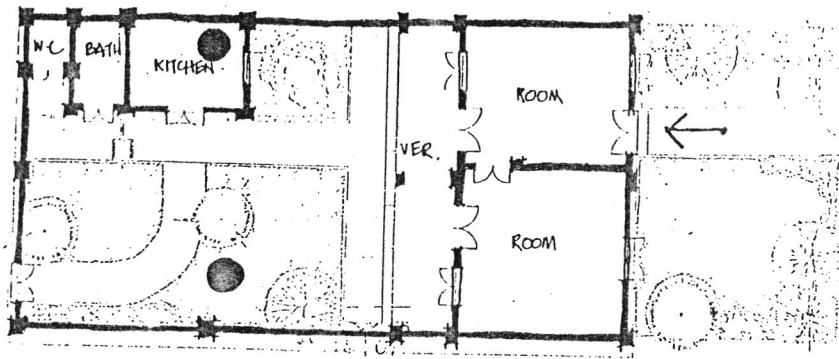
• SERVICES
TOGETHER

• MULTI STOREY
FLATS WITH
EACH STAIRCASE
SERVING TWO UNITS

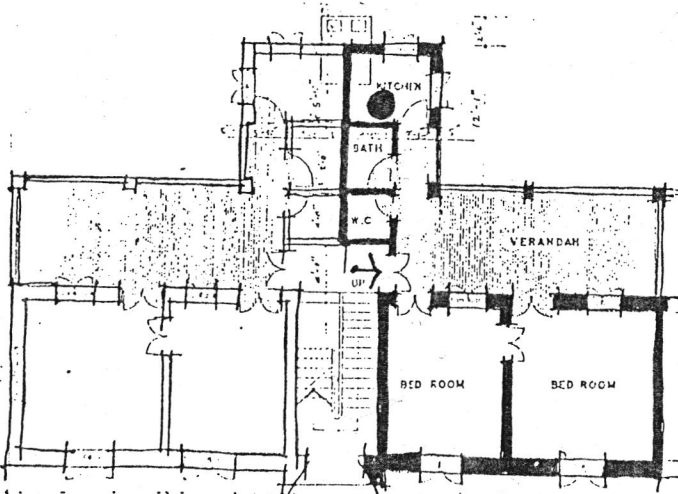


• MULTI STOREY
FLATS WITH
EACH STAIRCASE
SERVING A NUMBER
OF UNITS

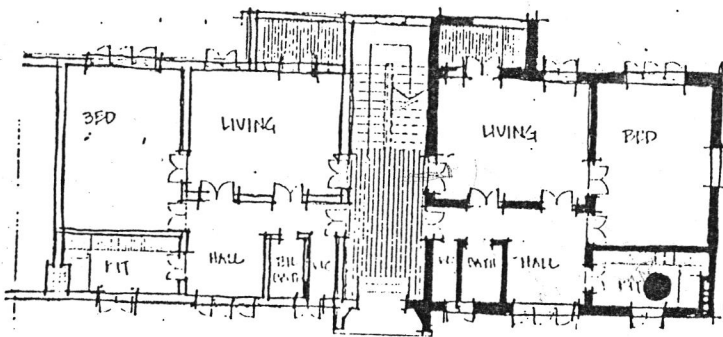
POSSIBLE LOCATIONS OF COOKING AREA



• SINGLE STOREY
ROW HOUSES

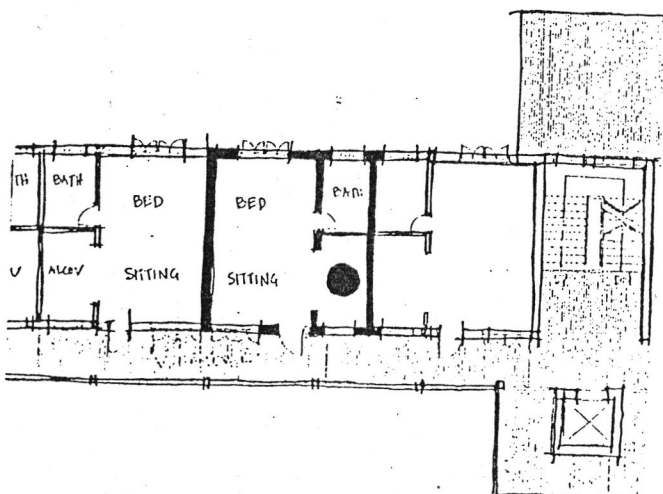


• SEPARATED
SERVICES
ZONE



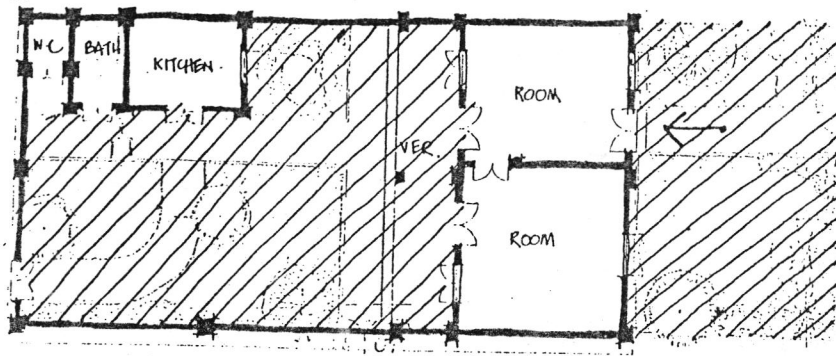
• SERVICES
TOGETHER

• MULTI STOREY
FLATS WITH
EACH STAIRCASE
SERVING TWO UNITS

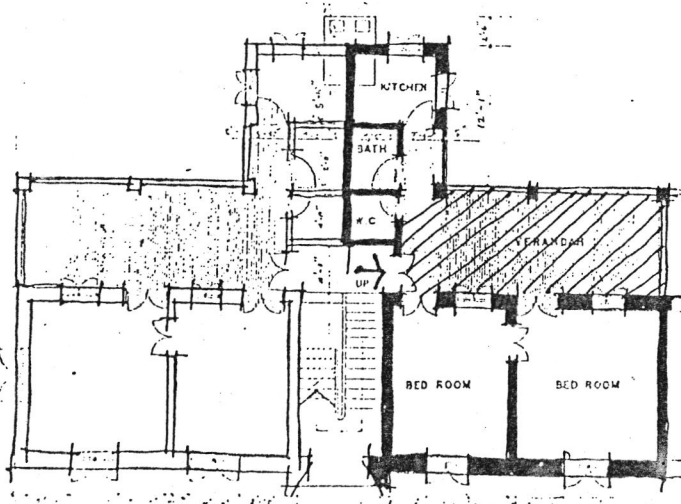


• MULTI STOREY
FLATS WITH
EACH STAIRCASE
SERVING A NUMBER
OF UNITS

AREAS WHERE EXTENSIONS & ALTERATIONS CAN BE MADE

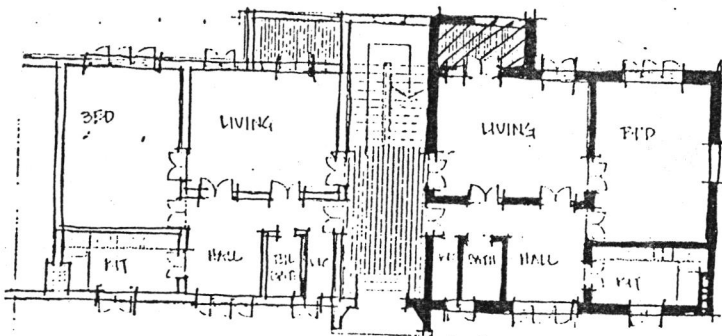


• SINGLE STOREY ROW HOUSES



[NOT EXTENDABLE]

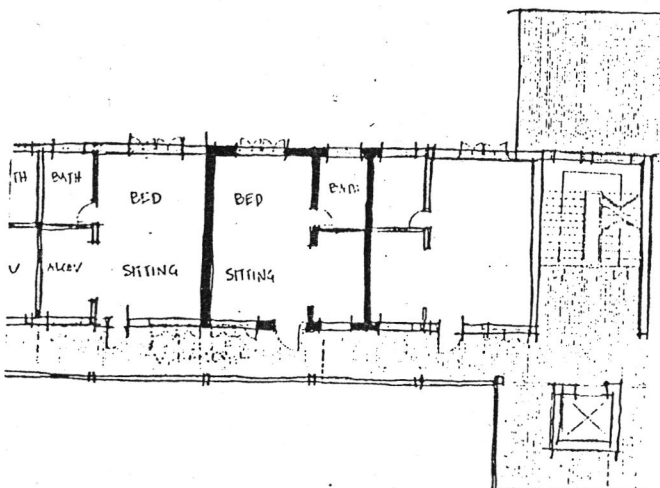
• SEPARATED SERVICES ZONE



[NOT EXTENDABLE]

• SERVICES TOGETHER

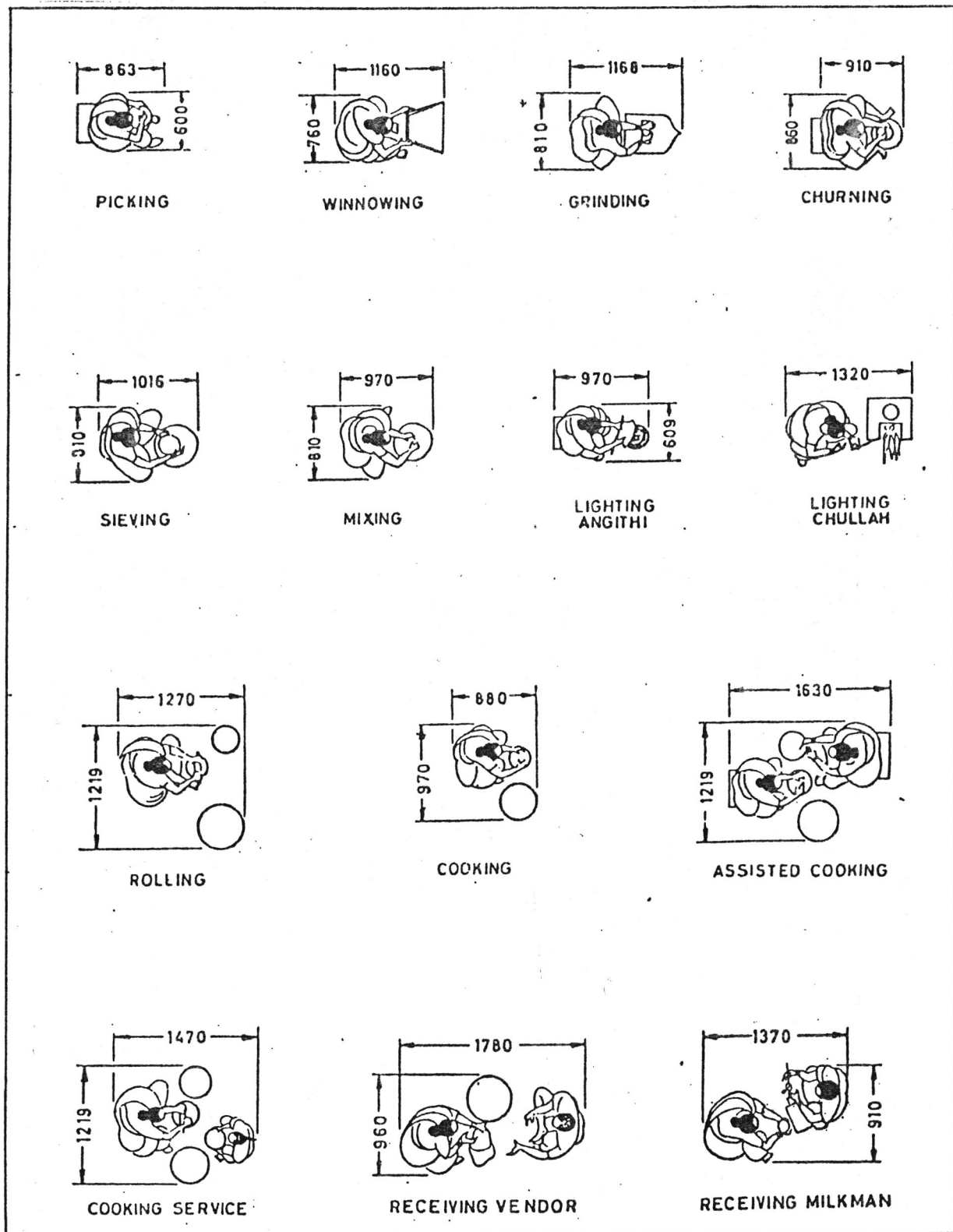
• MULTI STOREY FLATS WITH EACH STAIRCASE SERVING TWO UNITS



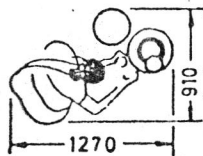
[NOT EXTENDABLE,
NO ALTERATIONS
POSSIBLE]

• MULTI STOREY FLATS WITH EACH STAIRCASE SERVING A NUMBER OF UNITS

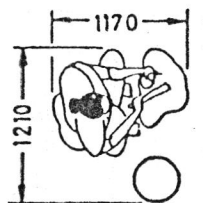
SPACE REQUIREMENTS FOR DOMESTIC ACTIVITIES



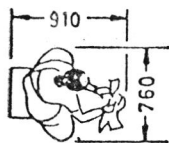
[25.4 mm = 1 inch]



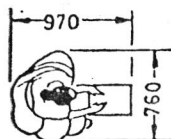
WASHING
UTENSILS



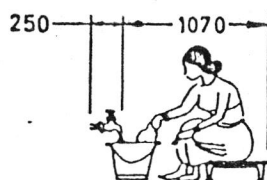
7 WASHING CLOTHES



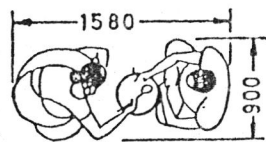
5 WASHING



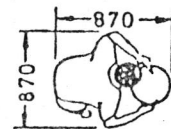
TAKING OUT



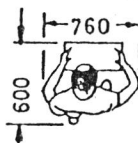
RINSING



POURING AND
RECEIVING



SERVING LOW



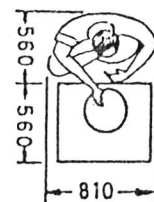
CARRYING TRAY



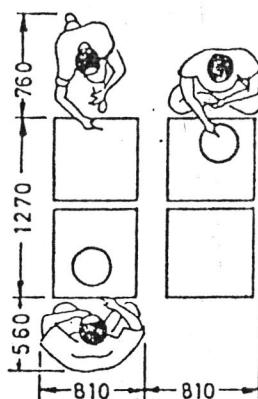
SITTING



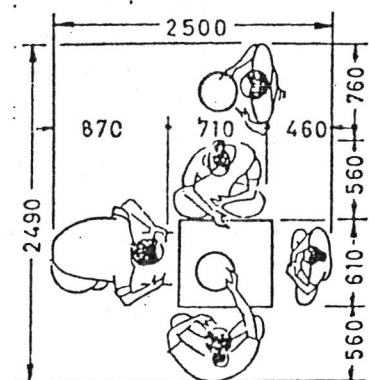
INFANT ASSISTED



ON CHOWKI

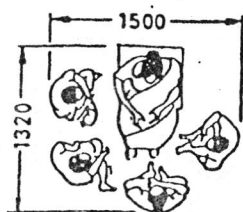


FORMAL

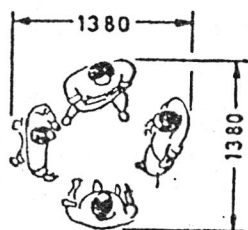


INFORMAL

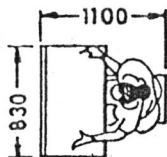
[25.4mm = 1 inch]



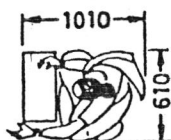
STORY TELLING



CHAT



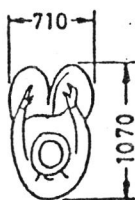
SEWING SITTING



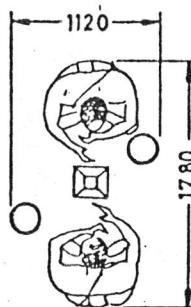
SQUATTING



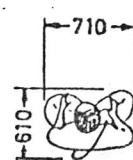
READING



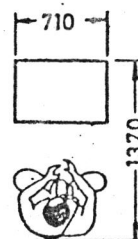
PERFORMING
NAMAZ



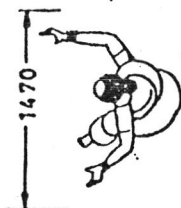
PERFORMING
HAVAN



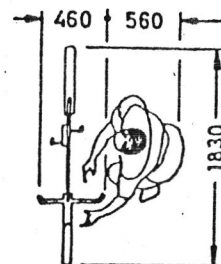
MEDITATION



IN FRONT
OF DEITY

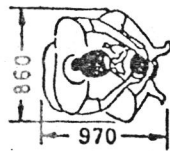


SPINNING

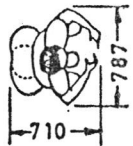


CLEANING
BICYCLE

[25.4 mm = 1 inch]



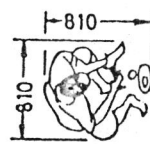
INFANT ASSISTED



1 INDIAN PAN



SHOWER



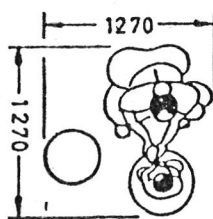
3 POLISHING



BATH SQUATTING



DRESSING BABY



BATHING INFANT



PUTTING ON SARI



DRYING BODY



PUTTING ON COAT



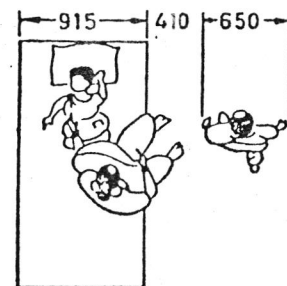
ADULT



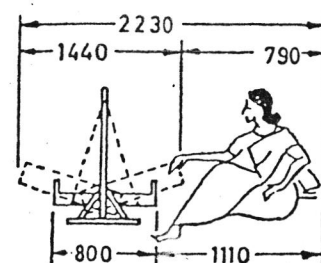
GROWN UP



INFANT



COMFORTING CHILD



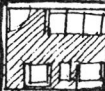
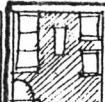
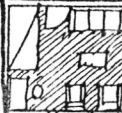
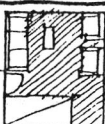
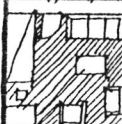
INFANT IN CRADLE

[25.4mm = 1 inch]

[INDIAN STANDARDS INSTITUTION, PUBLICATION NO 15:5533-1969, UDC 721-05 "RECOMMENDATION FOR DIMENSIONS OF SPACES FOR HUMAN ACTIVITIES, NEW DELHI 1969, SOURCE: "HOW THE OTHER HALF BUILDS" MCGILL UNIVERSITY (1984)]

SPACE REQUIREMENTS FOR HOUSEHOLD FUNCTIONS

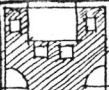
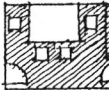
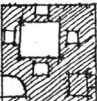
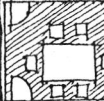
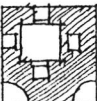
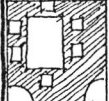
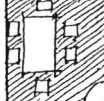
1. SPACE REQUIREMENTS FOR LIVING

	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"	11'-0"
5'-6"									
6'-0"									
6'-6"									
7'-0"									
7'-6"									
8'-0"									
8'-6"									
9'-0"									
9'-6"									
10'-0"									
10'-6"									
11'-6"									

[3.3 FT = 1M]

[LIVING SPACE DIMENSIONS ALSO CONSIDERS THE BED IN IT SEE B.1.1]

2. SPACE REQUIREMENTS FOR DINING

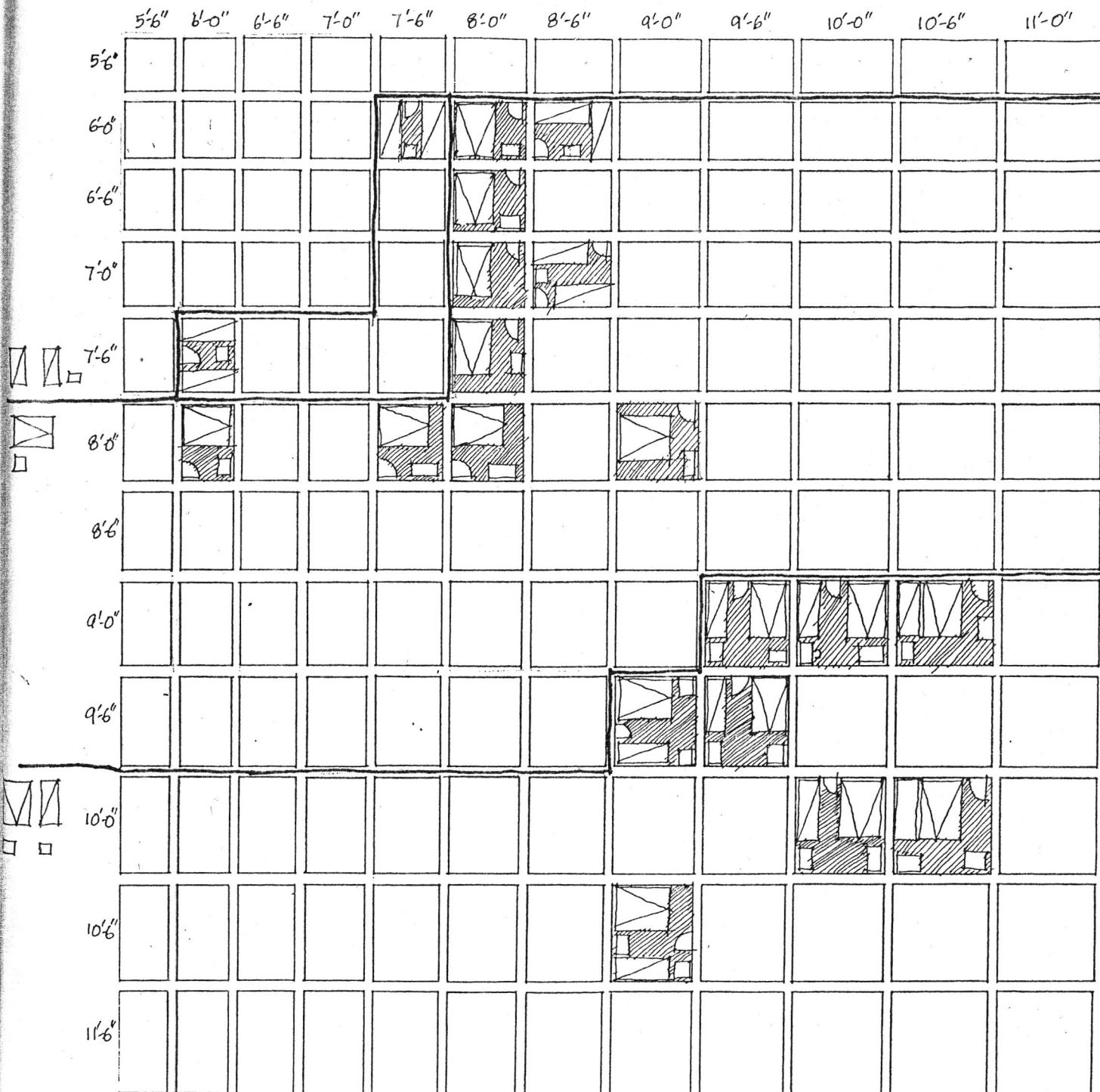
	6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"
6'-0"										
6'-6"										
7'-0"										
7'-6"										
8'-0"										
8'-6"										
9'-0"										
9'-6"										
10'-0"										

4 PERSONS

6 PERSONS

[3.3 FT. = 1 m]

3. SPACE REQUIREMENTS FOR SLEEPING



[3:3ft = 1m]

Appendix D

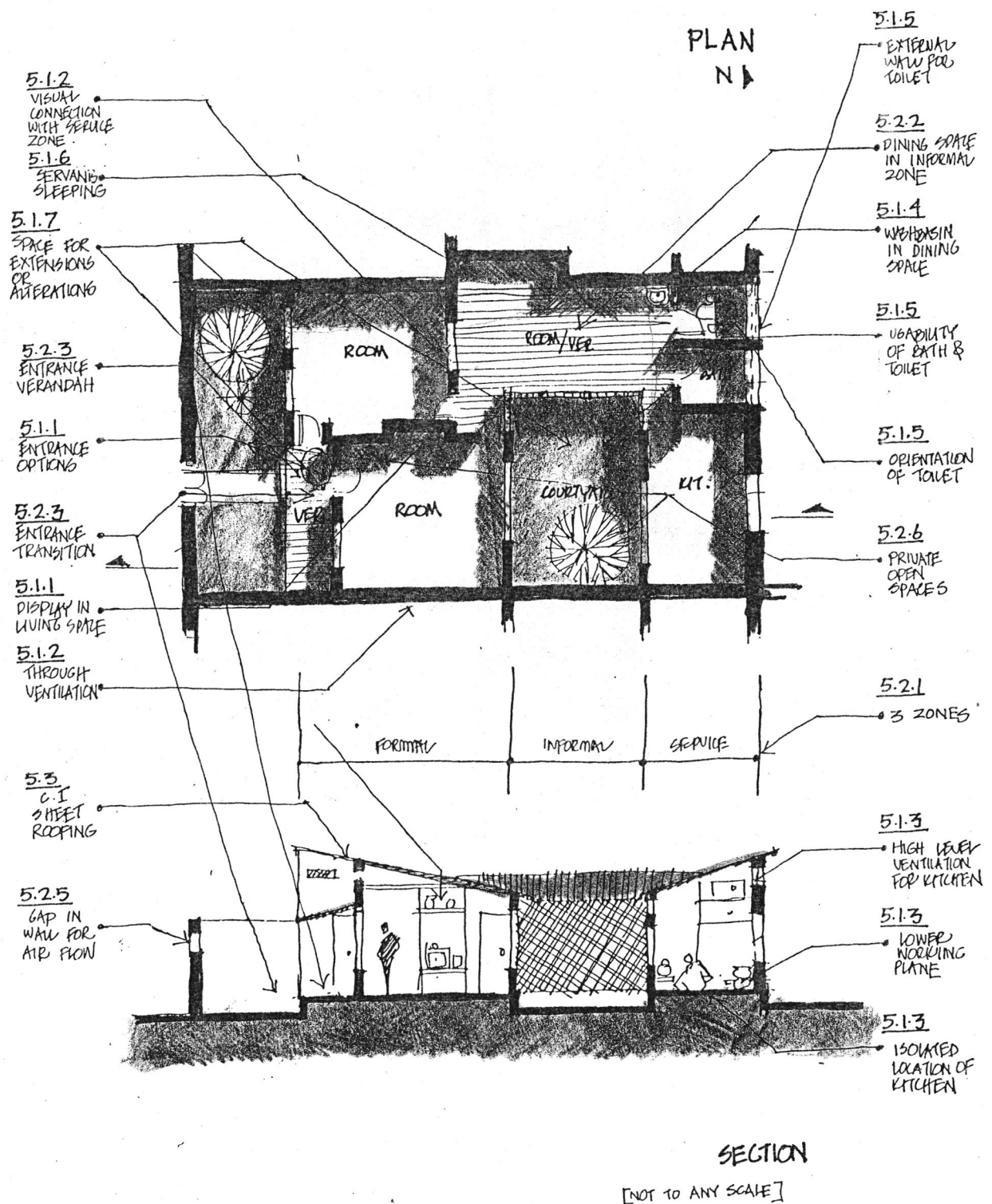
DESIGN EXAMPLES

Based on the discussions at the end of Chapter 5 three examples of house designs are included in this part which are based on the design recommendations in the last chapter.

The designs only make use of the general recommendations applicable to each case and are not do not consider the ones related to detail designs of particular spaces (ex. plumbing in the toilet). There is reference to particular sections of Chapter Five where these recommendations are discussed in detail.

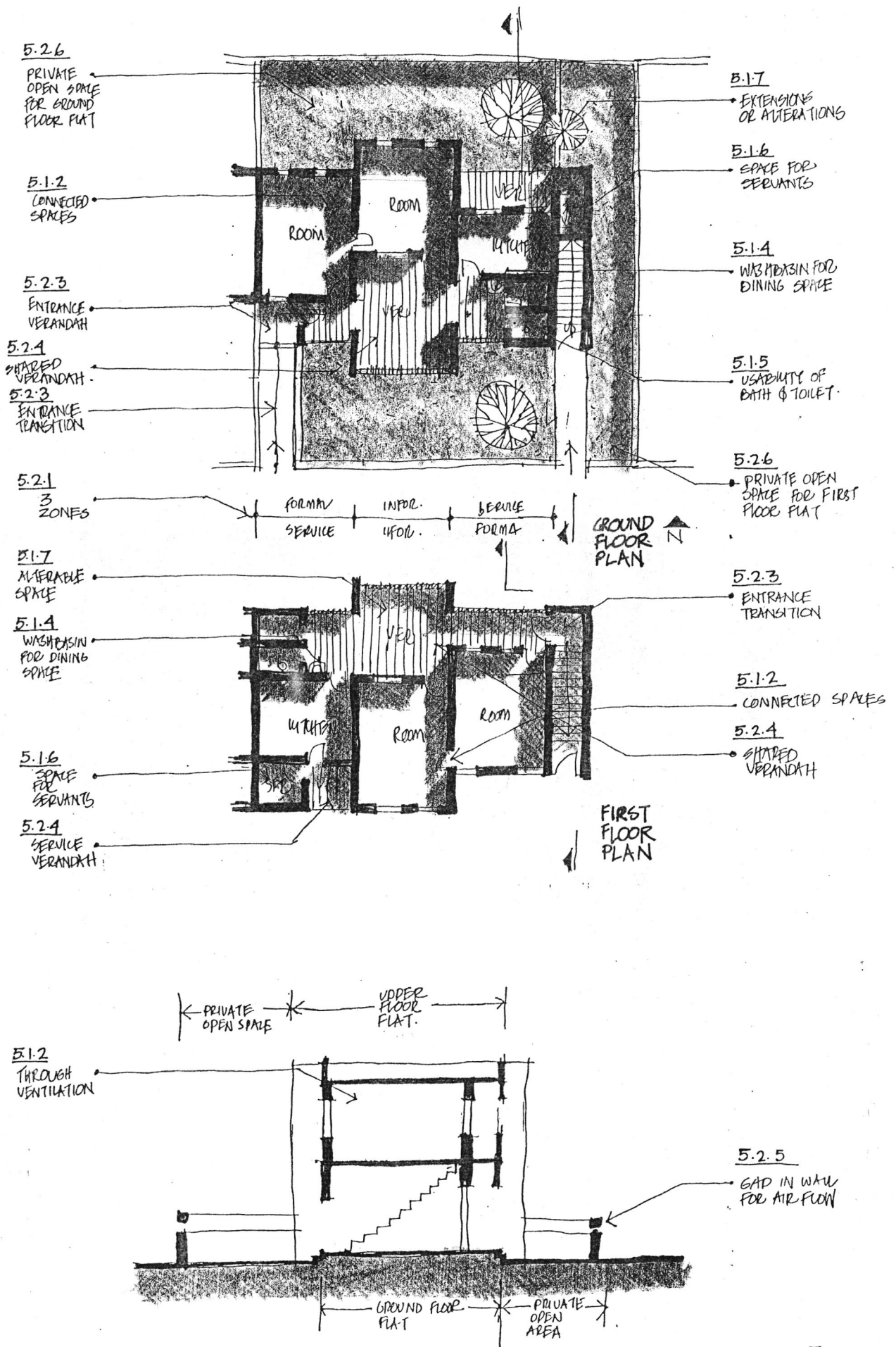
The single storey house on an individual plot makes use of a maximum number of the recommendations and the flat in the 5 storey block makes use of the least. The example of the flat is more concerned with the flexibility of planning offered by the structural system rather than the plan itself.

All the examples are of two room houses to provide common ground for comparison. The sketches are meant to provide an idea of the concepts of design and further modifications will be required if they are to be put to use in reality.



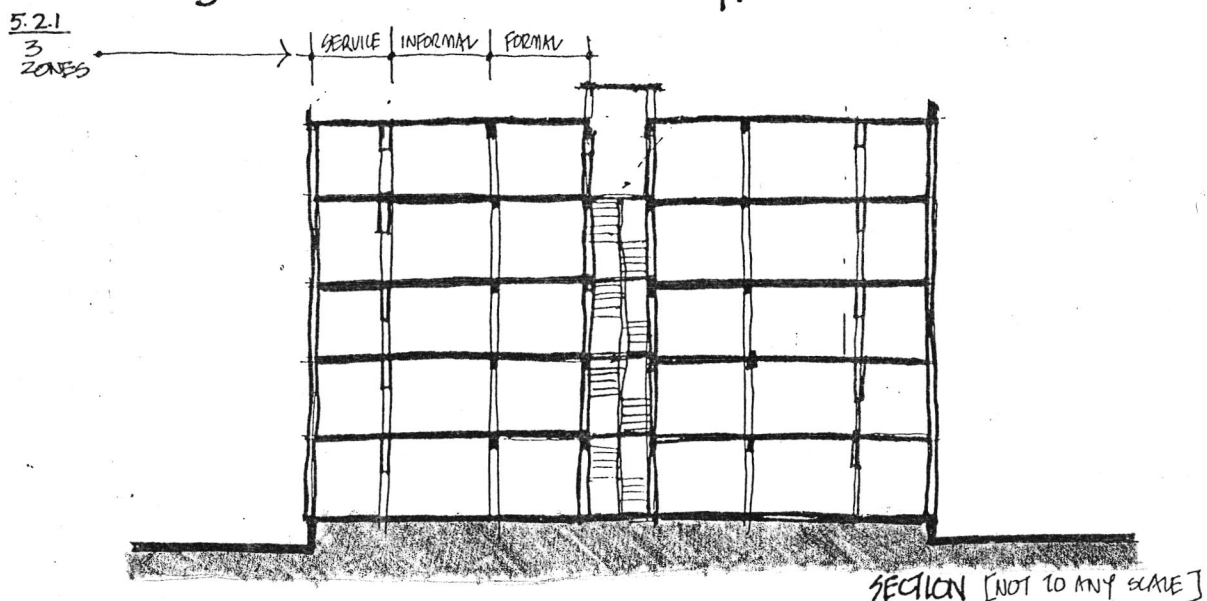
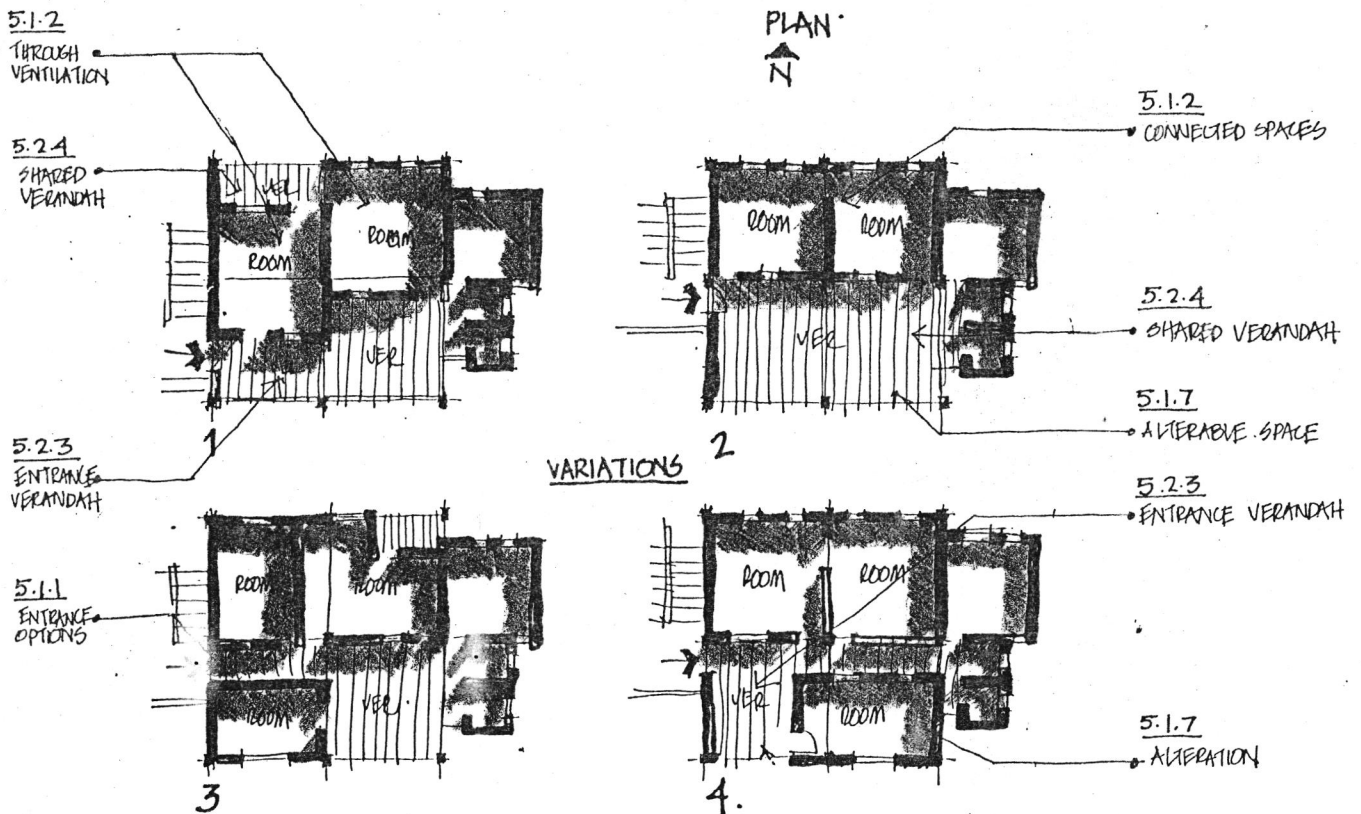
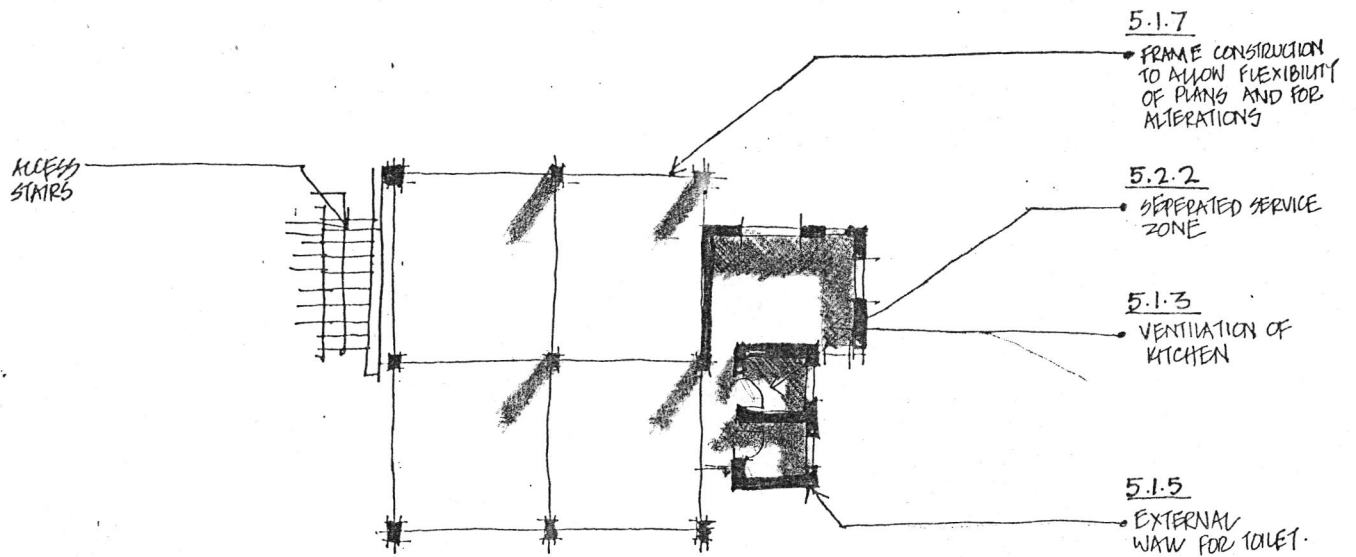
● **DESIGN SUGGESTION FOR A TWO ROOMED SINGLE STOREY ROW HOUSE ON AN INDIVIDUAL PLOT.**

* THE NUMBERS REFER TO THE SUB-HEADINGS IN CHAPTER 5 WHERE THESE SUGGESTIONS ARE DISCUSSED



• DESIGN SUGGESTION FOR FLATS IN A TWO STOREY BLOCK WITH SHARED PRIVATE OPEN SPACES

*THE NUMBERS REFER TO THE SUB-HEADINGS IN CHAPTER 5 WHERE THESE SUGGESTIONS ARE DISCUSSED



• DESIGN SUGGESTION FOR A FLAT IN A 5 STOREY BLOCK

* THE NUMBERS REFER TO THE SUB-HEADINGS IN CHAPTER 5 WHERE THESE SUGGESTIONS ARE DISCUSSED