A CRITICAL APPRAISAL OF RESIDENTIAL-BUILDING BYE-LAWS FOR THE MUNICIPAL CORPORATION OF GREATER BOMBAY WITH SPECIAL REFERENCE TO USER NEEDS

A DISSERTATION

submitted in partial fulfilment of the
requirements for the award of the degree
of
MASTER OF ARCHITECTURE

By

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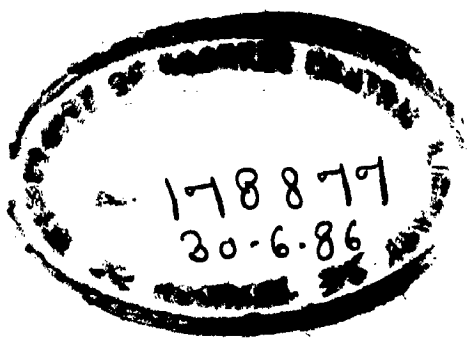

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A C K N O W L E D G E M E N T

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The help of Mr. Saini in typing and Kanvar family in xeroxing at the final stage enabled me to complete the work. They deserve my thanks so also all those who were useful directly or indirectly.

I will be failing in my duty if I do not pay humble regard to the cooperation of my parents who always encouraged me to go in this direction.

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C E R T I F I C A T E

Certified that the dissertation entitled 'A Critical Appraisal of Residential-Building Bye-laws for the Municipal Corporation of Greater Bombay with special reference to User Needs' which is being submitted by Suvarna Varty in partial fulfilment for the award of degree of Master of Architecture of the University of Roorkee, is a record of her own work carried out under my supervision and guidance. The matter embodied in this dissertation has not been submitted for the award of any other degree or diploma.

This is further to certify that she has worked for a period of eight months from August 1985 to March 1986 for preparing the dissertation at this University.

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ABSTRACT :

Before the discovery of vitamins, none had a concept of wholesome food except that which produced satiation and energy. Similarly,the present state of building bye-laws typically shows a limited physical concern and tends to ignore some of the vital aspects of human habitation like socio-environmental considerations.

Architectural buildings are designed to serve human needs, this somehow seems to have lost its meaningfulness in the framing of building bye-laws. This is logically true, since the builders,as a biggest promotional force in housing today, have forced architecture out of housing design by exploiting the building bye-laws. Our present national economy has aggravated this problem, especially in a city like Bombay.

The present study is undertaken to highlight the extent to which the building bye-laws are effective in satisfying users' needs. A close view is taken of nature, purpose and historical evolution of building bye-laws, the significance of which is studied in urban context with special reference to Bombay. At the same time a broad perspective of the attempts made for modifications and reforms of the prevailing building bye-laws is also considered. The main sources for finding out the efficacy of building bye-laws, it was felt, are the views of architects who design the buildings,those

of occupants who use them and the relevant literature which analyses them. Accordingly, all these three aspects are explored through different research tools.

It is observed that the design abilities of the architects are narrowly channelised and creativity, as a result, assumes secondary importance in much of what is built today. The restrictiveness of building bye-laws is found to affect the design of dwelling units as well, which ultimately is not congenial to user needs. An effort is made to suggest amendments in the prevailing building bye-laws, wherever the need has been felt, along with a direction for further research in the field.

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CHAPTER - I : INTRODUCTION

Philosopher Kahlil Gibran has correctly analysed human nature regarding the laws. He states -

'You delight in laying down laws,
Yet you delight more in breaking them.
Like children playing by the ocean
Who build sand-towers with constancy
and then destroy them with laughter'.

-(in 'The Prophet')

This is quite true as far as Building Bye-laws are concerned.

Housing has never been a problem to any society in a million years, except in modern times. No one had to explain to a South Sea Islander or an Eskimo or a Rajasthani villager, how to build a house. But the modern architect has to conceive a building that will fulfill the needs of his client while conforming to a maze of regulations imposed by the municipal authorities. When one pauses to reflect on it, one realises that in the Indian context, it is only in the last sixty years that urban centres like Bombay have had their housing problems. Before that it was society itself that produced housing for its people through its own processes. So it is obvious that the balance has been upset due to unnecessary tinkering with it.

1.1 IDENTIFICATION OF THE PROBLEM :

1.1.1 Nature and Purpose of Building Bye-laws :

Shelter is one of the primary needs of mankind. Man needs shelter essentially for protection from adverse climatic conditions and for safeguarding his security. Though shelter is primarily related to his biological needs, it is obvious that in the course of evolution, many other needs have clustered around these and have eventually taken a bio-social form. As a result, purely biological needs have become extinct for a civilized people. They operate in a complicated shape with the inclusion of several social, cultural and psychological urges.

The late psychologist Abraham Maslow provided a useful framework for understanding human needs in his studies of human motivation. He proposed that needs be ranked at five levels, creating what he called the hierarchy of human needs, in which needs are ranked from lowest to highest, beginning with physiological needs and culminating in the need for self-actualisation.(as shown in fig 1.1.1) The first level physiological needs are biological or tissue needs and are same for all members of the human species. These needs are essential for survival of human beings. The needs at the second level are security or safety needs - people's urge to keep and protect what they have. The third level of the hierarchy represents social needs - the need of association

MASLOW'S HIERARCHY OF HUMAN NEEDS

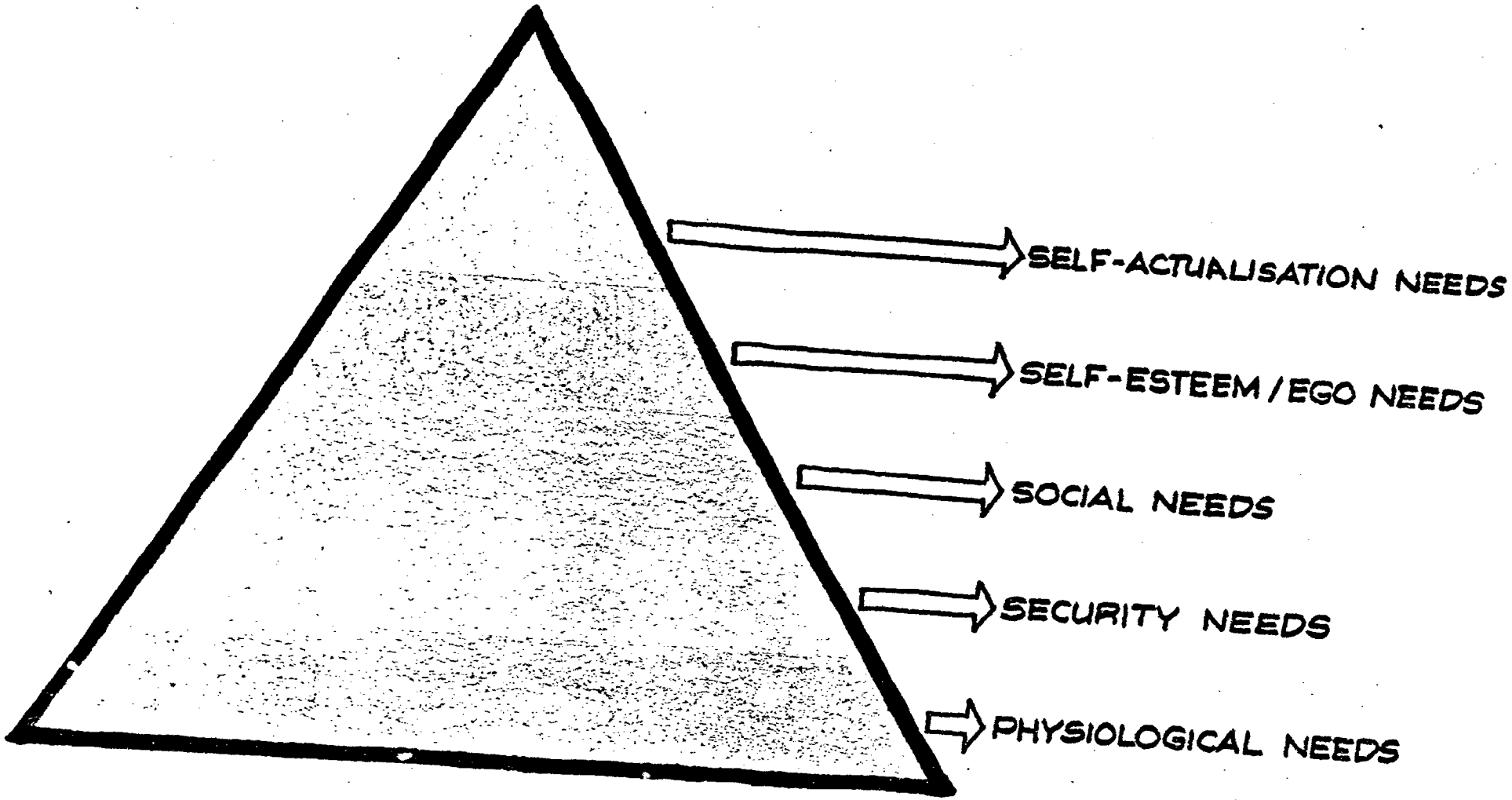


FIG. 1·1·1

with the other human beings. Fourth in Maslow's heirarchy are self-esteem or ego needs. At the apex of the hierarchy are self-actualisation needs. Unless lower level needs are reasonably well met, there may never be an opportunity to become a self-actualizing person, i.e. a person who has become what he or she is uniquely capable of becoming.

Clare Cooper has also supported this view of hierarchy of human needs, by way of simple rule of thumb, that pertains to choosing between conflicting needs. That is in a hierarchy extending from lower or more basic needs, to higher or more specialized needs, from shelter, security, comfort, convenience, through socializing, self-expression and aesthetics, a lower need must always take precedence over a higher one.

The civilized man of 20th century today needs built environment for varied purposes, each one more complex and intricate than the other. He needs it for shelter, for comfort, for feeling of security, privacy and status and for a sense of well-being. But what is still more interesting is that he also needs it for his aesthetic aspirations. Thus, built environment today has to be designed so as to promote physical, biological, psychological and aesthetic needs of the occupants. Consequently, it has to be comfortable and hygienic, so that congenial living conditions are assured within and also around the buildings.

With these evolving norms, it goes without saying that

the building design should meet some specific requirements relating to diverse aspects of living. To achieve these goals, various aspects of building activity are gradually subjected to certain minimum standards. These standards are prescribed in the form of Building Bye-laws. Thus, Building Bye-laws mean restrictions on building design in the form of minimum standards to safeguard congenial living conditions.

The main purpose of building bye-laws is protection of public health and public safety. The other purposes are protection of service systems, protection of aesthetics and provision for public amenities. Where bye-laws protecting public health are designed to produce minimum standards of daylight and ventilation, those protecting public safety are in terms of problems like spread of fire. Some of the regulations are for controlling the population on a given site in relation to service systems available. Protection of aesthetics is achieved by relating the height of the building to plot coverage and also with a control over set-back lines and volume of a building. Recreational grounds and 'no development or green' zones cater for provision of public amenity.

1.1.2 Historical Evolution of Building Bye-laws :

Emergence of Building Bye-laws is a continuous process,

steadily assuming a clear-cut identity over a long historical past. So long as man was a primitive wanderer, totally concerned with his animal self, there was naturally no question of rules and regulations about his dwelling place. Any cosy spot could be ideal so far as his shelter needs were met with. Human needs evolved to take a complex shape with civilization, resulting in the emergence of numerous higher level needs. Emergence of building bye-laws is a phenomenon that runs parallel to human civilization and progress.

The initial growth of civilization started with the realization of the fact that settlement in the river valleys would lead to lasting prosperity. The dawn of such development can be traced back to the period around 10,000 B.C., when the river valley civilizations of Tigris, Euphrates, Nile, Indus etc. flourished. The growth of these settlements resulted into the growth of villages and towns and finally cities, which resulted in the need for some sort of externally imposed system and planning. The awareness of this need is the starting point of Building Bye-laws.

Glimpses through history show that even the inhabitants of the above mentioned oldest civilizations had some awareness of planning principles. The remains of the cities of those days and the available historical data throw adequate light on the dwelling patterns of the time.

Vivid descriptions of some of the great cities of Egyptian civilization are found in history, dating back to 3000 B.C.. However, the only remains available of those cities are of the dwelling places of slaves and artisans who were working for the Illahun Pyramid. Such a dwelling place was called a Kahun. Although meant for the lower most stratum of society, the Kahuns too show an evidence of some rules and regulations concerning design, area, access to open spaces, light and ventilation.

Excavations of Mohanjodaro and Harappa of the Indus Valley, dating back to the same period,reveal a still more advanced state of architectural planning both for houses as well as for the towns. The city patterns include provisions for adequate drainage system, water supply and road design. The building patterns include norms for ventilation, building material and building height.

During ancient Indian architecture, building bye-laws laid down in Mansara, specified location for educational buildings and dharamsalas. Number of stories was specified for private houses as per rank of a person, the heights of buildings in the same street being corresponding. Silpa-sastra deals with technical matters. It also insists upon certain qualities for master builder (Stapathi) and gives directions for planning of villages. The planning principles were also observed in Pataliputra,which was an aggregation

of Indian villages joined together by spacious parks. The three crucial features in architecture, so far as these ancient records are concerned, seem to be the measurements, styles and shapes.

The credit of specific codification of building bye-laws goes to the great king Hammurabi of the city of Babylon, which flourished in the Euphrates Valley. In 2100 B.C., he codified his law of justice, so as to improve the lot of common people. This code prescribes adequate standards for workmanship and construction of buildings, failing which the consequential punitive measures were also stated.

In the democratic set-up of Greek civilization (5th century B.C.), building bye-laws took a more clear-cut shape. The architecture of the cities like Athens, Priene, Miletus are good examples. The Romans, further, proved to be still better organised in planning the architectural design of their cities. It was well controlled by certain regulatory system.

The Medieval period after 1000 A.D. is specially marked by neglect of planning control when the design of roads and squares of the towns developed at random. But even during this period of apathy, some attention was paid to building regulations and the designing of market squares.

From the Renaissance period till the end of 18th century, city planning assumed marked importance. The city

was considered as a monument and the towns were also given due importance as growing organizations. Later, however, the Industrial Revolution ushered in the dawn of machine age. The entire pattern of human adjustment was affected. Not only did it result in changing interpersonal and social responses but it brought about immense changes in various ecological dimensions.

During the state of change and confusion, planning of towns and cities did suffer temporary stagnation. Practically no control or guidance prevailed for it. Eventually houses were crowded in England and the total appearance of the city growth lacked the aesthetic quality.

Soon it was realised by the middle of the 19th century that lack of planning resulted in certain adverse conditions. It affected sanitation and public health. Hence an attempt was made to make some provision for drainage cleaning, water supply and ventilation. But no real heed was paid to planning as such.

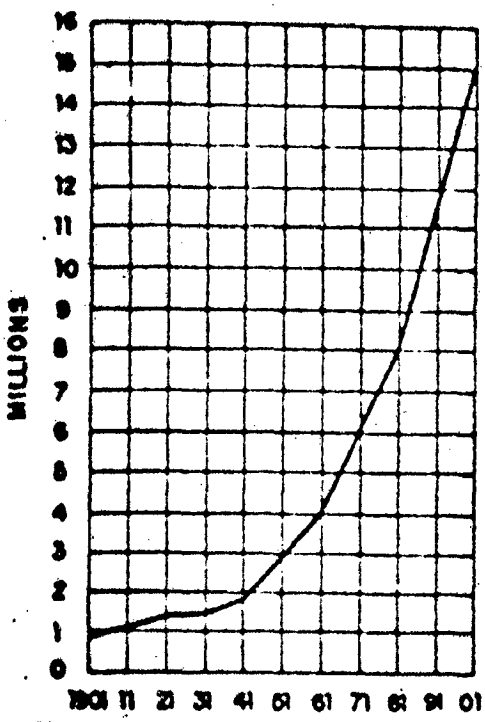
The Public Health Act of 1875 brought about enormous advances in Industrial England. During this time, model bye-laws prescribed the size of rooms, space behind the house and the width of road in front. This was followed by Tenement House Act of 1901 which kept a check on plot coverage and density. This is how slowly and gradually certain health bye-laws came into force.

1.1.3 Significance of Building Bye-laws in Urban Context :

During the last few decades, building bye-laws have played a vital role in urban spots, which are undergoing the process of rapid expansion on account of industrialization, rural exodus and population explosion leading to overcrowding and congestion. Urbanism and industrialization are the basic realities of modern society's environmental experience. Human needs remain basically the same, yet they must be met quite differently in urban environments since urban environments themselves make new needs felt.

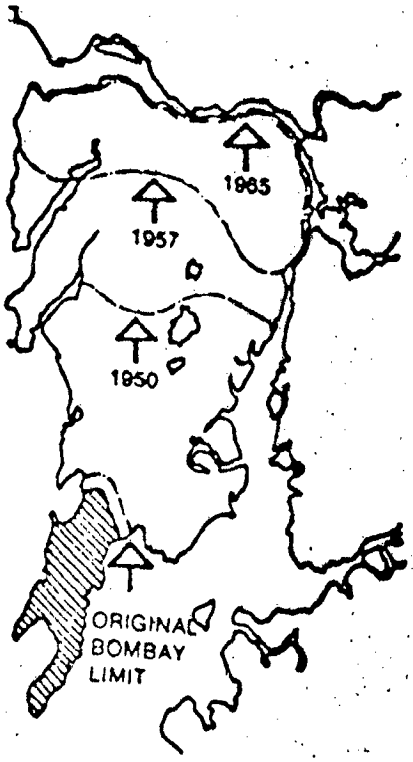
The residential building construction activity has consequently grown manyfold but has failed at the same time to meet with the changing needs of people. The concentration of housing units in and around cities creates problems on a mass scale, for the use of land and space in the urban setting has profound implications for the quality of modern life.

It would be a mistake to think that the city is just a larger number of people than the village. While the city is larger in size and scale than the village, its thrust and purpose are entirely different. Occupational diversity, social stratification and a changed role for women proceed together. The urban life space embraces new experiences, a new tempo of living, new visual components on an immense scale and new ways of responding to environmental stress,



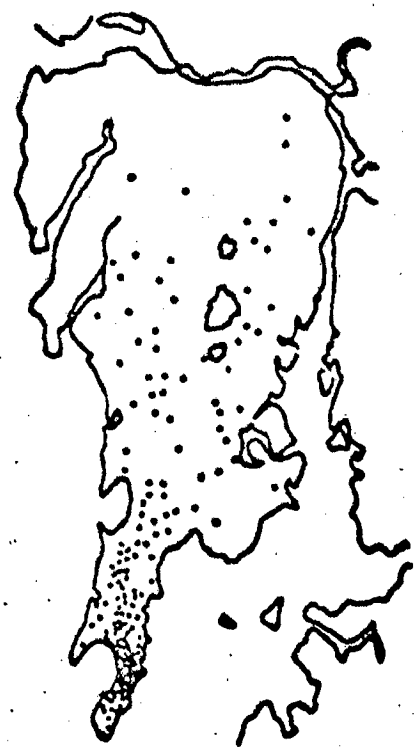
Bombay: Population growth

FIG. 1·1·2



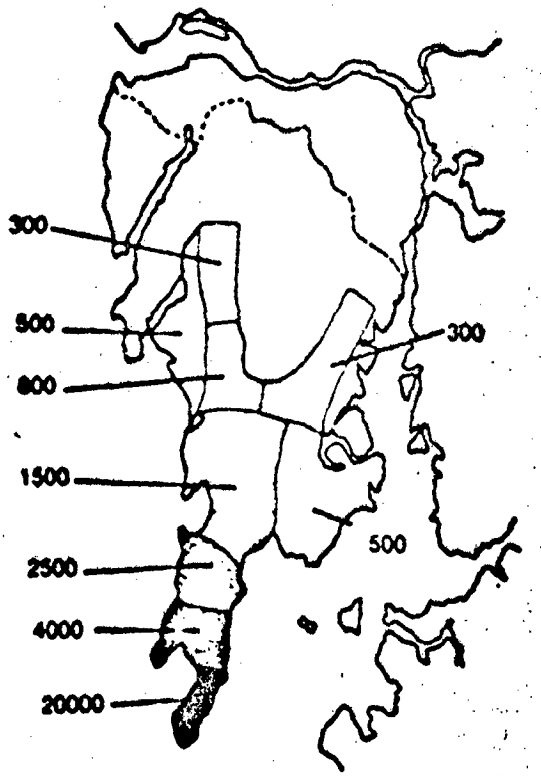
BOMBAY: MUNICIPAL LIMITS

FIG. 1·1·3



BOMBAY: JOB LOCATION
(• = 10,000 JOBS)

FIG 1·1·4



BOMBAY: LAND PRICES (Rs. PER M²)

FIG. 1·1·5

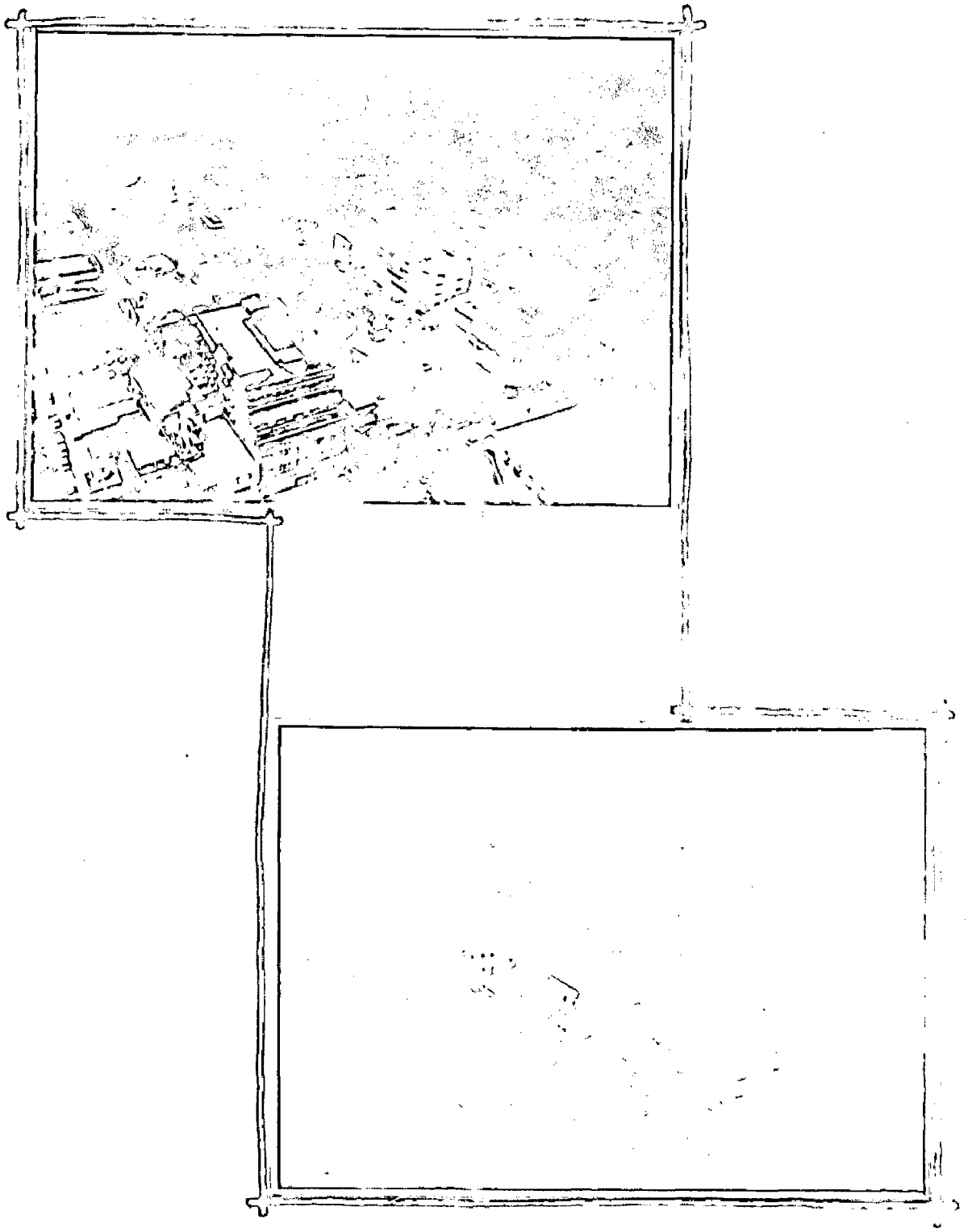
all of which make the experience of providing housing a unique and challenging one.

The situation is far more critical in a city like Bombay, where because of the ample work opportunities, the influx is perhaps the highest in the country (as shown in fig.1.1.2) leading to shortage of housing, shortage of land. Bombay is a city of islands. So there is no possibility of lateral expansion until and unless land is reclaimed from the sea. This results in longitudinal development with housing moving further north (as shown in fig. 1.1.3) Since most of the work places are still located in South Bombay (as shown in fig.1.1.4) ,such a situation leads to traffic congestion and other collateral problems. Evidently, there is speculation in real estate and an obvious spurt in the prices of land (as shown in fig.1.1.5)and housing, leading to large scale spreading of slums.

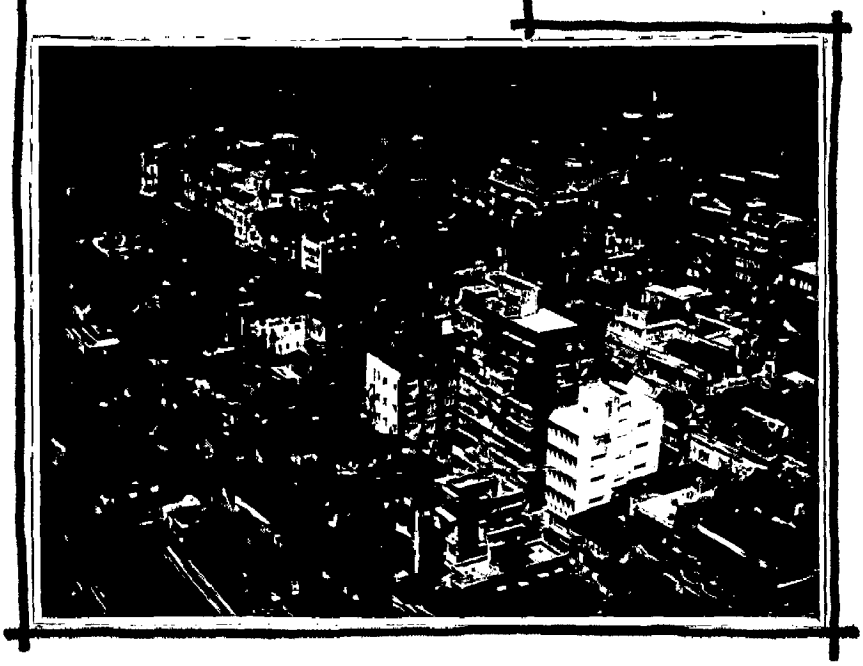
The significance of Building Bye-laws lies in providing adequate standards for housing that provide hygienic living conditions and in creating a homogenous development that keeps a check on over-crowding, allowing scope for essential need satisfaction of the occupants.

1.1.4 Performance of Building Bye-laws in Greater Bombay :

The picture today in the field of construction is somewhat pessimistic. The construction activity is mainly



DEVELOPMENT OF CITY OF BOMBAY IN THE ABSENCE OF BUILDING BYE-LAWS AND DEVELOPMENT CONTROL RULES



DEVELOPMENT OF CITY OF BOMBAY IN THE ABSENCE OF BUILDING BYE-LAWS AND DEVELOPMENT CONTROL RULES

guided by the municipal building bye-laws of the respective cities. It is surprising to find that the prevailing building bye-laws fail to serve the very purpose for which they were formed.

The salient reasons for such a sorry state of affairs can mainly be attributed to the following facts -

* The Building Bye-laws tend to be somewhat rigid as they fail to take into account the changing living patterns of people. Social change is remarkably rapid in big industrial cities. Provision for offering establishment facilities have to be need-oriented. Needs of people keep changing with the changing life-pattern. The building bye-laws which fail to relate themselves to the changing needs, are bound to fail in fulfilling their purpose.

* The economic pressures of the city and the Building market mechanism tend to encourage exploitation of Building Bye-laws for taking advantage of them.

* There are certain inherent defects in the procedures involved for obtaining sanction for the building proposal.

* The innovations in the availability of new materials, techniques of construction and climatic controls are not adequately incorporated in the building bye-laws.

On taking a closer look at these problems, one feels that architects are primarily concerned with planning of space that is habitable and environment that is livable. This is possible if the designer changes his attitude with the changing times. Compared to the advances made by the

other fields, architecture is limping way behind because it refuses to free itself from the shackles of the age old archaic rules, regulations and codes.

'The Development Control Rules for Greater Bombay' which were published in 1967, supercede the previous laws and regulations, but still the main rules governing the building activity i.e. 'Building Regulations - 1888' and 'Building Bye-laws - 1910' were framed during the preindependence days. These regulations expectedly show British traits and are not conducive or logical for our conditions. The revised draft - 'Building Bye-laws and Development Control Rules - 1983' supercede all these but according to expert opinions, they show no significant improvement since the revision is not done in proper perspective.

Rules and laws can never be borrowed. They necessarily have to be evolved out of the cultural values and living styles of people which are everchanging. Time should bring about an inherent progress driven by a 'need' to change. Architecture too has to perform its role and laws and codes become essential areas to bring about the change. One thing should be borne in mind that rules should leave free scope for citizens to shape and mould their life style as these (rules) are our servants and not masters, otherwise good, imaginative and innovative concepts of design will be totally mutilated.

Performance of rules must be constantly monitored and rules should be updated accordingly. It is high time to discover the relevance of these clauses to modern society. Thus the prime need of the hour is to replace the inept and meaningless clauses by healthy rules or to prescribe alternatives and amendments to make the outdated clauses pertinent to present day life.

Today, in Bombay, the activity of Building Construction is mainly dictated by the Builder, who most often is not qualified for the same. His outlook is purely commercial and his main aim is to make maximum profit out of this activity. With such objectives in mind, he forces the architect to stick to the minimum standards of building design prescribed by the building bye-laws and thus suppresses the individualistic approach of the architect to building design. It is difficult to achieve a good quality of built environment with the minimum standards prescribed in the building bye-laws, as they are merely the product of a compromise between the economic pressures and comfortable living. Creativity assumes secondary importance in much of what is built today, as the architect is more concerned about ensuring the maximum built-up area for the client at the minimum construction cost.

Secondly, all the requirements of the residents are not fulfilled with the spaces mentioned in Building Bye-laws. There is no mention of certain spaces, where some of the important daily activities are carried out, hence the general

trend is not to provide such spaces. The respective activities are then naturally accommodated in other spaces. Many a time the usage of spaces is altered (after getting the approval for the proposal) to suit the requirements of the residents.

Moreover, there are certain clauses which ultimately lead to spaces that are rendered unusable. The conditions of minimum open spaces are also not found to be satisfactory, in that certain requirements of the residents cannot be fulfilled with the standards prescribed by the building bye-laws.

The minimum requirements of lighting and ventilation, according to authentic opinions, are not optimum nor do they mention anything about cross-ventilation. These requirements need to be explored to prescribe the optimum standards.

All these aspects make us think whether it is ethical to deteriorate the quality of built environment under the names of market mechanism and economic pressures.

The main purpose of building bye-laws, in modern days, is to prevent the builders from exploiting the situation. To achieve this goal, it is very essential for any law not to be ambiguous as unclear wording is always left open to different interpretations. The law should be crystal clear so that the interpretation of the same should not create confusion. A great care should be taken while formulating the law to see that the same is without any loophole which

would tempt people to manipulate it and lead ultimately to the exploitation of the situation.

Apart from all these, the whole system of obtaining the approval of the proposal is rather faulty. The important aspect is that the approving body is composed of engineers who can hardly claim any knowledge of the environment as such. The attitudes of the regulatory body are also not found to be uniform. Certain concessions are allowed in certain cases on the grounds of their being special. Sometimes there are hindrances in approval even if the proposal is straight-forward, just because the architect is not of the 'obliging kind'.

The architect has to spend a lot of his valuable time to follow up his proposal to its final approval and consequently can pay less attention to designing. As a solution to this problem, gradually a clan is formed whose job is only to get the proposal sanctioned. Such practices raise serious doubts about the chastity of the architectural profession.

Broadly speaking about the problems of the city, one feels that the objective of F.A.R. is to limit the density but that has not been possible in many cities. The rigidity of F.A.R. regulations leads to shortage of accommodation. This shortage has forced people to live in slums but has not managed to coerce them to leave the big cities. On the

other hand, an increase in F.A.R. to solve the problem of slums, results in increased loads on the public services since infra-structural facilities remain the same (for the increased F.A.R.). Thus in either case, environmental deterioration is inevitable.

In a sense, Bombay can be compared to the proverbial frog, who was boiled alive and died without realising what was happening. Though at a slow rate and sometimes at a little faster rate, the condition of Bombay keeps deteriorating resulting into the total annihilation of its livable environment. It is high time that adequate steps are taken to control such a situation.

1.2 AIMS AND OBJECTIVES :

1.2.1 Purpose of the Study :

The present building bye-laws restrict themselves to the more primitive aspects of human habitation. Just as, before the discovery of vitamins, none had a concept of wholesome food except that which produced satiation and energy, building bye-laws have to include certain essential socio-environmental elements in their framing, if at all they are to be wholesome.

The prevailing concept of building bye-laws shows a limited physical concern and tends to protect the product rather than the user. Architecture is a social art which

must express and reflect the society for which it builds. The success of architectural design can be determined only by the extent to which it meets user needs and expectations. It is observed that in spite of meeting legal standards, housing today is not congenial for human habitation according to personal standards.

The building bye-laws, therefore, should also reach out to other disciplines such as sociology, psychology and anthropology, since the motivation is not simply the desire for shelter but the desire for right kind of shelter. The main bulk of building bye-laws, as already stated, was framed during the preindependence days and the revisions thereof did not show any radical change. It is desirable that performance of rules is constantly monitored and the rules are updated accordingly.

The present study is undertaken with all the above considerations in mind.

1.2.2 Types of Building Bye-laws Included in the Study :

The bye-laws concerned with the general building requirements in relation to various components in and around buildings will be included in this study. The emphasis will be on geometrical regulations which control the dimensions of indoor and outdoor living spaces and of space around buildings. The requirements of the parts of the building and those of dwelling units will be studied in

detail. The land-use regulations like rules for development of land and land-use classification along with some arithmetical controls which keep a check on building-bulk in relation to the area of site, also form a part of this study. In addition, the rules for general provisions like provisions for vertical circulation, parking and amenity spaces will be incorporated. As a part of limitations of the study, bye-laws concerning structural safety and building services will not be included and Development Control Rules will be dealt with for residential zone only and not for commercial or industrial zone. The statement of building bye-laws included in the study is given in appendix 'C'.

1.2.3 Scope of the Dissertation :

The dissertation deals with the following items -

* Building Bye-laws :
  - Minimum standards for areas of rooms/spaces
  - Rooms/spaces mentioned in building bye-laws
  - Minimum standards for widths of rooms/spaces
  - Minimum standards for heights of rooms/spaces
  - Restrictions on balcony dimensions/outdoor spaces
  - Minimum standards for staircases
  - Minimum standards for lifts
  - Minimum standards for open spaces
  - Minimum standards for lighting and ventilation

* Land-use Regulations concerning :

  - Zoning
  - Plot sizes
  - Set-back lines
  - Plot coverage
  - F.A.R. provisions
  - Density control

The procedure of approval is not handled but certain aspects of approval (like professional background of the approving authority and hindrances in the approval) are analysed critically. Though being important equally, the technical aspects of the building bye-laws like fire fighting, fire prevention, structural safety and plumbing, do not form a part of this study.

Line of thinking and appraisal is based on physical, functional, psycho-social and environmental aspects. It should be specially noted that the analysis is primarily on the plane of principle and building bye-laws are looked at in their fundamental relationship to architectural design and user needs.

The conclusions arrived at do not necessarily point towards final solutions but provide directions towards new perspectives. It is hoped that these perspectives would adequately expand the horizons of architectural outlook, as far as building bye-laws are concerned.

1.2.4 Statement of Objectives :

The broad objective of this study is to explore the optimum standards for the congenial living conditions in and around buildings on which the building bye-laws are deemed to have been formed.

The specific objectives are as follows -

* To find out what architects feel about the building bye-laws - How far these are relevant and how far they feel their designing abilities are channelised due to these bye-laws and also the difficulties faced by them in getting their proposal sanctioned.
* To study occupants' satisfaction to buildings which have a close reference to minimum standards as specified in building bye-laws.
* To critically comment on certain clauses of building bye-laws which
  - adversely affect the design of building
  - cause hindrances in the design process
  - do not cater adequately for user needs.

CHAPTER-II : REVIEW OF LITERATURE

2.1 ACHIEVEMENTS AND EVALUATION OF WORK DONE ABROAD :

2.1.1 A Discussion on Building Bye-laws at a general meeting (15th June,1954), at Royal Institute of British Architects, London :

Introduction of subject for the discussion was done by Richard A.Simons of the Building Research Station, who strongly feels that building bye-laws always reflect the state of society they serve. Giving earliest known example of Laws of Hammurabi, King of Babylon, he points out that every building that time, was supposed to perform the only function and that was - it had to stand up - it should not collapse. He sees in these provisions, the germ of some of the provisions of our present day building bye-laws, although in a course of time, these have become much more complex.

He says that 19th century was a period of great developments in many fields and a great period for legislation too. Building bye-laws made by local authorities, first appeared in the 1950's. Though local government board made great efforts to keep abreast of development, it was not so easy to keep the actual bye-laws up to date. They soon came in for criticism on the score of their restrictiveness.

After first world war, developments of new materials came into being due to shortage of traditional material, rising costs and a big leeway of building make-up. The scientific

research entered the field of building with establishment of Building Research Station in 1921 which suggested that bye-law requirements should be expressed in terms of performance instead of method of construction. This principle involved three different kinds of bye-laws -

a) bye-law expressed in purely functional terms
b) bye-law prescribing the basis of design to achieve the required standard of performance.
c) deemed - to - satisfy bye-law.

With an explicit description of each he points out that with our wide knowledge of building, we have turned again to the same method of expressing requirements, for the control of building, as were used by Hammurabi 4000 year ago, for just the opposite reason that his limited knowledge gave him no alternative.

The principle represents a compromise between the two interests - each with a very different points of view and most vitally concerned with bye-laws - the technical and the legal. Technically,the ideal is complete flexibility with a reasonable minimum standard,while the legal ideal is absolute precision. The difficulty as far as the law is concerned, is in prescribing with sufficient precision, the reasonable minimum standard. Being a compromise, the application has some important weaknesses which can be summed up in one word 'restrictiveness'.

Performance standards are essentially related to current practice which are always changing. He ends his talk with a

quotation from an eminent lawyer, the late Lord Macmillan : 'Reform of procedure is always a ticklish business, for we grow accustomed to the paths we have long trodden, however tortuous, and vested interests are apt to grow up around them. But the task must be undertaken from time to time if the vehicles of law are to keep pace with the changing requirements of the age'.

In the discussion followed, two principles seem to be of vital importance to C.S. white, -

a) Reasonable flexibility should inspire the wording, interpretation and administration of building legislation.

b) It is the duty of all architects, users and local authority officials to take critical interest in new developments.

On the other hand, George Fairweather does not share this view and feels that the purpose of building bye-laws is to protect life and health of users and in fulfilling this purpose, it should be sufficient to state the minimum standard of the function primarily concerned with these considerations. He says that it may be misleading to suggest that technicians and architects require flexibility. On the contrary architect would be very much pleased to have precision as he is always interested in knowing the 'function', of which precision is an important aspect.

However, W.A.Sherrington contradicts him by welcoming the principle of flexibility. He feels that too rigid interpretation of bye-laws has retarding influence on development

of architecture. Human element, according to him, should also be regarded as an essential factor in this flexibility. Richard Simons is in favour of very simple code based entirely upon function leaving everything else to the integrity and ability of the architectural profession. To achieve this, Thomas Sibthrop says that it is essential to make ourselves fully in touch with technical advances so that bye-laws can be used functionally rather than purely as 'deemed to satisfy' requirements.

2.1.2 Building Regulations : a paper by J.Gero and B.Maurice, written in connection with D.Hawkes's 'Critical Analysis of Building Legislation' and a doctoral thesis by B.Maurice :

The authors have categorised building regulations according to their purpose and shown how these regulations protect public health, public safety, economic investment, service system, aesthetics and public amenity. Speaking in relation to the effect of building regulations on built form, they have given reference of D.Hawkes's 'Critical Analysis of Building Legislation', in which he said that the expression of the provision of building bulk and spacing legislation is most frequently geometric, being simply in terms of linear dimensions. They have also pointed out that the early regulations were designed to control zoning rather than bulk or form and they feel that it was the New York Zoning Ordinance of 1916 which laid the groundwork for many geometrically

based regulations. There are in addition, arithmetical controls which relate quantities such as site area to the floor area of the building. Such arithmetical controls do not offer possibility of transmitting preconceptions which might occur with geometric controls.

The relationship between a piece of control legislation and the theoretical forms which it produces may be constant or variable depending upon the influence of physical environment in which they operate. D.Hawkes has examined the effects of geometrical regulations on built form and has shown that most geometric rules do not take account of the nature of the site's immediate surroundings, although this is often done by including in the geometric rules, the road widths adjacent to the site. The use of geometrical or graphical techniques dates back to the regulations in the early part of the century when all forms of specification were prescription-method-oriented rather than performance oriented. K.Watts and others have shown that in terms of day lighting requirements, many other forms are possible than those arrived at using geometrical rules. Similar conclusions may be drawn from the studies of Wise, Sexton and Lillywhite concerning air flow around buildings. Obviously, the method of specifying these regulations needs to be re-examined.

According to Hawkes, the form which the expression of the legislation itself has taken has not usually been an explicit statement of the significant parameters and the values

ascribed to them, but has consisted of formal analogies incorporating these standards. At the level of application, this legislation appears to be more concerned with forms than with values and standards. One of the reasons for this may be due to the methods by which the regulations are represented i.e. in graphical and geometric terms.

An alternative method may be to develop mathematical models which can be easily manipulated by computer, that can be readily attered or restated and re-examined to determine the effects of regulations. Such mathematical modelling can be applied to many forms of regulation expression, even the existing legislation can be modelled. M.J.Brown of Sydney city has developed a simulation model of the existing planning regulations for Sydney. Such models not only increase the ability of designers to examine a wide range of solutions but can be used by legislators to determine the effects of changes in legislation.

2.2 ACHIEVEMENTS AND EVALUATION OF WORK DONE IN INDIA :

2.2.1 The National Building Code :

The National Building Code, which has been formulated by the Indian Standards Institution, has in fact made a praiseworthy attempt of achieving the optimum standards in construction activity of urban areas in the country. It covers virtually all the aspects of modern living. The guiding committee has adequately provided for considerable flexibility in the

applications of various norms, so that advances in construction technology can be incorporated into the code from time to time. Its main target is to make an attempt to unify building bye-laws throughout the country. The provisions of the code are not mandatory, but serve as guidelines to government departments, municipal bodies and other construction agencies.

The need for such a code was felt as the building regulations and bye-laws brought out by municipal corporations and state governments which largely regulate construction activity in the country, are often found to be 'specification oriented' rather than 'performance-oriented'. More often than not, they restrict the creativity of the architects and structural engineers. The code represents ideal situations for building and construction and these are not always attainable.

2.2.2 Steps taken by Guild of Practising Architects (GPA) :

The Guild of Practising Architects (GPA) was set up in 1977. The main objects of the Guild are to protect, safeguard and promote the interests of practising architects and to take necessary steps for the furtherance and promotion of the 'Art of Science' of architecture.

Complicated rules and regulations prescribed by local bodies like Delhi Development Authority, Municipal Corporation of Delhi, New Delhi Municipal Committee etc. and the divergent procedures and practices followed by them in according approval to building plans, not only causes delay in the

progress of work, but also create unnecessary problems in the way of growth and development of the building industry. In keeping with its aims and objectives, the Guild of Practising Architects, immediately on its coming into existence, took up with the authorities concerned, the question of bringing uniformity in the building bye-laws and the procedures being followed by them and the simplification of the rules and regulations for the benefit of all concerned, the details of which are not stated as the attempt made to seek the information regarding the same, was unsuccessful.

2.3 ACHIEVEMENTS AND EVALUATION OF WORK DONE IN BOMBAY :

2.3.1 Objections and suggestions in respect of Development Control Rules and Building Bye-laws by 'Practising Engineers Architects and Townplanners Association' (PEATA) :

Practising Engineers Architects and Townplanners Association (PEATA) has published 'Objections and suggestions in respect of publication of the draft revised development plan of municipal corporation of greater Bombay'. It is divided into five parts, the fourth part of which deals with the objections/suggestions in respect of Development Control Rules and Building Bye-laws. The clauses 11 to 21 of this part, deal with the 'General Building Requirements'-(Part-II of the Draft - Development Control rules and Building bye-laws)

The objections/suggestions are raised/made by adding,

deleting or replacing certain words so as to make the clauses more appropriate. The general trend of these suggestions is reviewed below in points :-

- Limit for the building height is increased for the same width of the means of access.
- Additional requirements are suggested for pathways.
- Requirement of recreational area is proposed to be reduced and the area of structure permitted in such recreational ground is desired to be proportional to the area of recreational ground. Toilets are considered to be essential in such recreational grounds.
- In general, the trend is towards less open space for tall buildings, since after the limit of 24m. building height, more height is expected to be permitted for the same open space.
- The restriction on terrace provision is found to be unjustifiable and unreasonable.
- Maximum chajja projection is suggested to be increased from 0.3m to 0.5m.
- Maximum balcony width is also desired to be increased from 0.9m to 1.35m and restriction on balcony is expected to be maintained on 10% floor area instead of 1/3rd length of the perimeter of the building.
- Requirements for parking of scooters and cycles are expected to be as per Time Saver Standards. The car-parking standards are lowered and made flexible i.e. limit of minimum area for which parking is made compulsory, is increased with provision of a range for these areas. The car-parking is suggested not to be made compulsory for narrow plots.

- Areas of staircases, lifts, common corridors, fire escape passages and entrance hall at ground floors are not expected to be computed in F.A.R., since these areas do not increase the density of the building. Minimum width of staircase is proposed to be increased to 1.2m from 1.0m. Minimum two staircases are desired to be insisted upon for buildings having more than 25m height. Incentive for providing wider staircases, lift shafts, common corridors is suggested by way of excluding these areas from F.A.R. calculations, only if the dimensions of these are at least 50% higher than the requirements under the bye-laws.
- Minimum size and width of bathroom and combined toilet are suggested to be reduced, whereas area of mezzanine floor is proposed to be increased to 50% of the built-up area of that room, if the minimum width of it is more than 3m. An increase is suggested in the height of basement.
- Rules for fire escape stairs are expected to be made applicable at a greater height of the buildings.
- Clause for provision of refuse area is deemed to be deleted as it is likely to create health hazard due to lack of maintenance.

2.3.2 A System Chart for processing building proposal by A.Ogale, practising architect of Bombay :

The system of obtaining approval of the proposal is rather faulty in that the architect has to spend a lot of his valuable time to follow up his proposal to its final approval and consequently can pay less attention to designing as such.

As a solution to this problem, A.Ogale, a practising architect of Bombay has worked out a System Chart for processing building proposal. In this chart,he has shown how the building proposal, once submitted, can be processed. This can eliminate architect's trouble of going to different authorities for different approvals concerned. He has also specified time limits for different procedures for getting the proposal sanctioned. Thus, considerable amount of time can be saved. It will be beneficial for architects' community to implement this system chart in practice.

CHAPTER - III : METHOD AND PROCEDURE

The various aspects of 'method and procedure' are classified into two parts -

3.1 : Field work carried out by means of survey of architects' views, case studies and occupants' survey

3.2 : Information collected through relevant literature and formulation of optimum standards, in the light of which each bye-law (i.e. included in the study) is evaluated.

3.1.1 Survey of Architects' Views :

With a view of knowing architects' opinions about the Building Bye-laws of Greater Bombay, a survey of architects of Bombay was carried out. A pilot study was done in the beginning, which initially included seven architects, with whom the discussions were carried out regarding the factors causing dissatisfaction with the prevailing building bye-laws. The responses were considered as a base while referring various books on research methodology to form a questionnaire, which was distributed among ten other architects. Keen observations were made at this juncture regarding the clarity of questions and time taken by the architects to answer the questionnaire.

The questionnaire was revised accordingly, by deleting, adding or modifying certain questions. This revised questionnaire (as per appendix 'A') was distributed among seventy five architects. The names and addresses of these architects

were traced mainly from 'All India Architects' and Builders ' 'Directory' and 'Directory of Indian Institute of Architects' and also through personal contacts. The cross section of sample was selected by keeping in mind the overall experience in the field. This was as follows :

Less than 10 years	-	20 architects
10 to 20 years	-	20 architects
20 to 30 years	-	20 architects
more than 30 years	-	15 architects

Thus an attempt was made to keep the cross-section uniform. The same proportions were followed right from the pilot study. Pilot study and formation of questionnaire took about two and a half months whereas distribution and collection of questionnaires was done in a month's time.

3.1.2 Case Studies :

Case studies are divided into two categories -

* Intensive case studies
* Partial case studies.

Plan of each dwelling unit is studied and evaluated with reference to the building bye-laws for the intensive case studies, whereas partial category includes case studies in point where design of a particular aspect is affected due to the strict observation of building bye-laws.

The total number of intensive case studies done is three. The criteria for selection of these case studies are -

* Buildings with dwelling units having close relation to the minimum standards, with minor fluctuations
* Buildings having dwelling units with use-conversion of spaces
* The socio-economic level of residents. This was judged roughly from the location of the building. (Since the dissertation deals with the minimum standards - which usually are found in middle class dwellings, the selection of case studies is done each from upper middle-class, middle middle-class and lower middle-class.

Accordingly, the division was as follows -

Type of Building	Name of Building	Name of Locality	Location	Income Level (Rs./month)
Bldg. Type 1	Build-arch Terrace	Mahim	City	2600-4000
Bldg. Type 2	Chaitali	Bandra (East)	Suburb along Western Railway	1600-2500
Bldg Type 3	Goawalla Trust building	Kurla	Suburb along Central Railway	1000-1500

The only criterion for selection of partial case studies was the flaw noticed in a certain aspect of building design that resulted through bye-law regulations. The total number of partial case studies done was six.

3.1.3 Occupants' Survey :

Many architects maintain that the occupants are not

able to distinguish between good and bad, so there is no importance and meaning to the records of their preferences and satisfaction : Architects are the ones who have to educate and plan for the public. However, according to Dan Soen, to ignore the dwellers' preferences in a democratic society harbours danger. Michelson's conclusion is that 'Even though a lack of wisdom may prevent people from choosing what is clearly in their own best interests', it is their preferences and not architectural theories that will in the long run influence, much of what is built today.

Keeping these points in mind, occupants' survey was carried out in all the three buildings of Intensive case studies. A brief interview schedule was framed (as per appendix 'B') for stydying the level of their satisfaction regarding their dwellings. Number of occupants interviewed in each building type were 11, 19 and 22 respectively. Since the occupants' satisfaction is not absolute and can be defined only in relative terms, the interviews were conducted in an informal manner which helped in pinpointing several new aspects related to their satisfaction, which were not included in initial interview schedule.

3.2 Exploration of Optimum Standards from the Viewpoints of the User Needs :

The home is seen as an environment for growth and human development, rather than a "finished product" to be looked at and displayed. The success of the design can

only be determined by the extent to which it meets users' needs and expectations. At the same time, human needs are variable and frequently unpredictable. These certainly are not quantifiable but complex, subtle and mysterious in nature. Therefore, these needs are more likely to be met through an understanding of the sensory, non-rational elements than by more technology.

With this background in mind, several books related to the topic were studied. As the topic of the dissertation is concerned with the critical view for building bye-laws, most of the relevant literature was traced from the periodicals. Some papers were also collected through correspondence with Royal Institute of British Architects, London, Building Research Establishment (Department of the Environment),U.K. and Bartlett School of Architecture and Planning, University College, London.

In the light of this information, each bye-law included in the study is evaluated with its statement in nutshell and criticism moving side by side.

CHAPTER-IV : CASE STUDIES AND DATA ANALYSIS

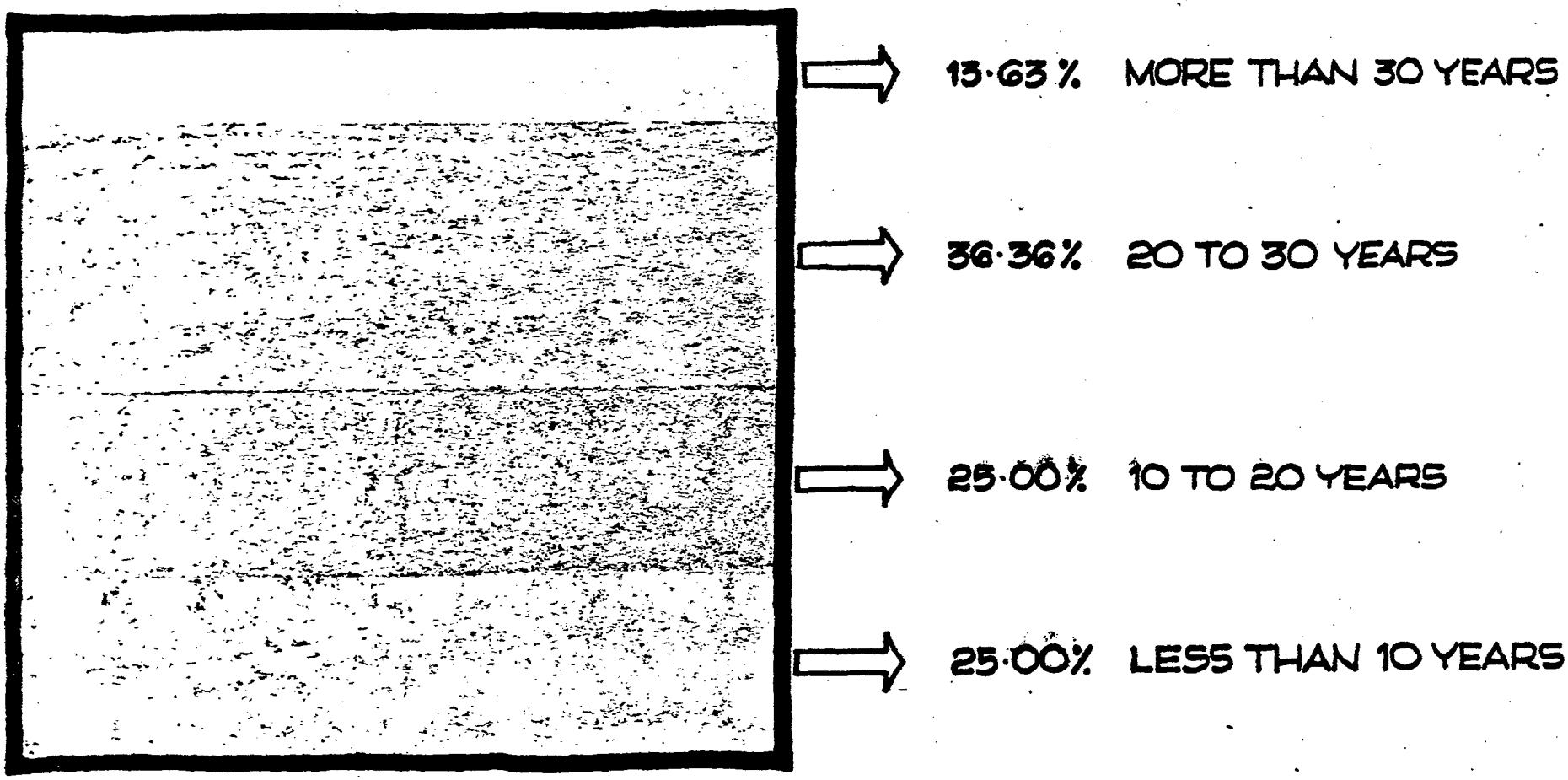
4.1 ANALYSIS OF DATA FROM ARCHITECTS' SURVEY :

The questionnaire for Architects' survey was distributed among 75 architects, 44 of whom responded. The number of architects was maximum - 16 i.e. 36.36% in 20 to 30 years overall experience category, whereas categories of 10 to 20 years experience and that of less than 10 years, responded in equal proportion of 11 architects each i.e. 25%. More than 30 years experience category had only 6 architects' i.e. 13.63% response. The results of the survey are stated below as per the question number. (The illustrations are on plate 4a to plate 4h).

1) 47.73% architects find building bye-laws helpful in controlling the residential development. 27.27% find them somewhat helpful. 20.45% feel that they are very helpful and only 4.55% think that these are not of much help. None of the architects is denying their help.

2) As far as the present building bye-laws are concerned, half the sample i.e. 52.27% find them moderately useful whereas 27.27% think that these are cumbersome. Architects finding them to be very useful or useless are in equal proportion of 11.36%. Neutral opinion regarding this is carried out by 4.54%.

Thus, majority of architects do realise the significance of building bye-laws in general, but at the same time, they find the present building bye-laws to be moderately useful or



CROSS SECTION OF THE SAMPLE SHOWING OVERALL EXPERIENCE IN THE PROFESSION

PLATE 4b

1 HELP RENDERED BY THE BUILDING REGULATIONS

20·45 % VERY HELPFUL

47·73 % HELPFUL

27·27 % SOMEWHAT HELPFUL

4·55 % NOT OF MUCH HELP

0·00 % NOT AT ALL HELPFUL

2 USEFULNESS OF THE PRESENT BUILDING REGULATIONS

11·36 % VERY USEFUL

52·27 % MODERATELY USEFUL

4·54 % NEITHER USEFUL NOR USELESS

27·27 % CUMBERSOME

11·36 % USELESS

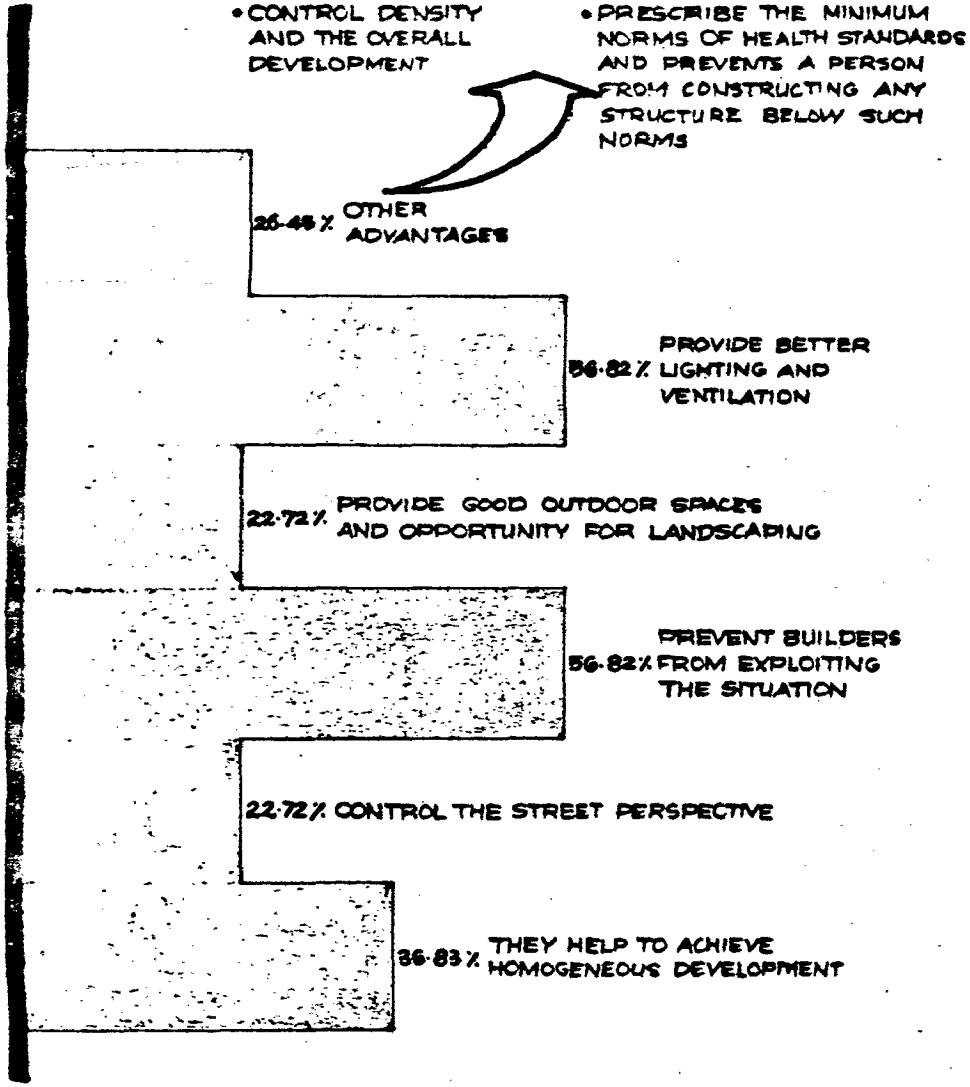
cumbersome.

3) Among the advantages of present building bye-laws, 56.82% feel that they prevent builders from exploiting the situation and provide better lighting and ventilation. 36.83% feel that they help to achieve homogeneous development and 22.72% consider them to control the street perspective and provide good outdoor spaces and opportunity for landscaping. 26.45% are among the other advantages like controlling density and overall development and prescribing minimum norms of health standards.

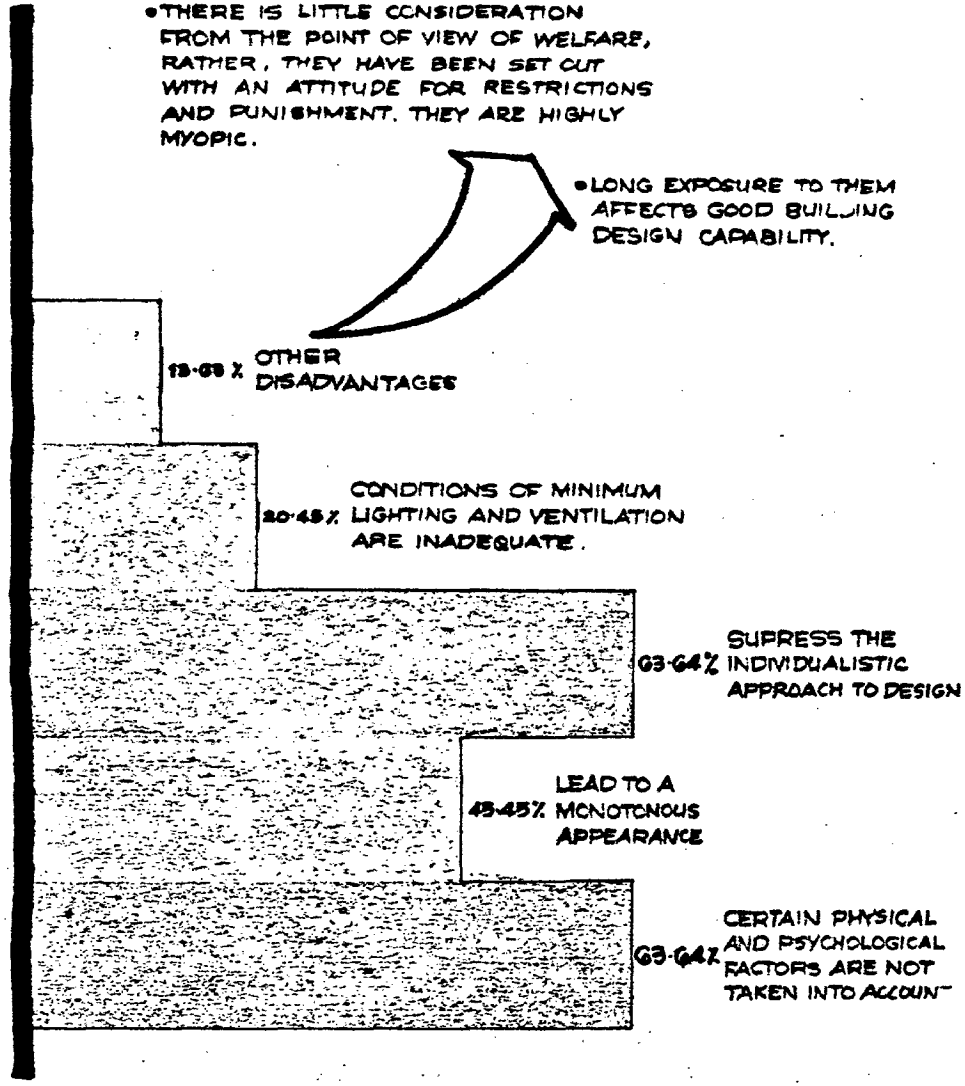
Regarding the disadvantages, 63.64% feel that they do not take into account certain physical and psychological factors and suppress the individualistic approach to design. 45.45% think that these lead to a monotonous appearance. 20.45% feel that the conditions for minimum lighting and ventilation in these are inadequate. 13.63% are for other disadvantages like long exposure to these, affects good building design capability and there is little consideration from the point of view of welfare, rather these have been set out with an attitude for restrictions and punishment. They are highly myopic.

4) Change in the methodology of submission and approval of drawings is desired by 93.18%, out of which 61.36% desire changes only in procedure whereas 31.82% opt for changes in format of drawings as well as procedure. 9.09% suggest other changes like evolution of total system, regulating the procedure through one apex and changes in scrutinizing procedure.

5) Majority i.e. 61.37% want the professional background of the approving authority to be purely technical, whereas 31.82% feel that it should be administrative



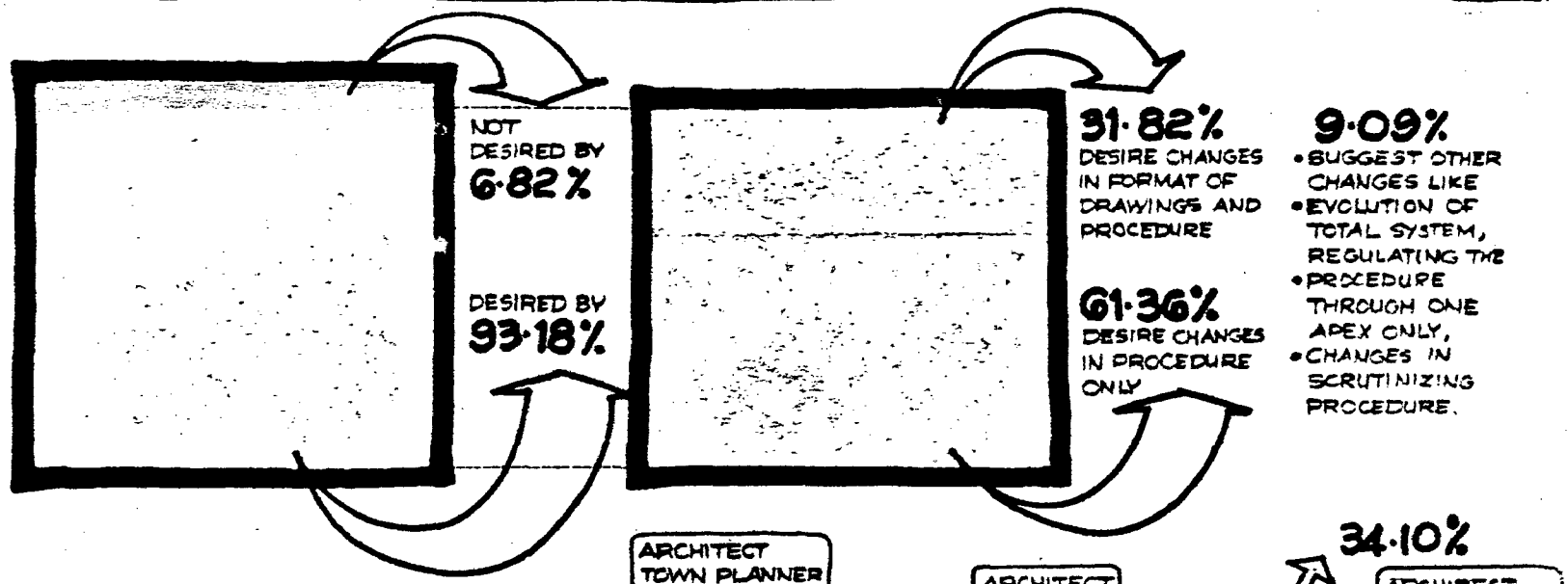
3 ADVANTAGES

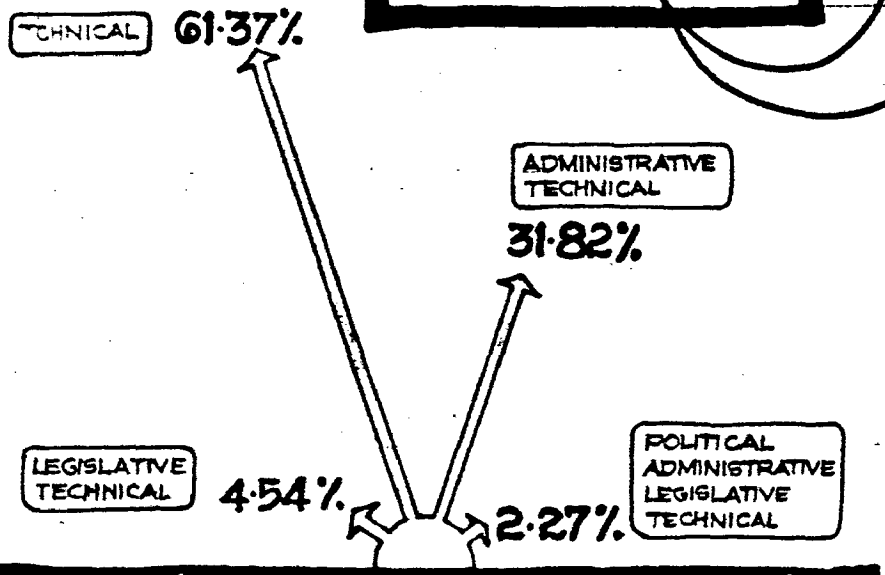


DISADVANTAGES

4

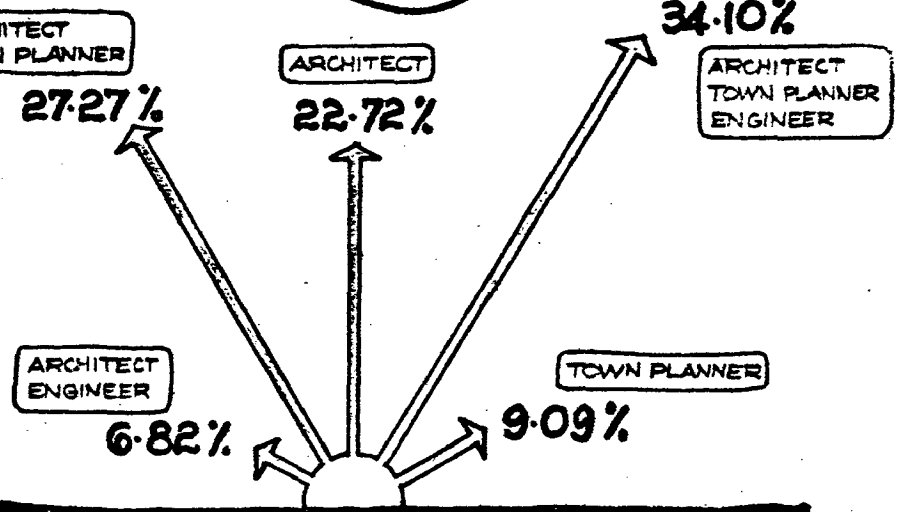
CHANGES IN METHODOLOGY OF SUBMISSION AND APPROVAL





5 a

PREFERENCES FOR PROFESSIONAL BACKGROUND OF APPROVING AUTHORITY



5 b

PREFERENCES FOR THE BRANCHES OF THE TECHNICAL BODY

and technical. Legislative and technical combination is desired by 4.54%, while only 2.27% opt for the combination of political, administrative, legislative and technical.

Among the branches of technical body, 34.10% are for the combination of architect, town planner and engineer. 27.27% opt for architect - town planner combination. Sole architect is desired by 22.72% and sole town planner by 9.09%. Architect - engineer combination is opted by 6.82%.

Division of approving body is desired by 79.55% and 20.45% are against such compartmentalisation.

6) 90.91% have experienced difficulties in approval, in spite of a straightforward proposal. Their answers were quite emphatic. They also went to the extent of saying that the proposal will never get easily approved, however straightforward it is, because there are always minor differences in the interpretations and that they have even taken the matter to the higher authorities for simple, straightforward cases.

7) Regarding the recommended policies, 34.10% are for implementation of bye-laws without exceptions (in spirit, not just by the letter). 29.54% think that concessions should be given to special cases, for plots of irregular size and shape and for strong architectural concepts. 11.36% are both for waiving aside some objections in certain cases and giving concessions to special cases. 4.54% feel that some objections can be waived aside in certain cases.

8) 88.64% of architects feel that their imagination is restricted due to builders' pressure to stick to the minimum standards. Some of them also said that builders not only insist on sticking to the minimum

5 C

DIVISION OF THE APPROVING BODY

NOT DESIRED BY 20-45%

DESIRED BY 79-55%

7

RECOMMENDED POLICIES

3410% IMPLEMENTATION WITHOUT EXCEPTIONS (IN SPIRIT, NOT JUST BY THE LETTER)

4-54% WAIVING ASIDE SOME OBJECTIONS IN CERTAIN CASES

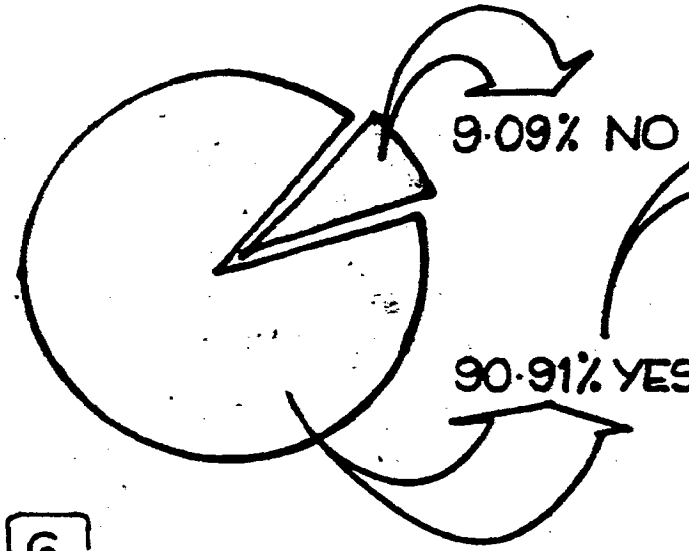
29-54% GIVING CONCESSIONS TO SPECIAL CASES (WITH A REAL AUTHENTIC COMMITTEE WITHOUT FAVOURITISM), CONCESSIONS FOR PLOTS OF IRREGULAR SIZE AND SHAPE AND EXCEPTIONS BASED ON STRONG ARCHITECTURAL CONCEPTS.

2-28% IMPLEMENTATION WITHOUT EXCEPTIONS WITH SOME OBJECTIONS WAIVED ASIDE IN CERTAIN CASES

15-90% IMPLEMENTATION WITHOUT EXCEPTIONS, GIVING CONCESSIONS TO SPECIAL CASES.

11-36% WAIVING ASIDE SOME OBJECTIONS IN CERTAIN CASES AND GIVING CONCESSIONS TO SPECIAL CASES.

2-28% IMPLEMENTATION WITHOUT EXCEPTIONS, WAIVING ASIDE SOME OBJECTIONS IN CERTAIN CASES AND GIVING CONCESSION TO THE SPECIAL CASES.



9-09% NO

90-91% YES

THE POSITIVE RESPONSES INCLUDE THE ANSWERS LIKE

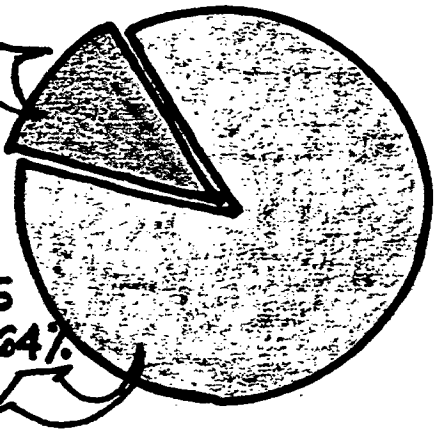
- YES, ALWAYS, YES, PLENTY
- IT NEVER GETS APPROVED IF IT IS A STRAIGHT-FORWARD PROPOSAL
- HAVE TAKEN THE MATTER TO THE HIGHER AUTHORITIES EVEN IN SIMPLE, STRAIGHT-FORWARD CASES.
- HOWEVER STRAIGHT-FORWARD A PROPOSAL, THERE ALWAYS ARE MINOR DIFFERENCES IN THE INTERPRETATIONS OF THE BUILDING REGULATIONS WHICH USUALLY ARE BASED ON LOGIC.

6

DIFFICULTIES IN APPROVAL IN SPITE OF A STRAIGHT-FORWARD PROPOSAL

THERE MAY BE A FEW WHO DO IT.
IT IS UPTO THE ARCHITECT TO BUILD HIS OWN IMAGE FOR PROFESSIONAL RESPECT.

11-36% NO



YES 88-64%

THE POSITIVE RESPONSES INCLUDE THE ANSWERS LIKE

- YES DEFINITELY
- NOT STICKING BUT FLOUTING
- NOT ENCOURAGING BUT INSISTING
- DEPENDS UPON BUILDER'S POLICIES, LOCATION AND THE TYPE OF THE BUILDING

8

RESTRICTION OF IMAGINATION DUE TO THE BUILDERS' PRESSURE TO STICK TO THE MIN. STANDARDS

standards, but encourage to flout the same. At the same time, they feel that it all depends upon builder's policies, location and type of building.

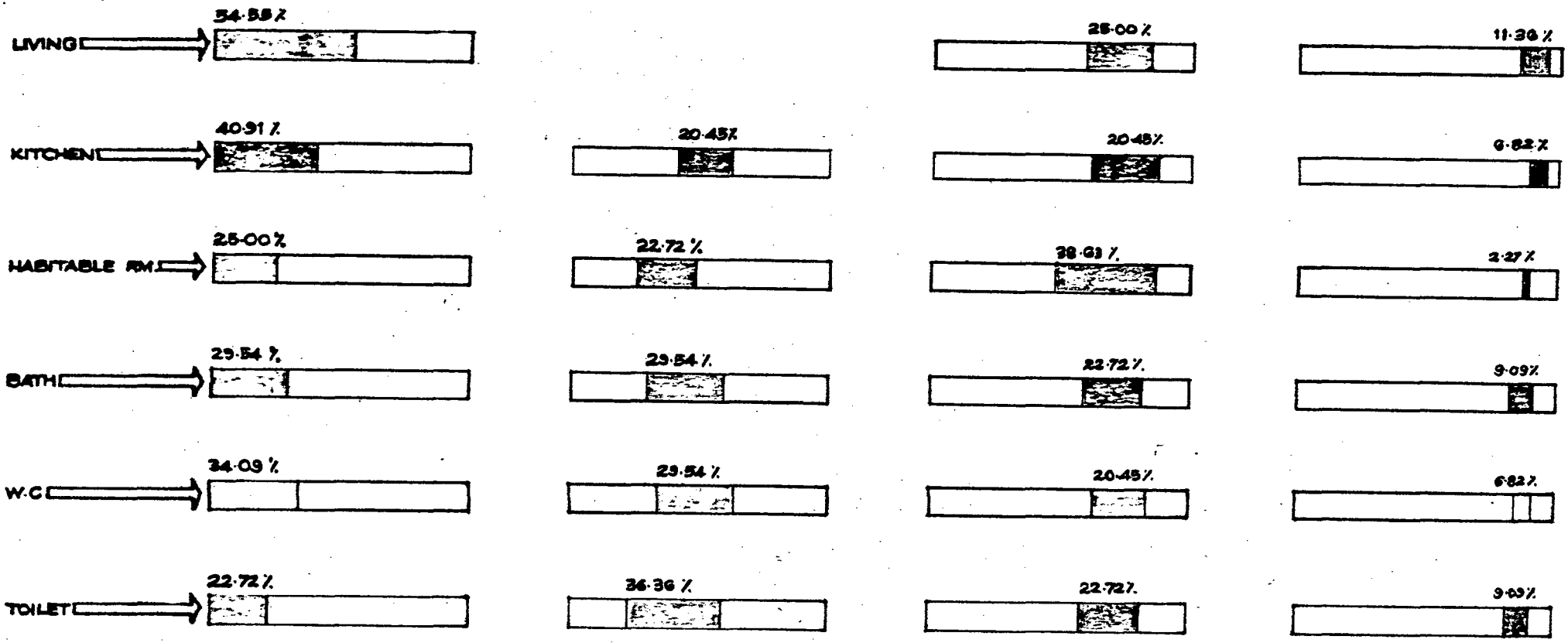
9) As for the opinion about minimum areas, living and kitchen areas as per old bye-laws are opted by majority. Minimum area for a habitable room is desired to be exceeded. Satisfaction regarding minimum bath area can be seen for old as well as revised bye-laws. Where old standards for W.C. area are found more appropriate, revised standards for toilet area are preferred by majority. A meagre percentage is for reducing all the areas.

10) 52.27% find the spaces mentioned in building bye-laws, inadequate. The remaining 47.73% feel that residents' requirements are fulfilled for a family of 3 to 5. 77.28% suggest specific mention about drying area, servant's accommodation, study room, guest room and store. In order to stop the use conversion of spaces, smaller habitable areas for such rooms are desired. Washing place and garbage chutes are also required to be mentioned.

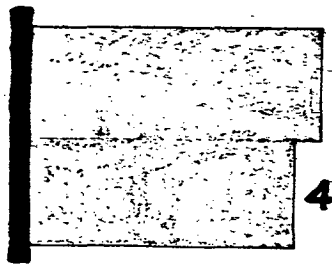
11) Variety of opinions are seen regarding the preferences for minimum widths. For living and habitable room, minimum widths are opted to be increased. Satisfaction is expressed for old standards for kitchen, bath and W.C. widths. The preference for old, revised and increased standards for toilet width is almost in equal proportion. When most of them are satisfied with revised width for corridor, some are also for still increasing the same. A meagre percentage does opt for reducing all the widths.

12) Majority desires to increase the minimum standards for heights of habitable room and kitchen. Satisfaction

9 PREFERENCES FOR MINIMUM AREAS



10 FULFILMENT OF HOUSEHOLD REQUIREMENTS WITH THE SPACES INDICATED ABOVE

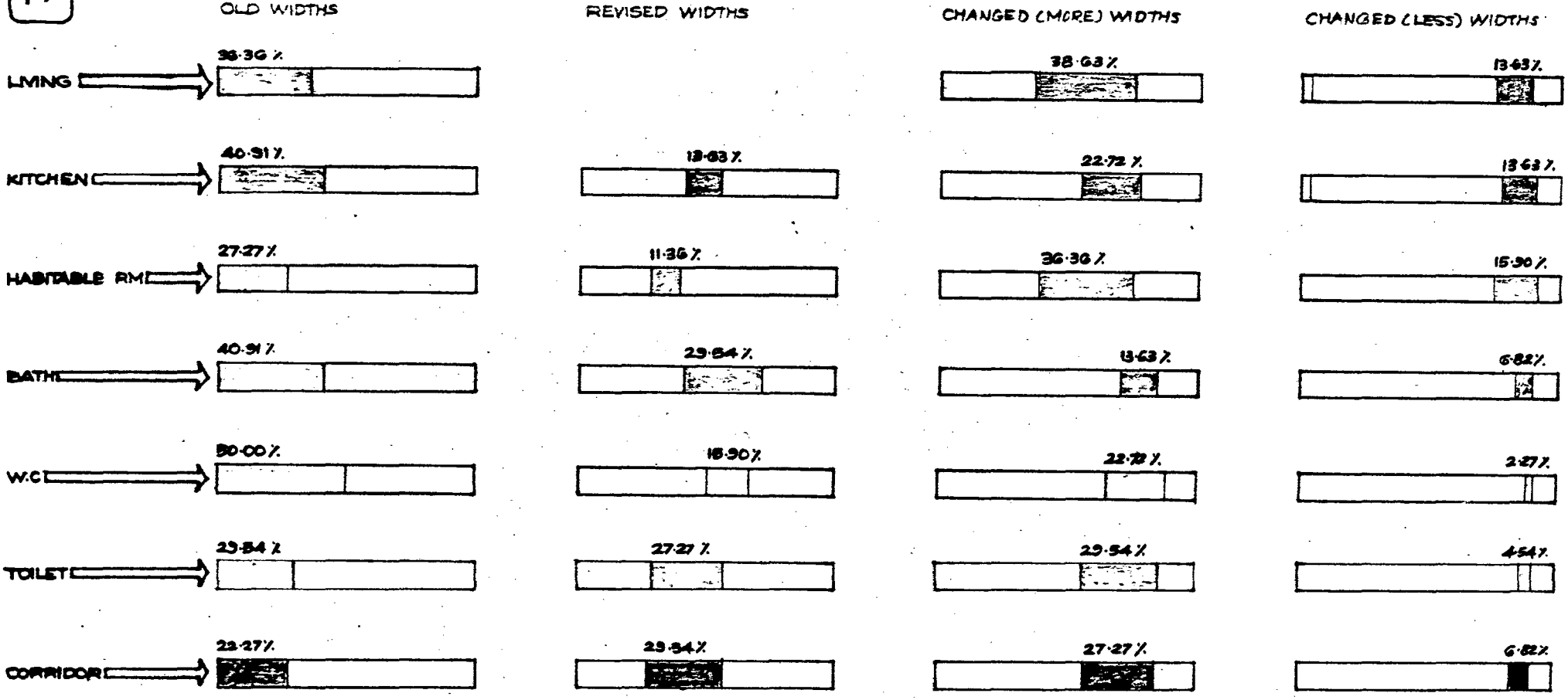


52.27% FEEL THAT THE RESIDENTS' REQUIREMENTS ARE NOT FULFILLED WITH THE ABOVE MENTIONED SPACES.

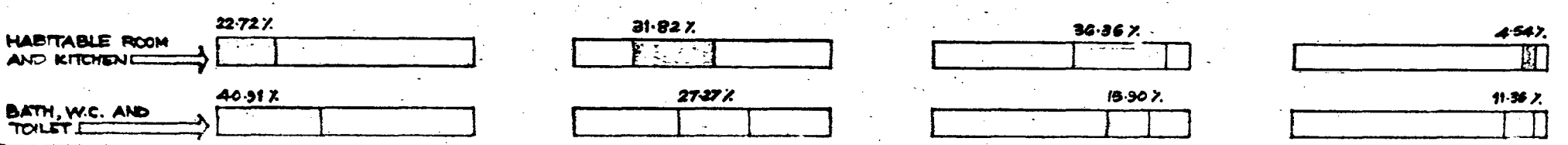
47.73% FEEL THAT THE RESIDENTS' REQUIREMENTS ARE FULFILLED WITH THESE SPACES ESPECIALLY FOR FAMILY OF 3 TO 5

77.28% FEEL THAT THERE SHOULD BE A SPECIFIC MENTION ABOUT DRYING AREA, DINING AREA, SERVANT'S ACCOMODATION, STUDY RM., GUEST RM. AND STORE. A SMALLER HABITABLE RM. SHOULD BE ALLOWED, SO THAT CONVERSION OF USE DOES NOT TAKE PLACE. WASHING PLACE AND GARBAGE CHUTE ARE ALSO ESSENTIAL.

11 PREFERENCES FOR MINIMUM WIDTHS



12 PREFERENCES FOR MINIMUM HEIGHTS



is marked for old standards of minimum height for bath, W.C. and toilet.

13) Nearly three quarters of the sample i.e. 72.73% suggest changes for effective utilisation of balcony whereas 27.27% do not show any dissatisfaction with the present restrictions on balcony dimensions.

14) Though half the sample is satisfied with the bye-laws regarding minimum open spaces, 36.36% find them inadequate. 9.09% feel that they are just adequate and only 4.55% find them to be in excess.

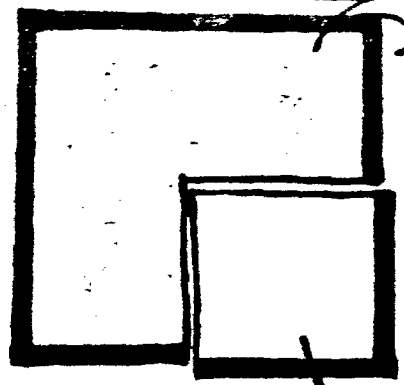
63.64% suggest changes in the pattern of open spaces like provision with mutual understanding with neighbouring plots, row house concept, compulsion for parking under stilts and landscaped recreational area, reducing rear open space and creating open recreational areas at upper floors.

15) 31.82% feel slight adverse influence of the present building bye-laws on their imagination. 29.54% feel the same to quite an extent and 27.27% to a great extent. However, 11.37% feel no such adverse influence of the building bye-laws and think that it only involves a little procedural work to convince the idea and consider a parameter as a stepping stone for a man who has imagination. Of course, this category is inclusive of some of the eminent architects.

16) Opinion is equally divided regarding the decision of minimum standards to be left to the discretion of architect.

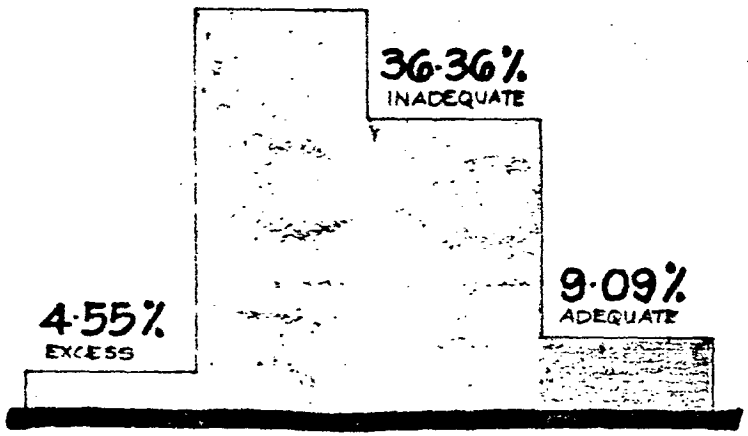
17) 61.37% do not opt for uniform F.A.R. provisions and feel that the difference should be based on different uses and locations (like city and suburbs). Though half the sample finds present F.A.R. provisions

13 RESTRICTIONS ON BALCONY DIMENSIONS

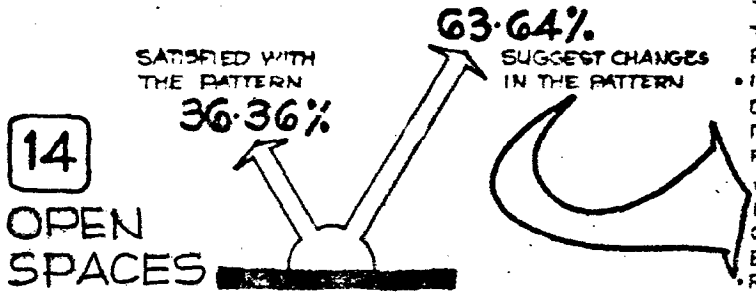


72.73% SUGGEST CHANGES FOR EFFECTIVE UTILISATION

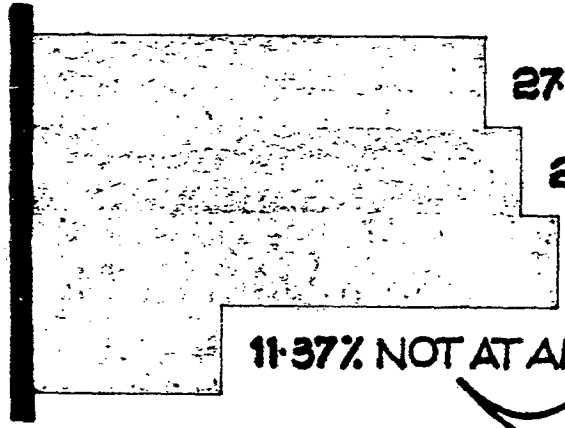
27.27% ARE SATISFIED WITH THE PRESENT CONDITIONS



14 OPEN SPACES



15 ADVERSE INFLUENCE ON ARCHITECTS' IMAGINATION



27.27% VERY MUCH

29.54% TO QUITE AN EXTENT

31.82% SLIGHTLY

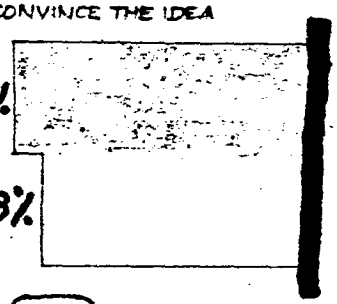
11.37% NOT AT ALL

- PARAMETER IS A STEPPING STONE FOR A MAN WHO HAS IMAGINATION
- IT DOES INVOLVE A LITTLE PROCEDURAL WORK TO CONVINCE THE IDEA

- IT SHOULD BE PROVIDED WITH MUTUAL UNDERSTANDING BETWEEN NEIGHBOURING PLOTS.
- ROW HOUSE CONCEPT SHOULD BE INCORPORATED
- PARKING UNDER STILTS SHOULD BE MADE COMPULSORY AND AT LEAST ONE SIDE OF PROPERLY LANDSCAPED RECREATIONAL AREA SHOULD BE KEPT CONTIGUOUS TO THE BLDG.
- 5% OF SUCH OPEN SPACES TO BE LEFT FOR RECREATION / LANDSCAPE WITH RESTRICTION ON MIN. WIDTH.
- IN CASE OF COMPOSITE DEVELOPMENT (COMMERCIAL PREMISES ON GR. FL. WITH RESIDENCES ON FLOORS ABOVE) OPEN SPACES TO BE CREATED ON ROOF OF COMMERCIAL PREMISES FOR EFFECTIVE UTILISATION.
- REDUCE REAR OPEN SPACE.

16 DECISION OF MINIMUM STANDARDS

- SHOULD NOT BE LEFT TO THE DISCRETION OF THE ARCHITECT 52.27%
- SHOULD BE LEFT TO THE DISCRETION OF THE ARCHITECT 47.73%



17 F.S.I. PROVISIONS

58.68% DESIRE UNIFORM F.S.I. PROVISIONS IN DIFF. PARTS OF THE CITY.

61.37% DO NOT WANT IT TO BE UNIFORM. THE DIFFERENCE SHOULD BE BASED ON DIFF. USES AND CITY AND SUBURBS

20.45% FIND THE F.S.I. PROVISIONS IN EXCESS 50.00%. FIND THEM OPTIMUM WITH NEED FOR RETHINKING AND FEEL THAT REDUCTION IS DESIRABLE.

20.45% FIND THESE INADEQUATE GIVING DUE IMPORTANCE TO THE ECONOMIC ASPECT

2.27% FIND THESE TO BE ADEQUATE

4.54% SAY THAT THESE ARE IRRELEVANT AND 2.27% UNIMAGINABLE

18 LIGHTING AND VENTILATION

77.28% FIND THE CONDITIONS OF MINIMUM LIGHTING AND VENTILATION TO BE ALRIGHT AS MINIMUM.

20.45% SUGGEST CHANGES.

2.27% FIND THESE SATISFACTORY IN SUBURBS AND INADEQUATE IN CITY.

PLATE 4h

optimum, they also feel that rethinking is necessary and reduction is desirable. The proportion of finding these provisions in excess or inadequate is equal. Architects finding it inadequate feel that due importance to the economic aspect should be given. However, there are some architects who find these provisions irrelevent or unimaginable.

18) The opinion about lighting and ventilation have been extremely diverse and contradictory wherever changes are suggested. Three quarters of sample are satisfied with these requirements as minimum.20.45% suggest changes and 2.27% find these to be satisfactory in suburbs and inadequate in city.

19) Though during discussions, it was found that most of them are not satisfied with the present building bye-laws, the disatisfaction was not sharply noticed in the written answers. Majority of answers are positive regarding the difficulty in adhering to the present building bye-laws but no reasons are specified for the same.

20) The following suggestions are made for the improvement of building bye-laws -

* Updating of bye-laws is necessary and they should be simplified and decreased in number.
* A look at bye-laws from humane angle is necessary.
* Bye-laws should be followed with mutual understanding with neighbouring plots.
* A preample to bye-laws is required to arrive at early decisions in matters of interpretation.
* Procedure of approval should be simplified, because more complicated the procedure, greater the temptation to cut corners, increasing the corruption.
* Separate procedure of approval for minor proposals is necessary.

* Ceiling of time (about 3 weeks) should be put for the procedure of approval.
* Discussions with architect regarding the proposal should be encouraged by forming an authentic committee.
* Bye-laws should be based on socio-economic conditions and climatic factors. Therefore, wide balconies, parking facilities and servant's accommodation are necessary.
* Permissible balcony area should be increased to 20% of floor area, 10% of which, should not be allowed to be enclosed.
* Density of 80 tenements/acre should be made uniformly applicable and should be strictly controlled.
* F.A.R. regulations must be monitored to confirm to planning needs and not land values.
* Implementation of zoning regulations should be strict.

4.2 CASE STUDIES :

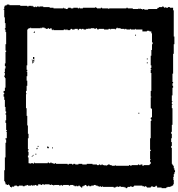
The illustrations of case studies of both the categories - intensive and partial, are shown on plate 4i to plate 4t.

The building types are classified as follows -

Type of building	Name of building	Socio-economic class
Bldg. Type 1	Build-arch Terrace	Upper middle-class
Bldg. Type 2	Chaitali	Middle middle-class
Bldg. Type 3	Goawalla Trust Building	Lower middle-class

4.3 DATA ANALYSIS OF OCCUPANTS' SURVEY :

Occupants' survey was carried out in all the three



AREA (IN SQ.FT) STATEMENT

BLDG. TYPE 1

LIVING	140·00
KITCHEN	83·25
BEDROOM	148·50
BATH	19·25
W.C.	12·00
PASSAGE	27·25
BALCONY	56·00
TOTAL BUILT-UP AREA	544·30

BLDG. TYPE 2

LIVING	136·00
KITCHEN	59·88
BEDROOM	100·00
BATH	15·75
W.C.	12·00
PASSAGE	22·50
BALCONY	0·00
TOTAL BUILT-UP AREA	415·36

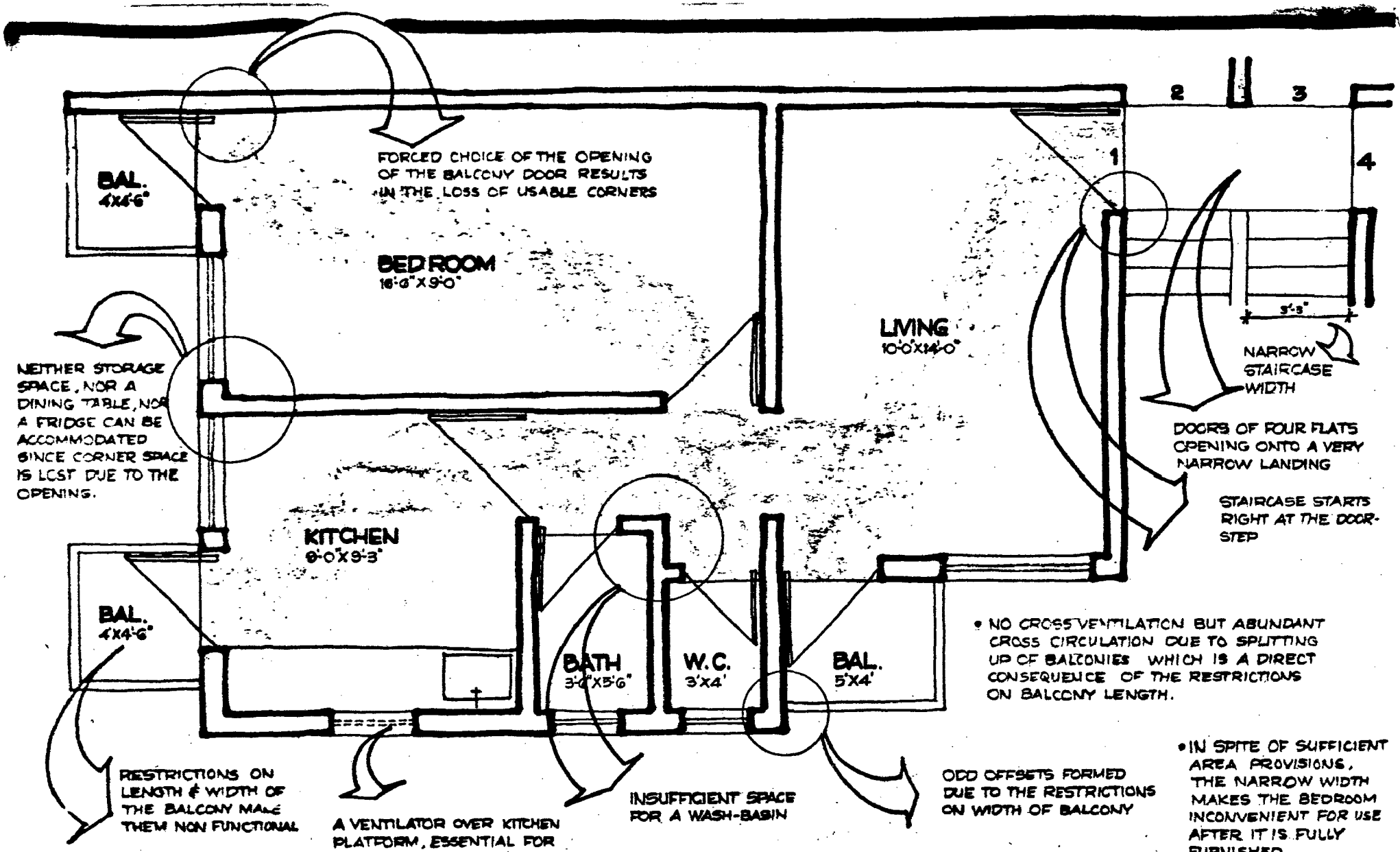
BLDG. TYPE 3

LIVING	120·00
KITCHEN	35·00
BEDROOM	84·00
TOILET	32·00
PASSAGE	15·00
BALCONY	38·00
TOTAL BUILT-UP AREA	362·20

■ BLDG. TYPE 1
■ BLDG. TYPE 2
■ BLDG. TYPE 3

• % MORE THAN 100 → MORE THAN ONE OPINIONS ARE EXPRESSED
• % LESS THAN 100 → SOME HAVE NOT EXPRESSED THEIR OPINIONS

PLATE 41


BAL.
4'X4'-6"
FORCED CHOICE OF THE OPENING OF THE BALCONY DOOR RESULTS IN THE LOSS OF USABLE CORNERS
BED ROOM
16'-6"X9'-0"
NEITHER STORAGE SPACE, NOR A DINING TABLE, NOR A FRIDGE CAN BE ACCOMMODATED SINCE CORNER SPACE IS LOST DUE TO THE OPENING.
KITCHEN
6'-0"X9'-3"
BAL.
4'X4'-6"
BATH
3'-0"X5'-6"
W.C.
3'X4'
BAL.
5'X4'
LIVING
10'-0"X14'-0"
1
2
3
4
3'-3"
NARROW STAIRCASE WIDTH
DOORS OF FOUR FLATS OPENING ONTO A VERY NARROW LANDING
STAIRCASE STARTS RIGHT AT THE DOOR-STEP
• NO CROSS VENTILATION BUT ABUNDANT CROSS CIRCULATION DUE TO SPLITTING UP OF BALCONIES WHICH IS A DIRECT CONSEQUENCE OF THE RESTRICTIONS ON BALCONY LENGTH.
• IN SPITE OF SUFFICIENT AREA PROVISIONS, THE NARROW WIDTH MAKES THE BEDROOM INCONVENIENT FOR USE AFTER IT IS FULLY FURNISHED.
RESTRICTIONS ON LENGTH & WIDTH OF THE BALCONY MAKE THEM NON FUNCTIONAL
A VENTILATOR OVER KITCHEN PLATFORM, ESSENTIAL FOR EXHAUSTING ODOURS & FUMES, USUALLY NOT PROVIDED. (AS NOT INSISTED UPON BY THE BUILDING REGULATIONS)
INSUFFICIENT SPACE FOR A WASH-BASIN
ODD OFFSETS FORMED DUE TO THE RESTRICTIONS ON WIDTH OF BALCONY

BLDG. TYPE 1

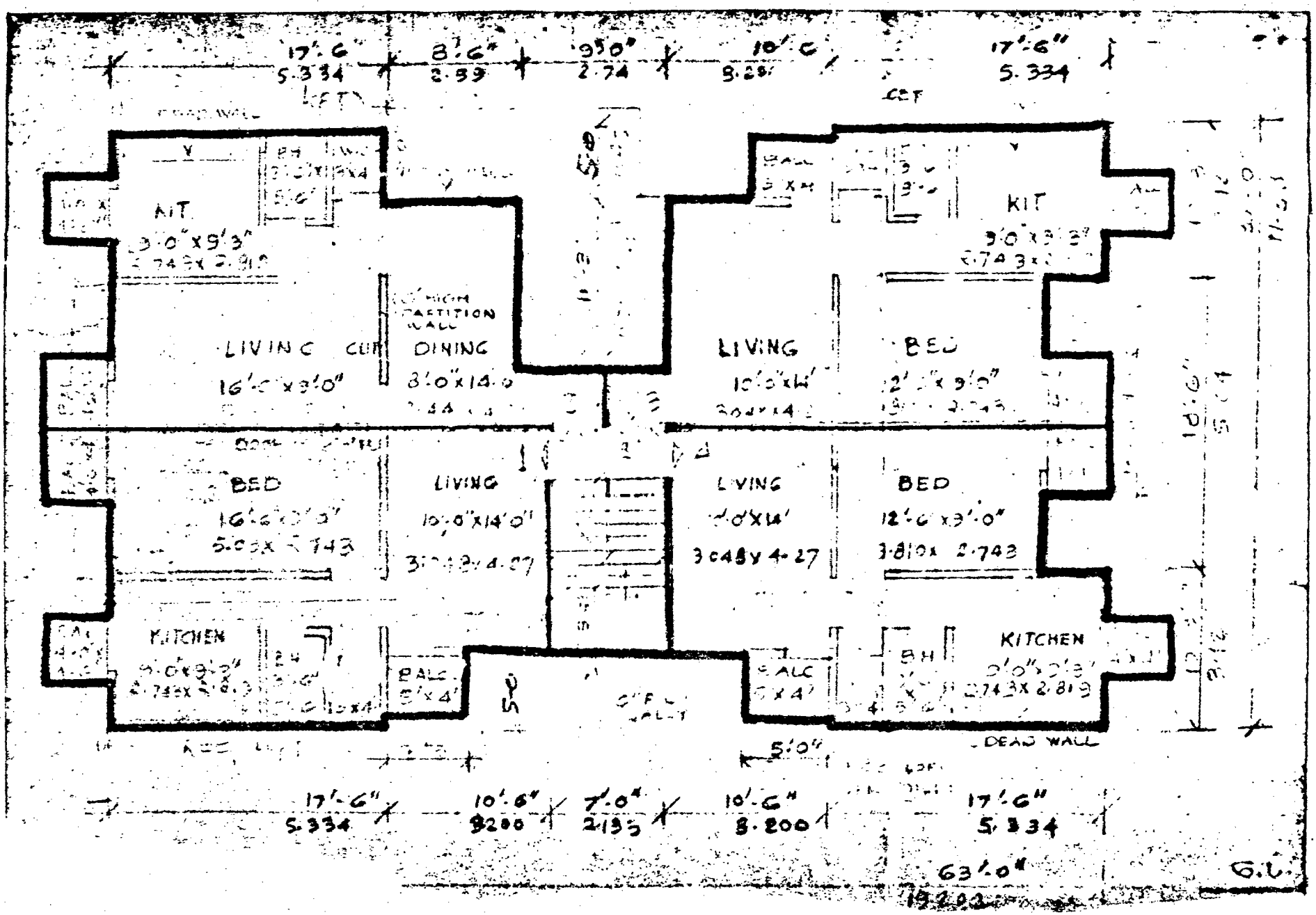
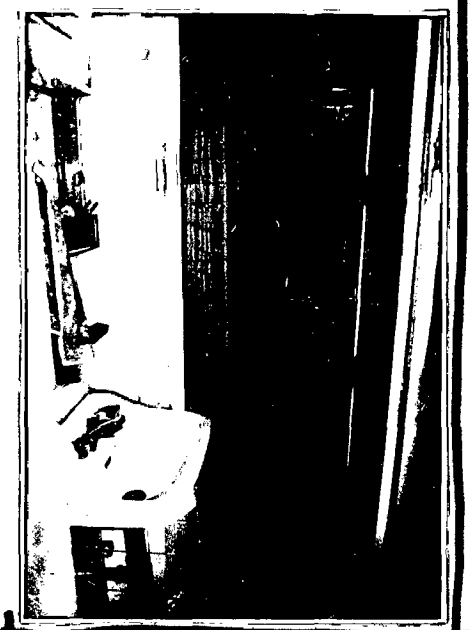

17'-6"
5.334
8'-6"
2.59
9'-0"
2.74
10'-6"
3.200
17'-6"
5.334
KIT
9'-0" x 9'-3"
2.743 x 2.819
LIVING
16'-6" x 9'-0"
DINING
9'-0" x 14'-0"
LIVING
10'-0" x 14'-0"
BED
12'-6" x 9'-0"
3.810 x 2.743
BED
16'-6" x 9'-3"
5.029 x 2.743
LIVING
10'-0" x 14'-0"
LIVING
10'-0" x 14'-0"
3.048 x 4.27
BED
12'-6" x 9'-0"
3.810 x 2.743
KITCHEN
9'-0" x 9'-3"
2.743 x 2.819
BALC
5'-0" x 4'-0"
BALC
5'-0" x 4'-0"
KITCHEN
9'-0" x 9'-3"
2.743 x 2.819
DEAD WALL
5'-0"
17'-6"
5.334
10'-6"
3.200
7'-0"
2.133
10'-6"
3.200
17'-6"
5.334
63'-0"
19.200

PLATE 4 K

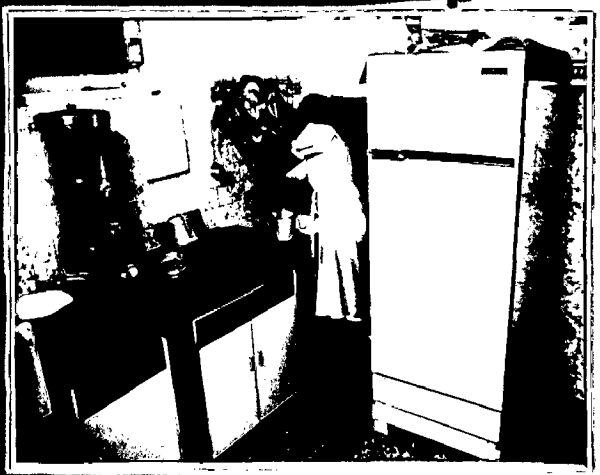
BUILD-ARCH TERRACE

MAHIM, BOMBAY
(BUILDING TYPE 1)

•NARROW STAIRCASE LANDING GIVING ACCESS TO FOUR FLATS

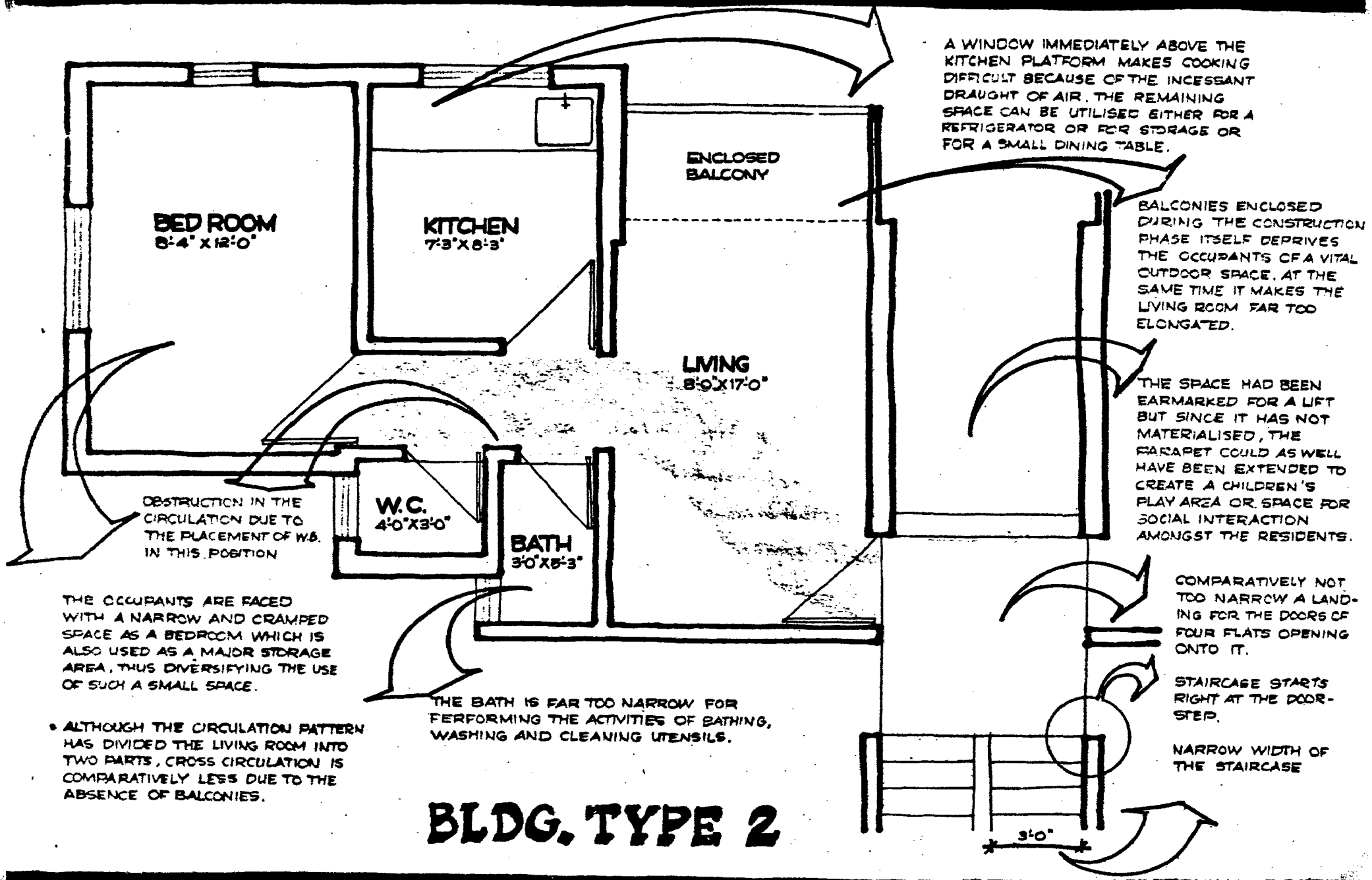


•WASH-BASIN RIGHT AT THE ENTRANCE OF WATER CLOSET OBSTRUCTS CIRCULATION



•KEEPING REFRIGERATOR IN KITCHEN CREATES ODD CORNERS MAKING ACCESS TO SINK DIFFICULT

•BATHROOM CONVERTED INTO KITCHEN. VENTILATION REMAINS THE SAME.



BLDG. TYPE 2

PLATE 41

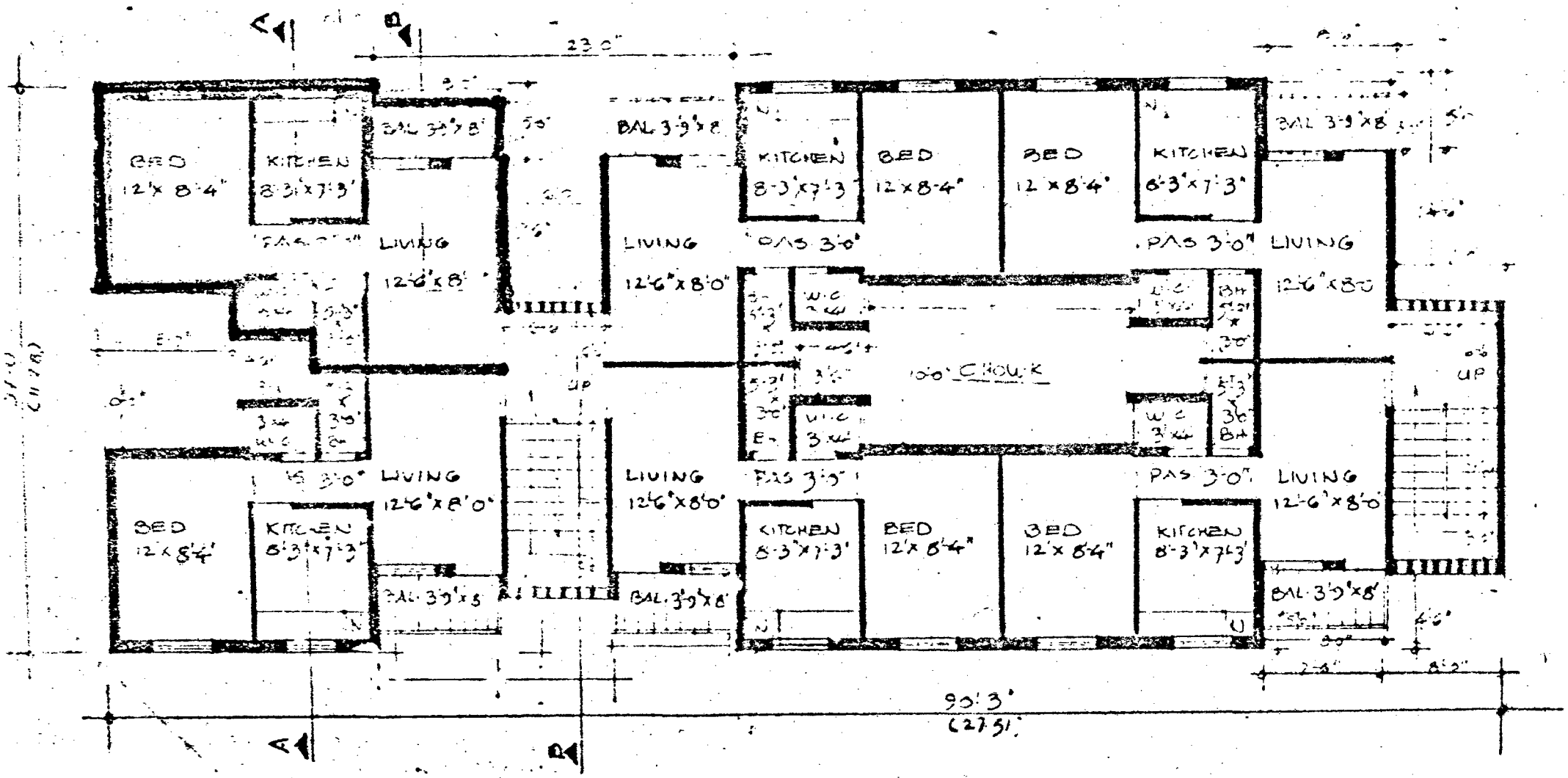
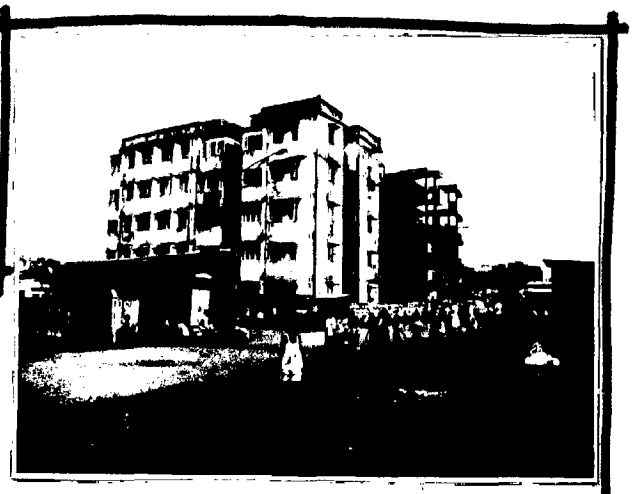

A
B
23'0"
BED
12'x 8'-4"
KITCHEN
8'-3"x7'-3"
BAL 3'-9"x8'
LIVING
12'-6"x8'-0"
PAS 3'-0"
BED
12'x 8'-4"
KITCHEN
8'-3"x7'-3"
BAL 3'-9"x8'
LIVING
12'-6"x8'-0"
PAS 3'-0"
BED
12'x 8'-4"
KITCHEN
8'-3"x7'-3"
BAL 3'-9"x8'
LIVING
12'-6"x8'-0"
PAS 3'-0"
W.C
BATH
10'-0" CHOWK
UP
BED
12'x 8'-4"
KITCHEN
8'-3"x7'-3"
BAL 3'-9"x8'
LIVING
12'-6"x8'-0"
PAS 3'-0"
BED
12'x 8'-4"
KITCHEN
8'-3"x7'-3"
BAL 3'-9"x8'
LIVING
12'-6"x8'-0"
PAS 3'-0"
BED
12'x 8'-4"
KITCHEN
8'-3"x7'-3"
BAL 3'-9"x8'
LIVING
12'-6"x8'-0"
PAS 3'-0"
W.C
BATH
UP
95'3"
(27.51)
A
B

PLATE 4m

CHAITALI

BANDRA (EAST), BOMBAY
(BUILDING TYPE 2)



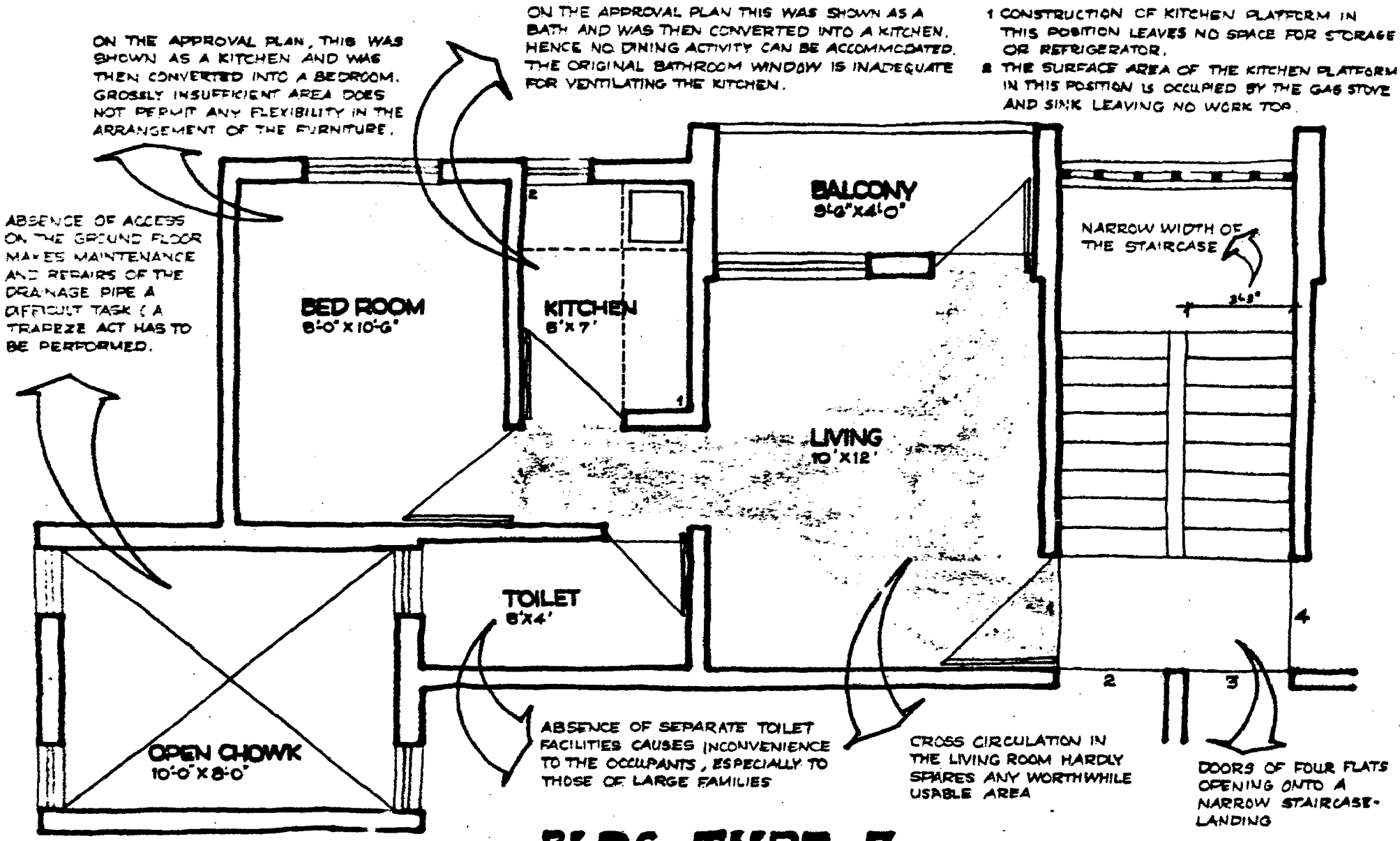
• NARROW STAIRCASE FLIGHT

• MULTI-PURPOSE USE OF ROOMS

• DINING ACTIVITY IN LIVING ROOM

• DINING ACTIVITY IN KITCHEN

• BEDROOM USED FOR STORAGE AND DRYING OF CLOTHES


ON THE APPROVAL PLAN, THIS WAS SHOWN AS A KITCHEN AND WAS THEN CONVERTED INTO A BEDROOM. GROSSLY INSUFFICIENT AREA DOES NOT PERMIT ANY FLEXIBILITY IN THE ARRANGEMENT OF THE FURNITURE.
ON THE APPROVAL PLAN THIS WAS SHOWN AS A BATH AND WAS THEN CONVERTED INTO A KITCHEN. HENCE NO DINING ACTIVITY CAN BE ACCOMMODATED. THE ORIGINAL BATHROOM WINDOW IS INADEQUATE FOR VENTILATING THE KITCHEN.
1 CONSTRUCTION OF KITCHEN PLATFORM IN THIS POSITION LEAVES NO SPACE FOR STORAGE OR REFRIGERATOR.
2 THE SURFACE AREA OF THE KITCHEN PLATFORM IN THIS POSITION IS OCCUPIED BY THE GAS STOVE AND SINK LEAVING NO WORK TOP.
ABSENCE OF ACCESS ON THE GROUND FLOOR MAKES MAINTENANCE AND REPAIRS OF THE DRAINAGE PIPE A DIFFICULT TASK (A TRAPEZE ACT HAS TO BE PERFORMED.
BED ROOM 8'-0" X 10'-6"
KITCHEN 8'X7'
BALCONY 9'-6"X4'-0"
NARROW WIDTH OF THE STAIRCASE
2'-8"
LIVING 10'X12'
TOILET 8'X4'
OPEN CHOWK 10'-0"X8'-0"
ABSENCE OF SEPARATE TOILET FACILITIES CAUSES INCONVENIENCE TO THE OCCUPANTS, ESPECIALLY TO THOSE OF LARGE FAMILIES
CROSS CIRCULATION IN THE LIVING ROOM HARDLY SPARES ANY WORTHWHILE USABLE AREA
DOORS OF FOUR FLATS OPENING ONTO A NARROW STAIRCASE-LANDING
1
2
3
4

BLDG. TYPE 3

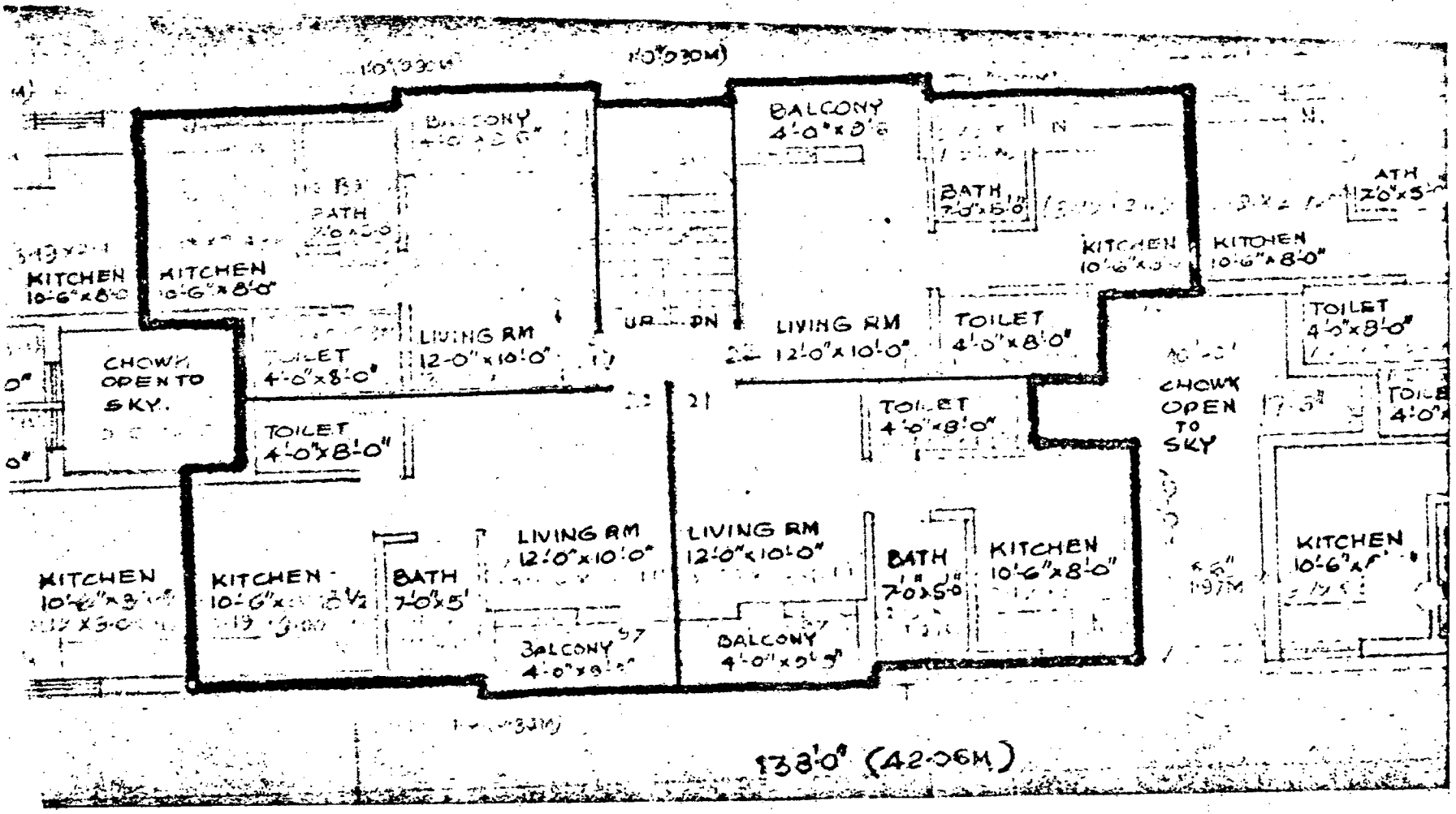
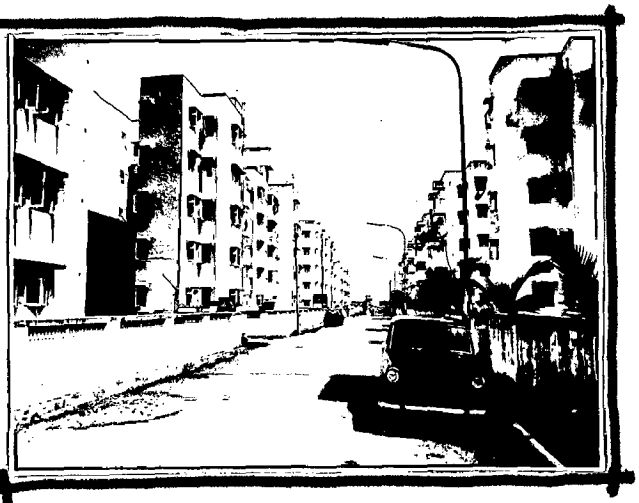

KITCHEN 10'-6"x8'-0"
KITCHEN 10'-6"x8'-0"
BATH 7'-0"x5'-0"
LIVING RM 12'-0"x10'-0"
TOILET 4'-0"x8'-0"
CHOWK OPEN TO SKY.
BALCONY 4'-0"x3'-6"
BATH 7'-0"x5'-0"
KITCHEN 10'-6"x8'-0"
LIVING RM 12'-0"x10'-0"
TOILET 4'-0"x8'-0"
CHOWK OPEN TO SKY
TOILET 4'-0"x8'-0"
KITCHEN 10'-6"x8'-0"
LIVING RM 12'-0"x10'-0"
BATH 7'-0"x5'-0"
BALCONY 4'-0"x3'-6"
LIVING RM 12'-0"x10'-0"
BALCONY 4'-0"x3'-6"
BATH 7'-0"x5'-0"
KITCHEN 10'-6"x8'-0"
KITCHEN 10'-6"x8'-0"
138'-0" (42.06M)

PLATE 40

GOAWALLA TRUST BLDG.

KURLA (WEST), BOMBAY
(BUILDING TYPE 3)

• KITCHEN OUT OF A BATH LEAVES NO WORK TOP OVER PLATFORM.



• BUILDING BYE-LAWS LEADING TOWARDS MONOTONOUS APPEARANCE

• SUPERFICIAL DECORATION IS BECOMING MORE COMMON DUE TO RESTRICTIONS ON BUILDING DESIGN.

• A THOUGHT SHOULD BE GIVEN TO THE ARCHITECTURAL DESIGN WHICH INVOLVES PLAY OF SPACES AND NOT MERE SUPERFICIAL DECORATION

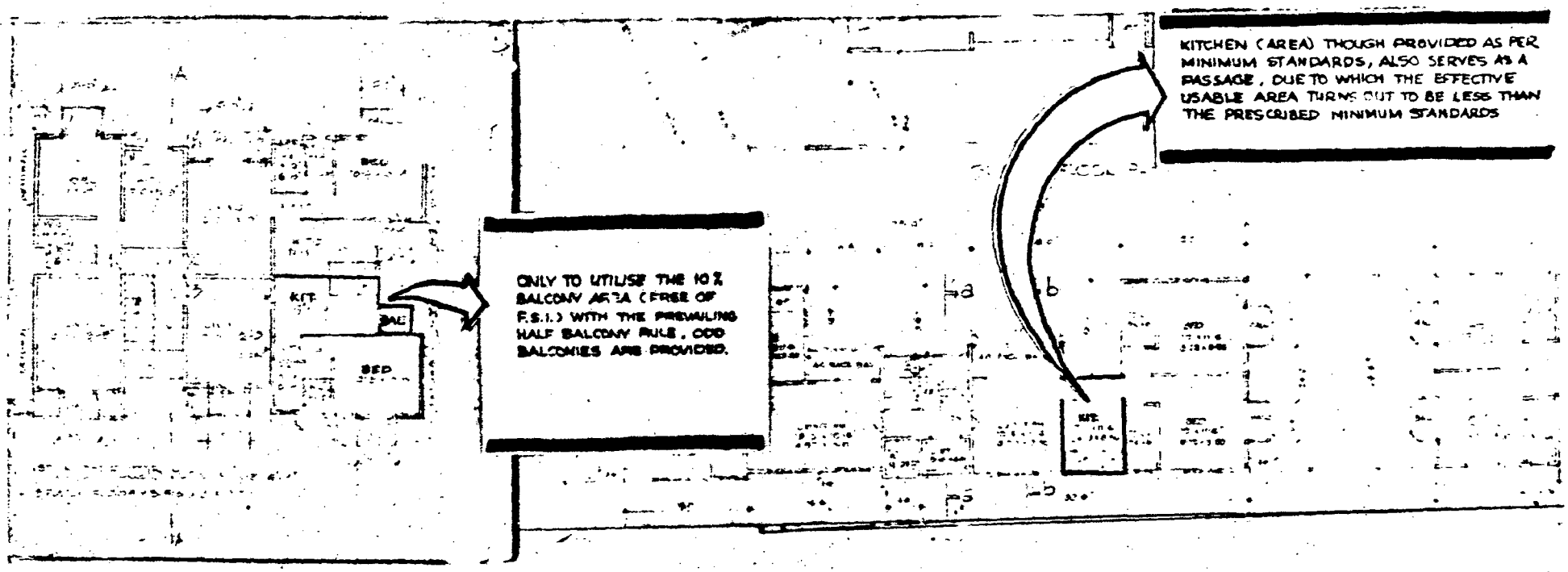

KIT
BAL
BED
ONLY TO UTILISE THE 10 % BALCONY AREA (FREE OF F.S.I.) WITH THE PREVAILING HALF BALCONY RULE, ODD BALCONIES ARE PROVIDED.
KITCHEN (AREA) THOUGH PROVIDED AS PER MINIMUM STANDARDS, ALSO SERVES AS A PASSAGE, DUE TO WHICH THE EFFECTIVE USABLE AREA TURNS OUT TO BE LESS THAN THE PRESCRIBED MINIMUM STANDARDS

PLATE 4 P

DUCT PROVIDED FOR THE TOILET IS THEN CONVERTED INTO A DRYING VERANDAH BY PUTTING A SLAB AND PROVIDING A DOOR OPENING.

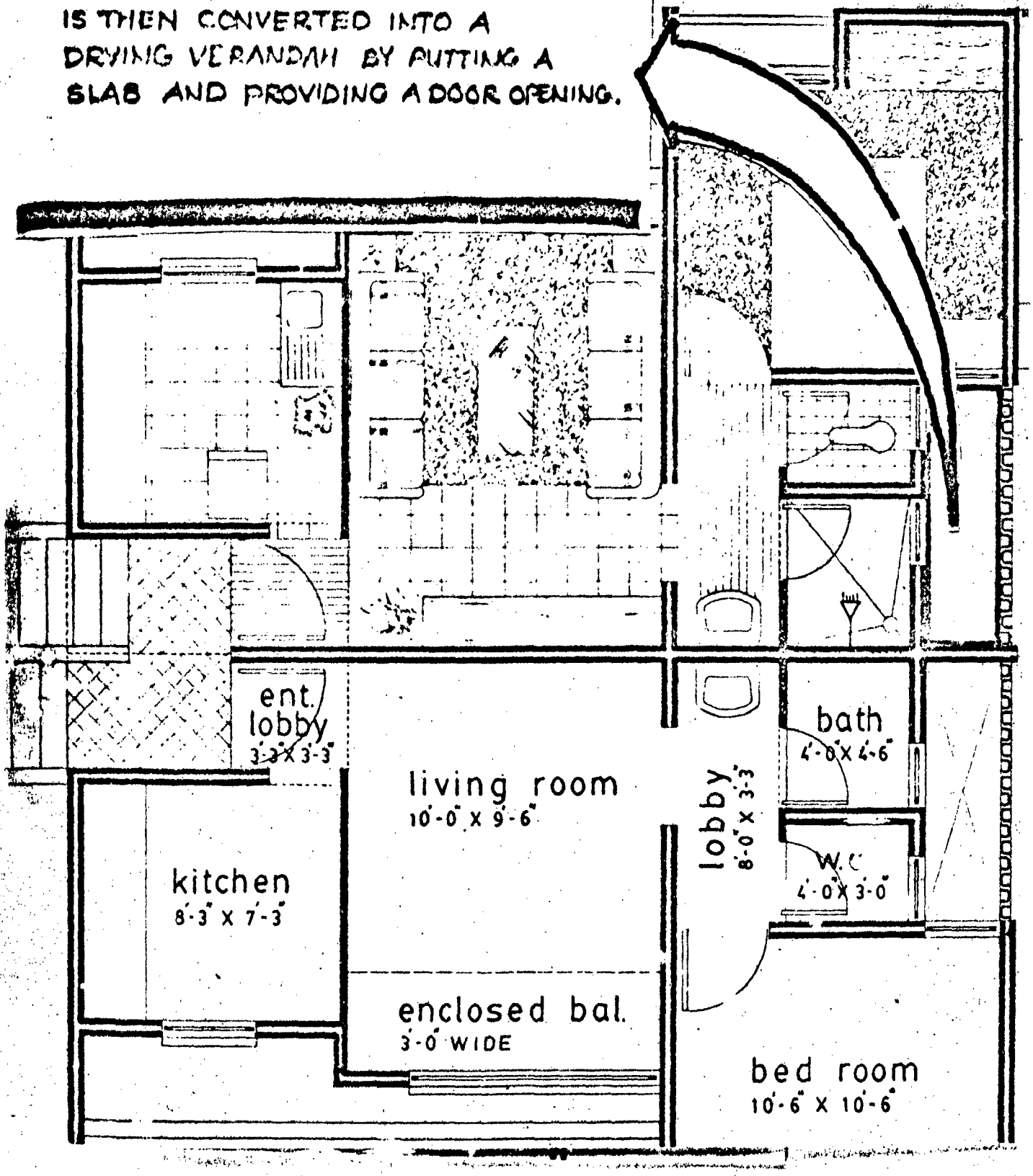


PLATE 4Q

THE LOBBY ON THE MUNICIPAL PLAN (FOR APPROVAL) IS THEN CHANGED TO ERVANT'S ROOM AS THE ROOM (HABITABLE) OF THIS SIZE IS NOT ALLOWED

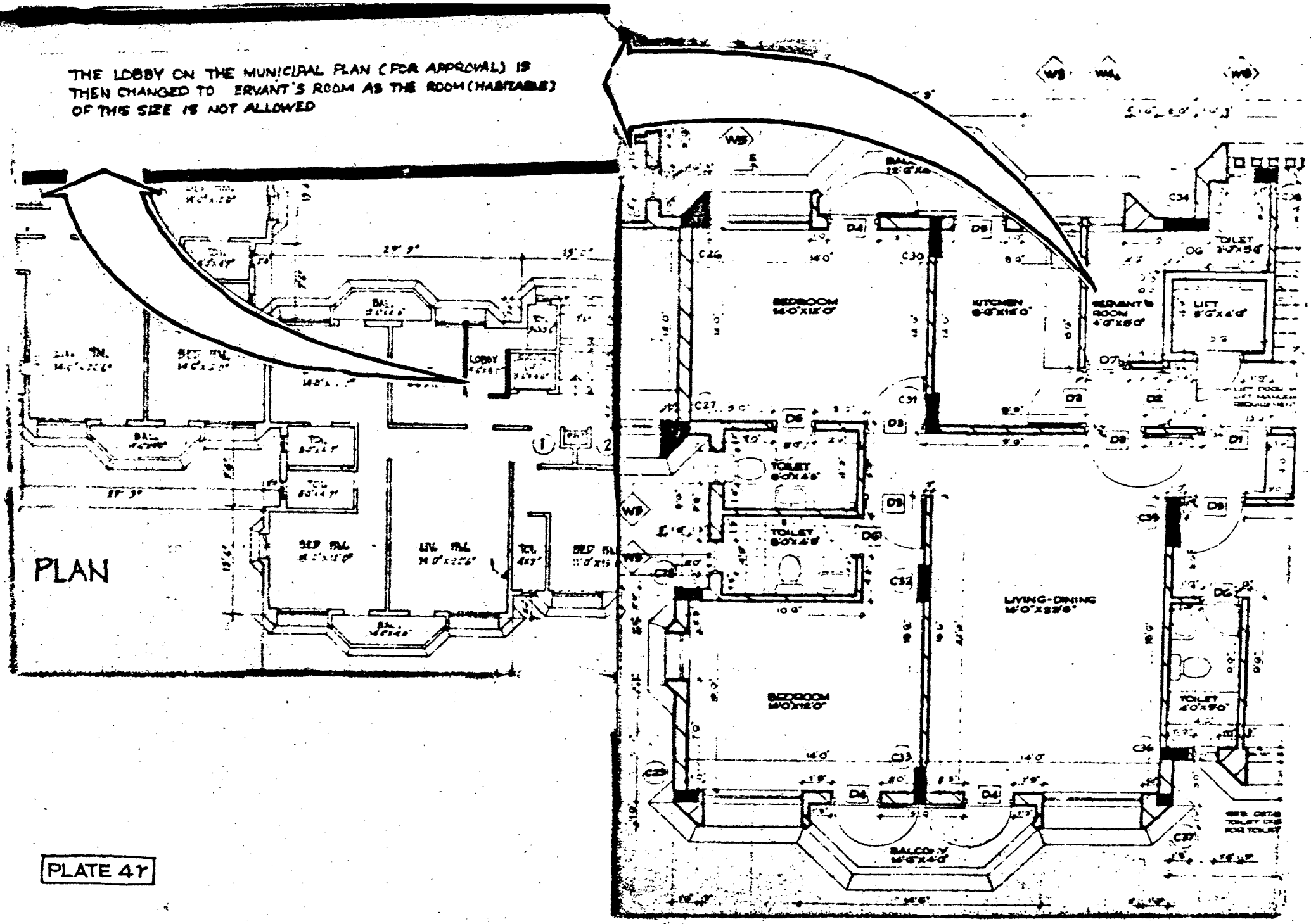
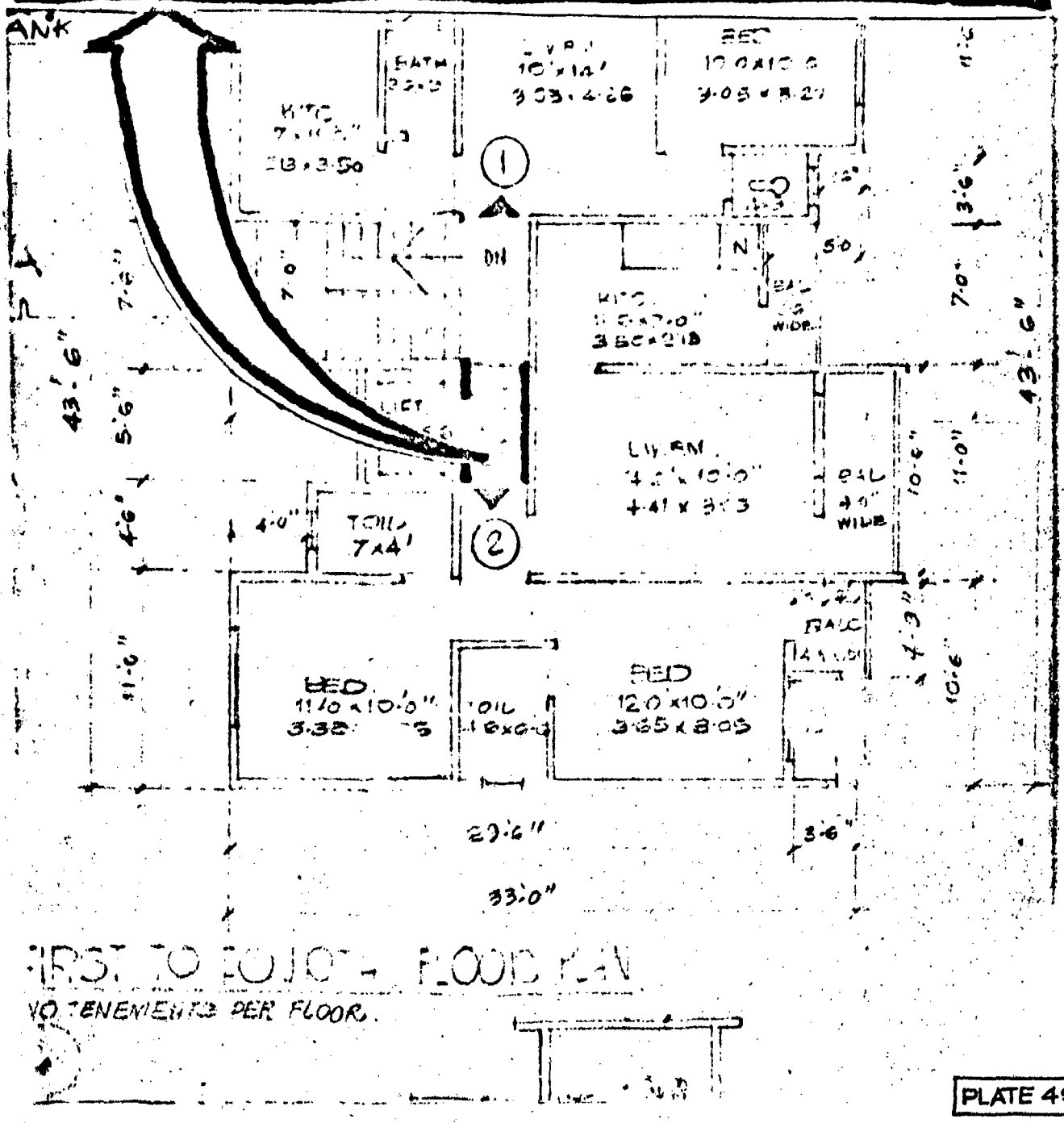


PLATE 41

TOO NARROW A LIFT LOBBY WHICH OBSTRUCTS THE CIRCULATION DUE TO PEOPLE WAITING FOR THE LIFT. THE LIFT COULD BE EASILY TAKEN BEHIND TO CREATE A LOBBY. (BUT IT IS NOT COMPULSORY AS PER BUILDING REGULATIONS)



FIRST TO FOUR FLOOR PLAN

TWO TENEMENTS PER FLOOR.

PLATE 46

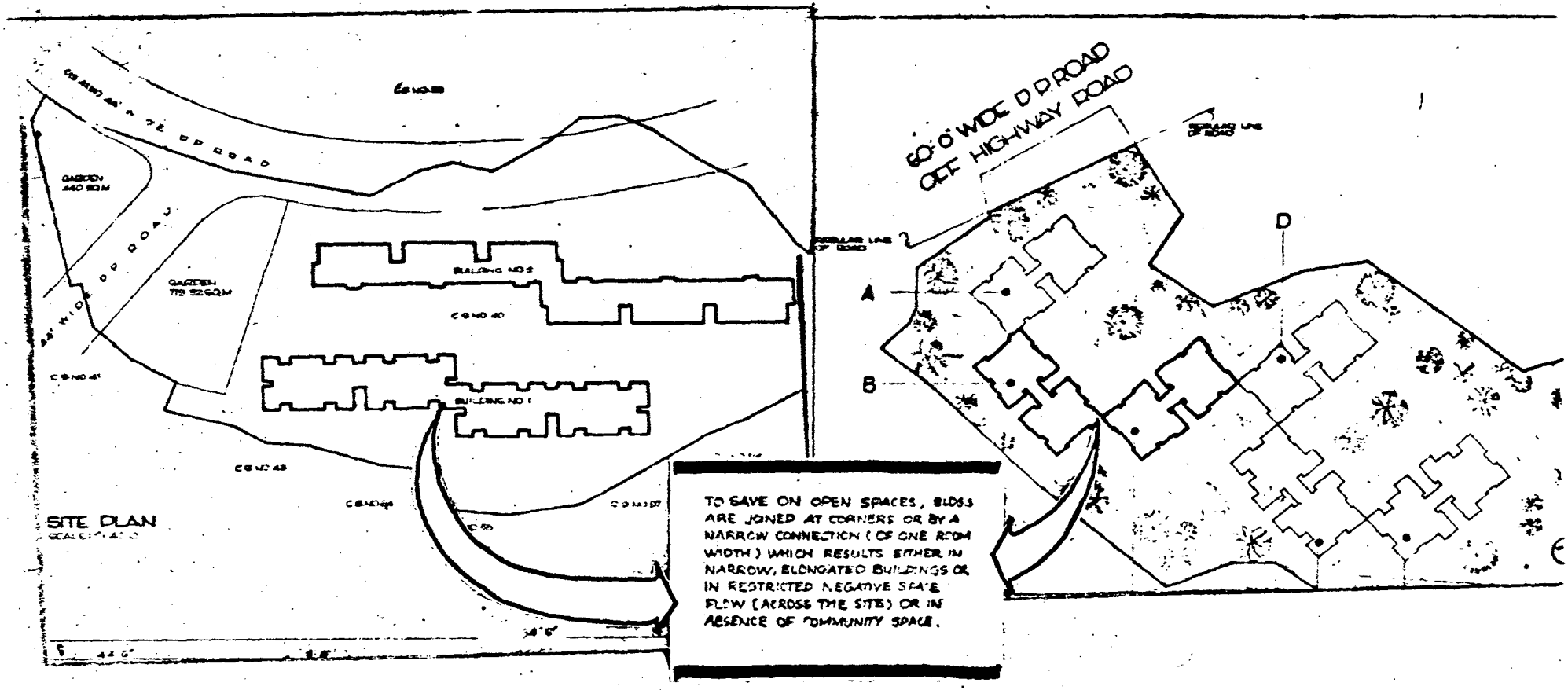

60'-0" WIDE D.P.ROAD
OFF HIGHWAY ROAD
A
B
D
SITE PLAN
TO SAVE ON OPEN SPACES, BLOCKS ARE JOINED AT CORNERS OR BY A NARROW CONNECTION (OF ONE ROOM WIDTH) WHICH RESULTS EITHER IN NARROW, ELONGATED BUILDINGS OR IN RESTRICTED NEGATIVE SPACE FLOW (ACROSS THE SITE) OR IN ABSENCE OF COMMUNITY SPACE.

PLATE 4t

buildings for intensive case studies. The results are illustrated on the following sheets. Yellow, orange and green colours are used for the results of building type 1,2 and 3 respectively.

The opinions about the sizes of the rooms/spaces, lighting and ventilation and storage sufficiency can be seen on plate 4u. The other results are illustrated on plate 4v to 4y and are as follows -

* Dining activity -

  82% of occupants of bldg. type 1 dine at the table and 18% on floor, 50% out of which do so due to the lack of space to accommodate dining table. The percentage of residents eating on floor increases to 63% and 91% for bldg.type 2 and 3 respectively, as the class lowers.

  Equal percentage (i.e. 36.4%) of bldg. type 1 dine either in living or in kitchen. The remaining 27.2% dine in both the rooms. For the other building types, dining is mainly carried out in living, kitchen being very small. In none of the buildings, a separate dining space is provided.

  In building type 1 and 2, the room is not found large enough by majority, to accommodate the dining activity. Some of them find the room sufficient only for folding dining tables.

* Cleaning Utensils -

  All the residents of bldg. type 1 clean their utensils in kitchen sink, the size of the kitchen being adequate. In bldg. type 2 only 21% clean the utensils in kitchen sink, kitchen being comparatively smaller.

USERS' OPINIONS ABOUT SIZES, LIGHTING & VENTILATION OF ROOMS/SPACES

ROOM/SPACE	LARGE	PERFECT	SMALL	WELL LIGHTED	WELL VENTILATED
LIVING ⇒	0%	45%	55%	100%	73%
KITCHEN ⇒	0%	27%	73%	100%	64%
BED ROOM ⇒	0%	36%	64%	100%	55%
BATH ⇒	0%	73%	27%	100%	91%
W.C. ⇒	0%	82%	18%	100%	91%
LIVING† ⇒	0%	31%	53%	79%	63%
KITCHEN ⇒	5%	21%	74%	84%	58%
BED ROOM ⇒	0%	31%	69%	84%	58%
BATH ⇒	0%	63%	37%	68%	68%
W.C. ⇒	0%	74%	26%	79%	63%
LIVING ⇒	0%	55%	45%	100%	82%
KITCHEN†† ⇒	0%	0%	100%	100%	77%
BED ROOM ⇒	0%	64%	36%	91%	91%
BATH ⇒	0%	73%	27%	91%	73%
W.C. ⇒	0%	73%	27%	91%	82%

STORAGE SUFFICIENCY

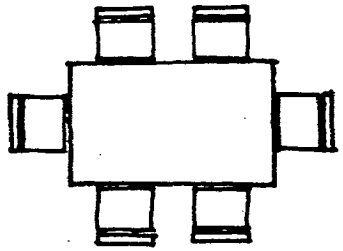
YES	NO
55%	45%
42%	58%
9%	91%

† THE REMAINING 16% FIND THE LIVING RM. PERFECT IN LENGTH BUT NARROW.

†† 18% OF THE OCCUPANTS FIND THE KITCHEN VERY SMALL.

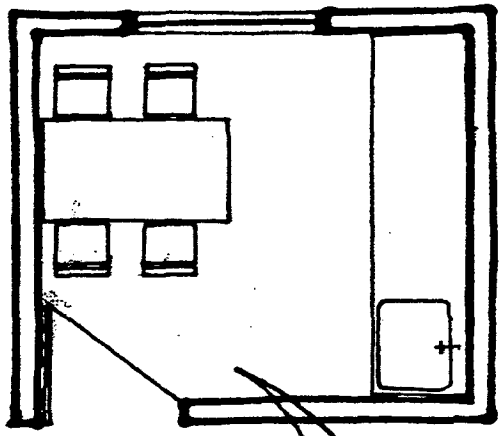
DINING ACTIVITY

HOW....



18 % 82 %
63% 37 %
91% 9 %

OUT OF THESE 9% DINE ON THE FLOOR AS THERE IS NO SPACE TO ACCOMODATE DINING TABLE



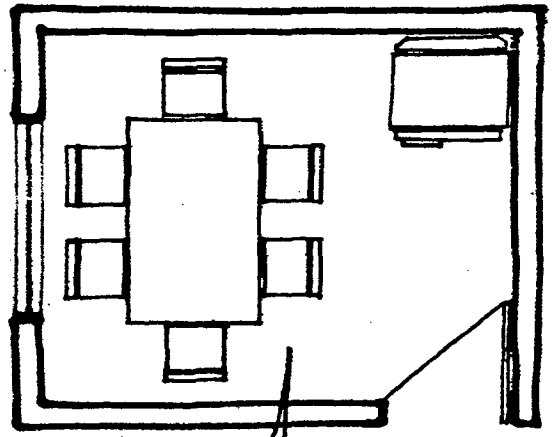
IS THE ROOM LARGE ENOUGH FOR DINING....

27·2 % 42 % 54·6 %
63·6 % 58 % 45·4 %

NO

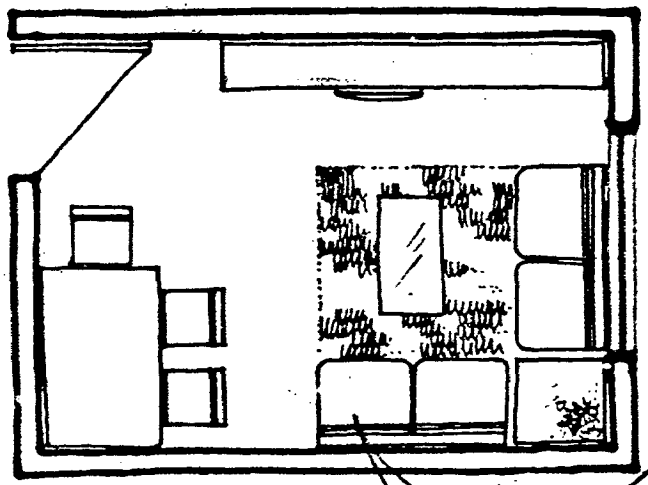
THE REMAINING 9·2% FIND THE ROOM SUFFICIENT FOR A FOLDING DINING TABLE ONLY.

YES



SEPARATE DINING ROOM/SPACE NOT PROVIDED.

WHERE....



36·4 % 36·4 %
63·0 % 37·0 %
91·0 % 9·0 %

THE REMAINING 27·2 % DINE IN LIVING AND KITCHEN BOTH

PLATE 4V

The rest use bathrooms for cleaning utensils. Though kitchen is still smaller in bldg. type 3, 54.6% use kitchen sink for the same activity, the reason being no separate facility for bath and W.C. Washing places are not provided in any of the buildings.

* Toilet facilities -

When residents of bldg. type 2 and 3 are totally for Indian type W.C., only 54.6% of bldg. type 1 opt for the same and 9.2% out of these desire European type W.C. in addition, especially for old people.

The majority in all the three bldg. types are for separate toilet (bath and W.C.) facilities and the percentage for the same increases from upper to lower middle-class, the reason being increase in the household size.

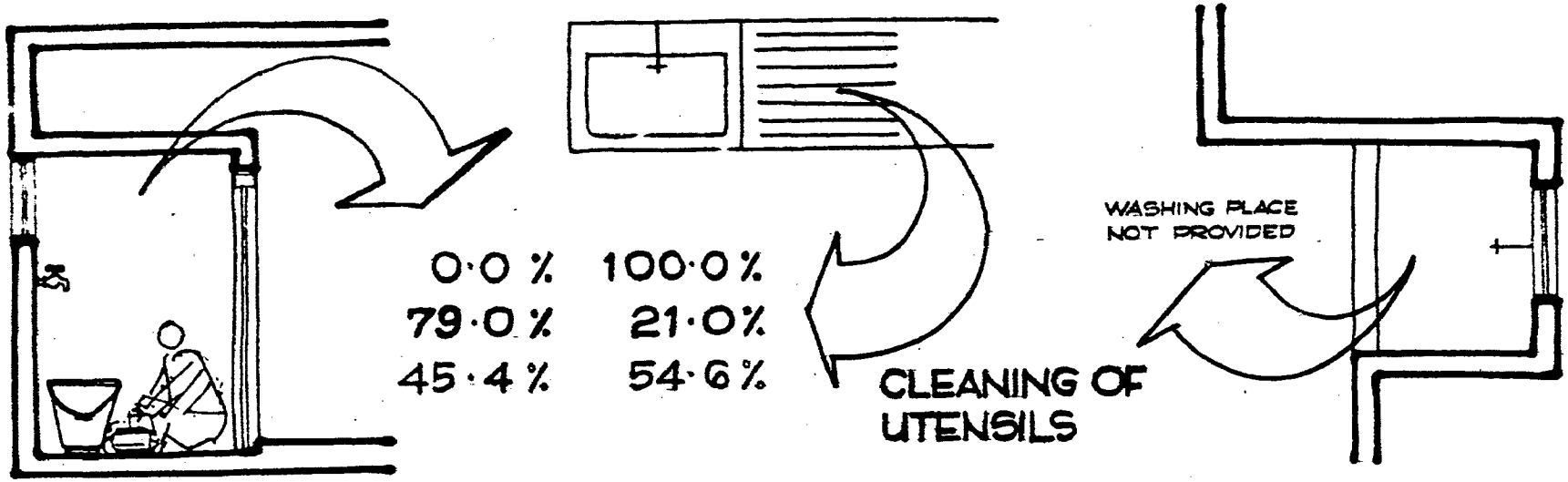
* Drying of clothes -

The drying of clothes is mainly done in balconies in all the buildings. Where balconies are enclosed, the drying activity is carried out either by tying strings outside the enclosed balcony, or in passage or room. No drying verandah is provided in any of the buildings.

* Balconies -

The half length balconies of bldg. type 1 are mainly used for standing, since they are very small. Some of them are used for sitting or for storage. The full length balconies of bldg. type 3 are also used for sleeping, drying food stuff and as a study room, apart from the above purposes.

81.8% using half length balcony, find it to be of small size and consider the full length balcony to be of perfect size. None of the occupants in both the buildings feel the size of the balcony to be large.



0·0 % 100·0 %
79·0 % 21·0 %
45·4 % 54·6 %

CLEANING OF UTENSILS

WASHING PLACE NOT PROVIDED

PREFERENCE FOR W.C. TYPE

OUT OF THESE 9·2 % PREFER EUROPEAN TYPE (IN ADDITION) FOR OLD PERSONS

54·6% 100% 100%

45·4% 0% 0%

27·2% 72·8%
16·0% 84·0%
9·0% 91·0%

PREFERENCE FOR TOILET TYPE

PLATE 4W

DRYING OF CLOTHES

IN THE BALCONY	IN THE PASSAGE	IN THE ROOMS
100 %	0 %	0 %
11 %	58 %	31 %
77 %	9 %	9 %

ON STRINGS TIED OUTSIDE THE BALCONY — 5 %

NO SEPARATE DRYING VERANDAH IS PROVIDED IN ANY OF THE BUILDINGS

SIZE OF THE BALCONY

PERFECT	SMALL
18·2 %	81·8 %
81·8 %	18·2 %

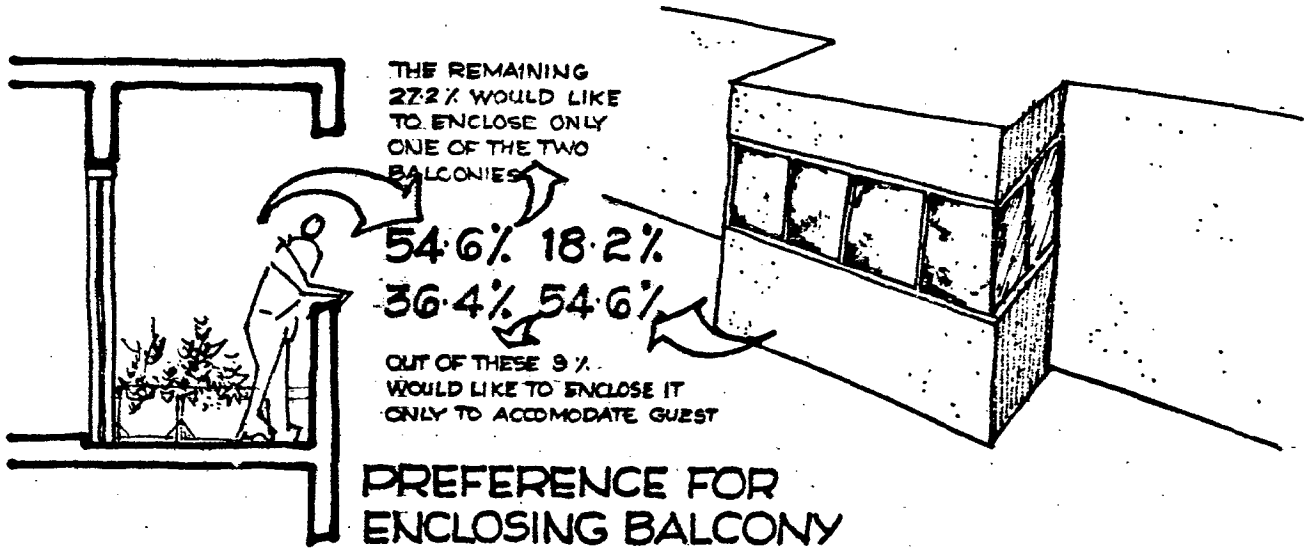
NONE OF THE OCCUPANTS IN BOTH THE BUILDINGS FEEL THAT THE SIZE OF THE BALCONY IS LARGE.

SUGGESTED CHANGES IN THE DIMENSIONS OF THE BALCONY

LENGTH	36·4 %	0 %
WIDTH	0·0 %	9 %
BOTH	45·4 %	9 %

USE OF BALCONY FOR....

STANDING	100·0 %	27·2 %
SITTING	45·4 %	18·1 %
SLEEPING	0·0 %	18·1 %
DRYING FOOD-STUFF	0·0 %	9·0 %
STORING	9·2 %	22·6 %
BALCONY BEING USED AS A STUDY ROOM	9·0 %	



PREFERENCE FOR ENCLOSING BALCONY

PLATE 4X

36.4% residents of bldg. type 1, using half length balcony, suggest changes only in the length of balcony, whereas 45.4% residents of bldg. type 3, who enjoy privilage of full length balcony, suggest changes in both the dimensions.

As for the preference regarding enclosing the balcony, 54.6% using half length balcony, do not wish to enclose their balconies and 27.2% out of these, wish to enclose only one of the two balconies. 54.6% of the occupants using full length balconies opt for enclosing the same, 9% of these wish to enclose it only to accommodate guest.

* Height of rooms -

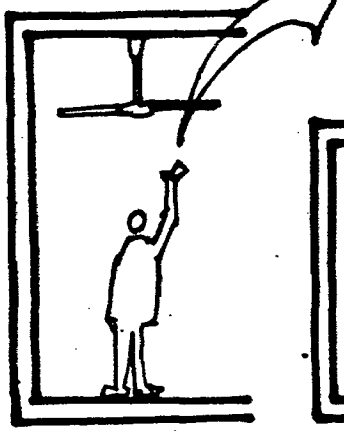
Height of the rooms is found to be perfect by nearly three quarters of the occupants in all the buildings. The rest find it to be small. No one feels the height of the rooms to be excessive.

* Stair cases -

72.8% residents of bldg. type 1 find the staircase width to be narrow and 9.2% feel the same only for transportation of furniture. 47% and 54.6% of bldg. type 2 and 3 respectively find the staircase to be narrow and 9.2% of bldg type 3 find the landing narrow. Thus, upper middle-class residents are more for wider staircases.

One fourth of the residents of bldg. type 1 and 2 find difficulty in climbing due to the physical structure of the staircase. From the discussions with the occupants, it was found that most of the fourth floor residents and some of the third floor residents desire for provision of lift and are prepared to bear the extra cost for the same.

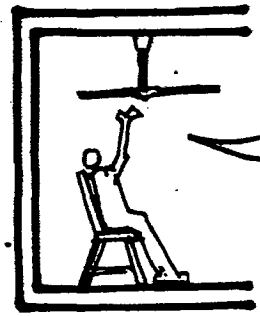
NO ONE FEELS THAT THE HEIGHT OF THE ROOMS IS EXCESSIVE



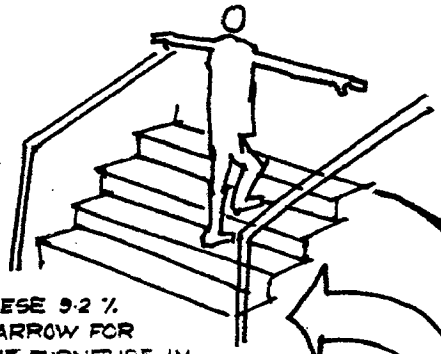
HEIGHT OF THE ROOMS

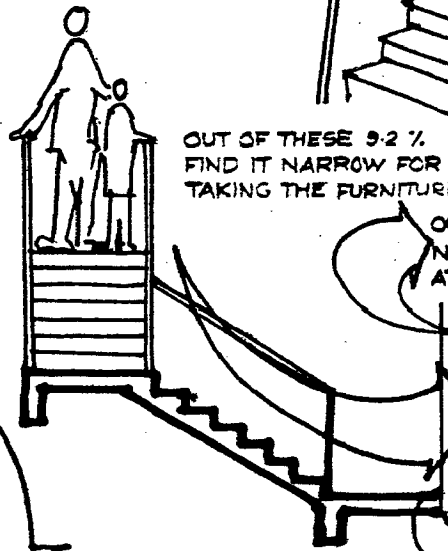
72·8% 74·0% 72·8%

27·2% 26·0% 27·2%



WIDTH OF THE STAIRCASE





OUT OF THESE 9·2 % FIND IT NARROW FOR TAKING THE FURNITURE IN

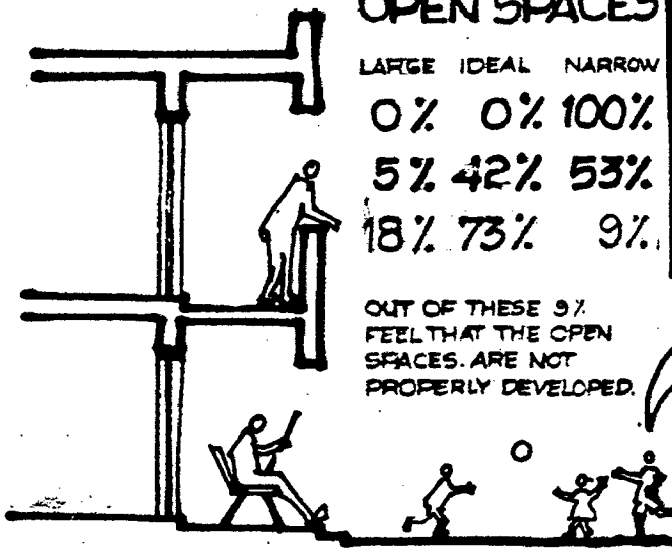
OUT OF THESE 9·2 % DO NOT FIND IT SMALL AS AT TIMES IT IS EVEN SMALLER

72·8% 27·2%

47·0% 53·0%

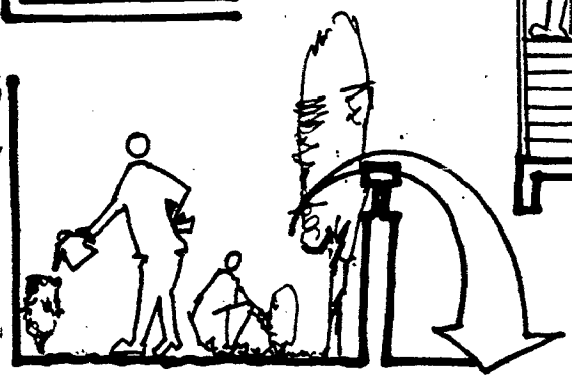
54·6% 45·4%

OUT OF THESE, 9·2 % FIND THE LANDING NARROW.



OPEN SPACES

LARGE	IDEAL	NARROW
0%	0%	100%
5%	42%	53%
18%	73%	9%

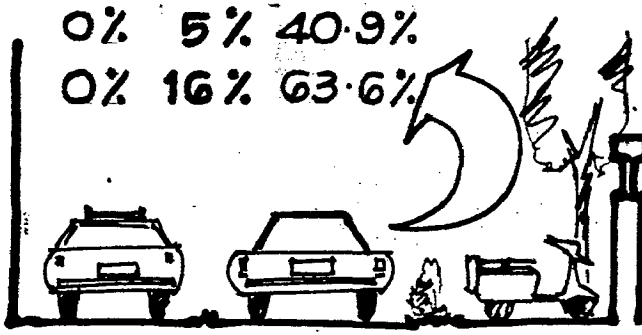


OUT OF THESE 9% FEEL THAT THE OPEN SPACES ARE NOT PROPERLY DEVELOPED.

0% 31·5% 54·5%

0% 5% 40·9%

0% 16% 63·6%



DIFFICULTY IN CLIMBING DUE TO THE PHYSICAL STRUCTURE OF THE STAIRCASE

27·2%

26·0%

9·0%

PLATE 4Y

USERS' SATISFACTION REGARDING HOUSEHOLD FACILITIES

YES	NO	YES	NO	YES	NO
9%	91%	47%	53%	36.4%	63.6%

USERS' SUGGESTIONS

BLDG. TYPE 1

- LARGER KITCHEN
- LARGER LIVING ROOM
- SPACE FOR DINING TABLE
- SPACE FOR WRITING TABLE
- STORAGE SPACE
- SPACE FOR REFRIGERATOR
- SPACIOUS BALCONIES
- STUDY ROOM
- ADDITIONAL ROOM FOR CHILDREN
- ADDITIONAL ROOM FOR THE ELDERLY WHICH CAN BE USED FOR CHILDREN'S STUDY ALSO
- SPACE FOR WASHING MACHINE
- BUILT IN CUPBOARDS
- SPACE FOR SEWING MACHINE
- SPACE FOR SERVANT'S SLEEPING
- A SMALL, ADDITIONAL TOILET FOR SERVANT
- A LIFT
- SPACE FOR CHILDREN'S PLAY IN THE COMPOUND
- SPACE FOR PARKING

BLDG. TYPE 2

- LARGER ROOMS TO ACCOMMODATE ALL KINDS OF FURNITURE
- DINING SPACE IN KITCHEN
- SPACE FOR REFRIGERATOR IN KITCHEN
- BALCONY AS AN OUTDOOR SPACE
- STORAGE SPACE IN KITCHEN
- LARGER BATHROOM
- SPACE FOR WASH BASIN
- WIDER PASSAGE
- ADEQUATE VENTILATION ARRANGEMENT
- A LIFT
- A LARGER STAIRCASE LANDING SO AS TO MAKE IT A MORE USABLE SPACE. (THIS SPACE CAN BE USED FOR CHILDREN'S PLAY WHICH ENABLE PARENTS TO KEEP A CHECK.
- PLAY SPACE IN THE COMPOUND

BLDG. TYPE 3

- STORAGE SPACE
- LARGER KITCHEN
- LARGER LIVING ROOM
- SPACE FOR DINING TABLE
- SPACE FOR REFRIGERATOR IN KITCHEN
- SPACE TO ACCOMMODATE GUEST
- SPACE FOR CHILDREN'S STUDY
- WASHING PLACE
- DRYING AREA
- WIDER STAIRCASE
- A LIFT
- TERRACE
- A WELL DEVELOPED COMPOUND

* Open spaces -

The open spaces around the building are experienced as narrow in first two building types. Provision for children's play, gardening and parking is possible only in building type 3, but the residents feel that the open spaces are not properly developed.

Refer plate 4z for users' suggestions and their satisfaction regarding the household facilities.

CHAPTER V : BUILDING BYE-LAWS--THEIR RELEVANCE

"We shape our buildings and afterwards our buildings shape us".

- Winston Churchil

A housing can meet the legal standards set by the local government and still be unfit for human habitation by the personal standards. The housing that is produced today, voilates man's basic needs in many ways. Architecture not only has technical goals, but also a psycho-social function. K. Koffka has pointed out that the role of environment can induce, activate or slow a child's development. If the elements of the healthy environment are missing, a house can only qualify as human storage. It should be borne in mind that the home envirorment need not be large to be healthy.

The core of the housing problem is not that we do not know how to build the physical shelters and not that we do not recognize the need to provide environmental amenities, but lies in the lack of comprehensive understanding of the relationship of physical aspect of housing and the social and environmental aspects of housing. The difficulty is how to solve this problem qualitatively as the elements involved are entirely different in nature. 'Shelter' comprises physical elements whereas 'man' is a much more complicated element. He is physical and finite in form but his feelings are

invisible and social relationships intangible. Hence, exploration of some new concepts in the field of biology, sociology, anthropology and psychology is needed, which should be integrated with the building bye-laws so that man can successfully interact with his environment.

5.1 MINIMUM STANDARDS FOR AREAS OF ROOMS/SPACES :

	Old(in sq.ft.)	Revised(in sq.m.)
Living	120	-
Kitchen	80	5.50
Kitchen-Dining	-	9.50
Habitable Room	100	9.50
Bath	16	1.80
Water Closet	12	1.10
Toilet	28	2.80

During the last decade or two, there is an increasing preference for flat type accommodation. The reasons for this trend may be breaking of joint family system and growing awareness among people of their privacy needs. On the other hand, prices of flats are exorbitantly increasing due to inflation and rising prices of land. These, already have gone so high that majority of the population cannot afford large accommodations. The builders have been quick to exploit this change in the nature of demand. They insist on having smaller flats with maximum number of rooms from the point of view of better sale. Architects, naturally with such pressurisation

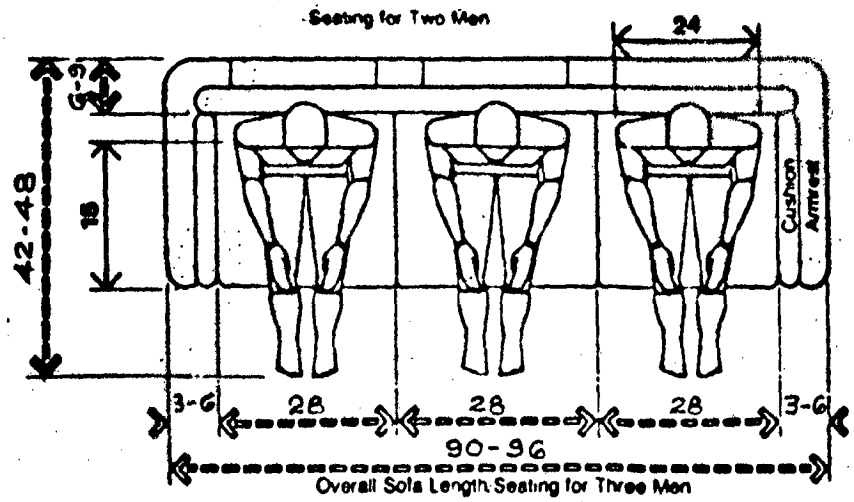
from builders, act as people-packers and try to pack as many rooms as possible in a small area of a flat. This is achieved mainly by sticking to the minimum standards for the sizes of rooms/spaces as per the building bye-laws.

With the result, ventilation and other factors are given a slip. Moreover, after deducting the circulation area, the actual usable area of a room becomes much less than that what is provided. This is mainly true for smaller flats where the entry is directly into the living to save upon the built-up area on entrance lobby or a passage, reducing the actual usuable area of the living. (as shown in fig.5.1.1).

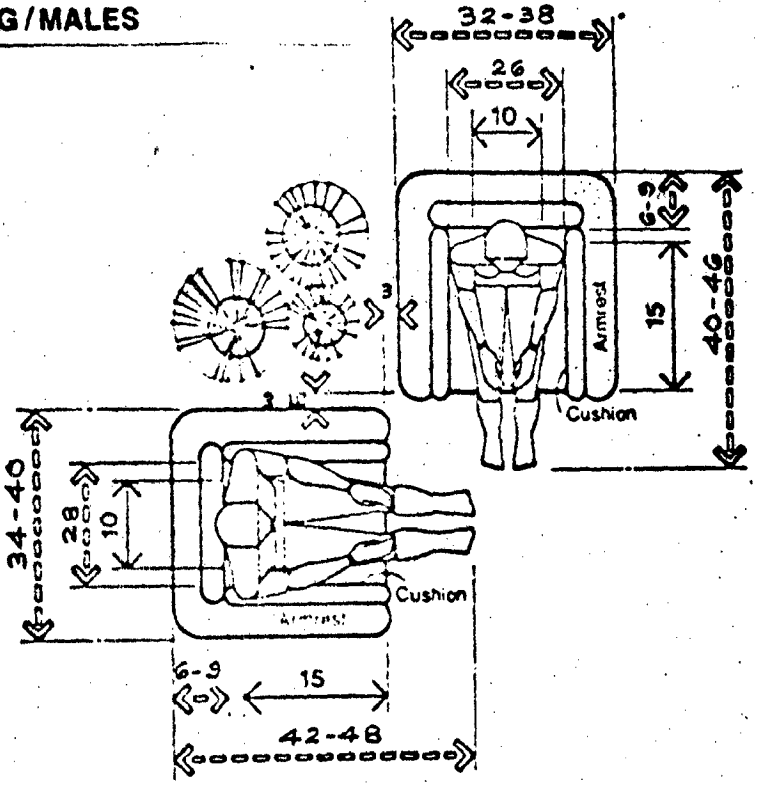
It can be seen from the illustrations of anthropometric studies (5 a to 5 t.) that the prescribed minimum standards for areas of rooms/spaces are not always in accordance with these studies.

Human needs cannot remain static throughout the life but keep changing over time. Family values and goals change in response to successive wants and needs that occur in a fairly predictable sequence of events called as family life cycle. There are three major stages in a family life cycle : Founding stage, Expanding stage and contracting stage. Of course, not all families pass through these stages in the same way. Areas of rooms depend largely upon family size and therefore changes in family size as per the family life cycle play an important role in determining the room sizes. A

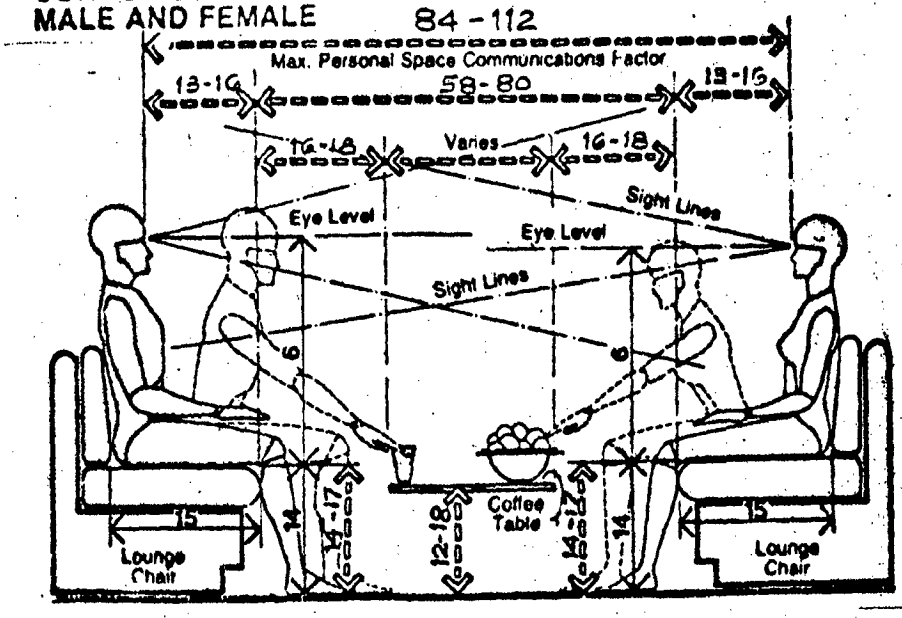
PLATE 5a



SOFA SEATING / MALES

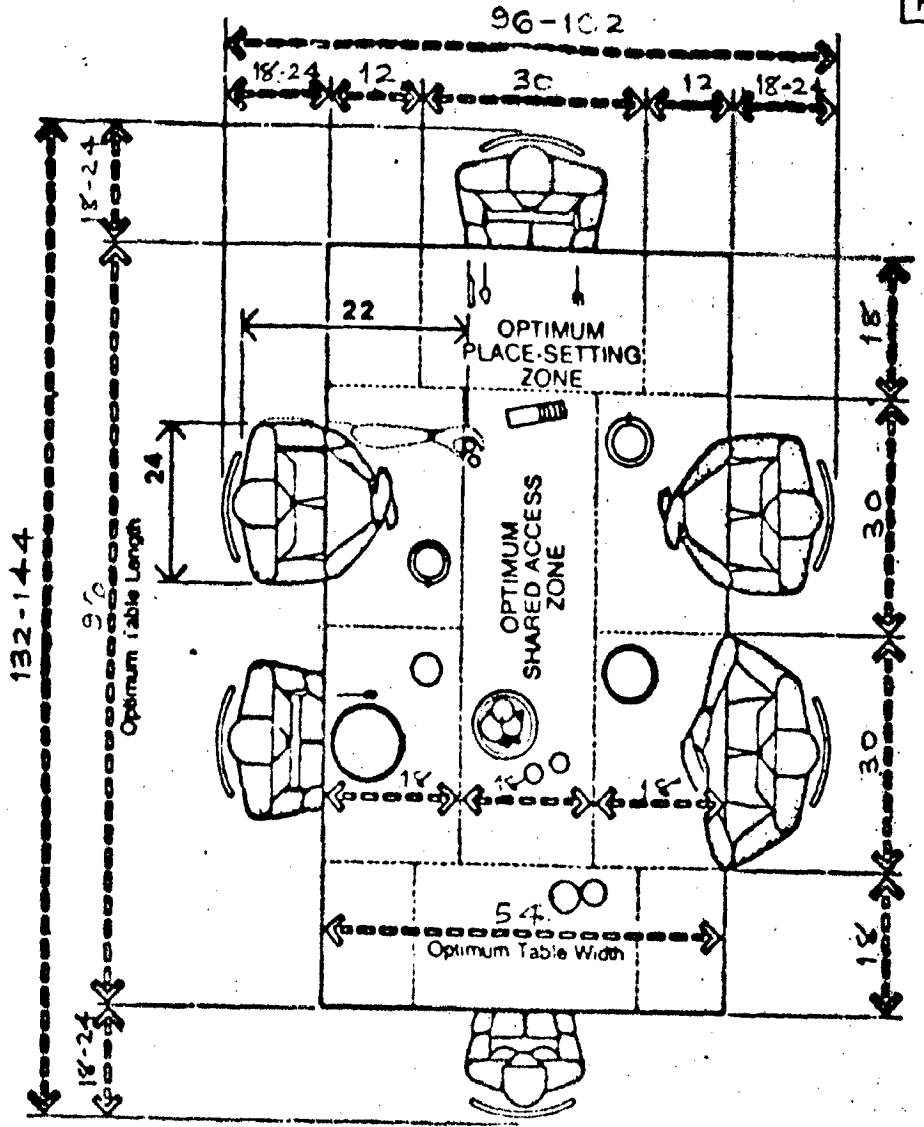


CORNER LOUNGE CHAIR SEATING/
MALE AND FEMALE 84 - 112

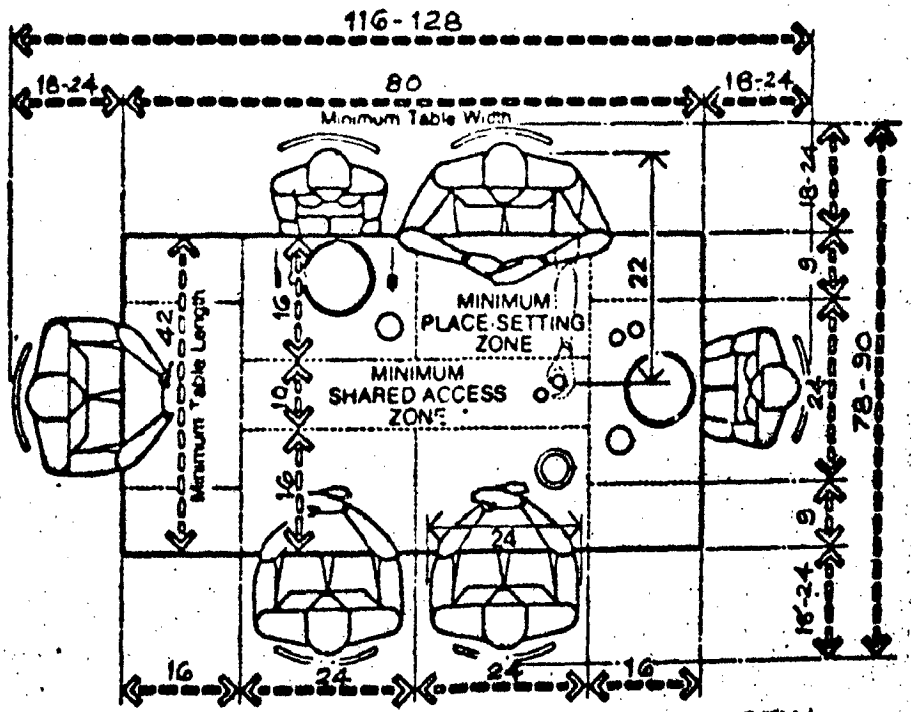


LOUNGE SEATING / CLEARANCES

PLATE 5b

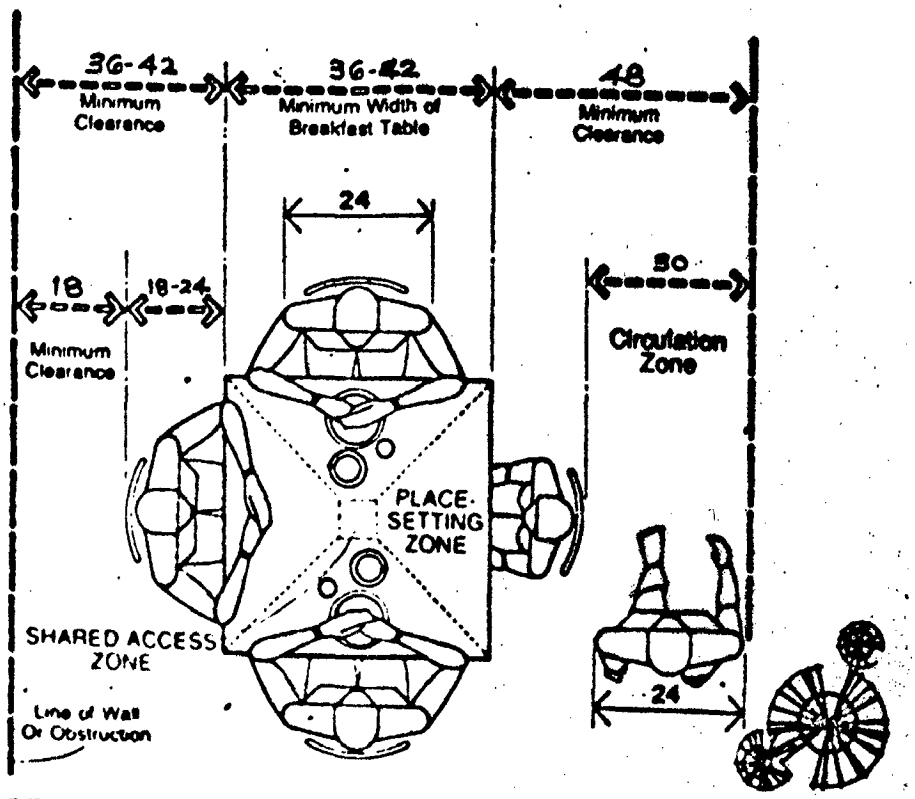


RECTANGULAR TABLE/OPTIMUM LENGTH AND WIDTH/DINING FOR SIX

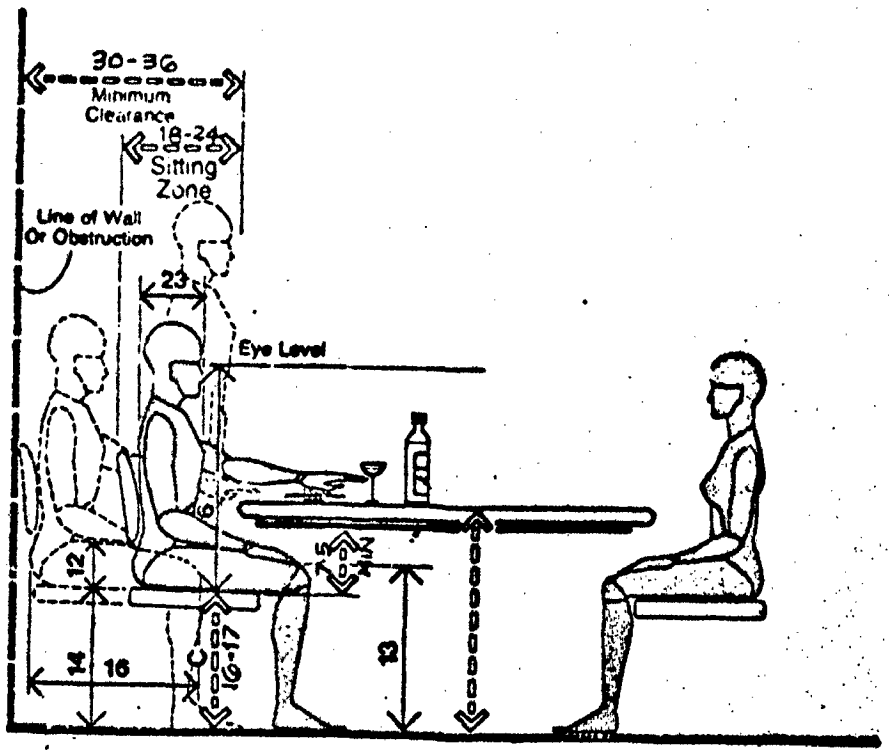


RECTANGULAR TABLE / MINIMUM LENGTH AND WIDTH / DINING FOR SIX

PLATE 5C

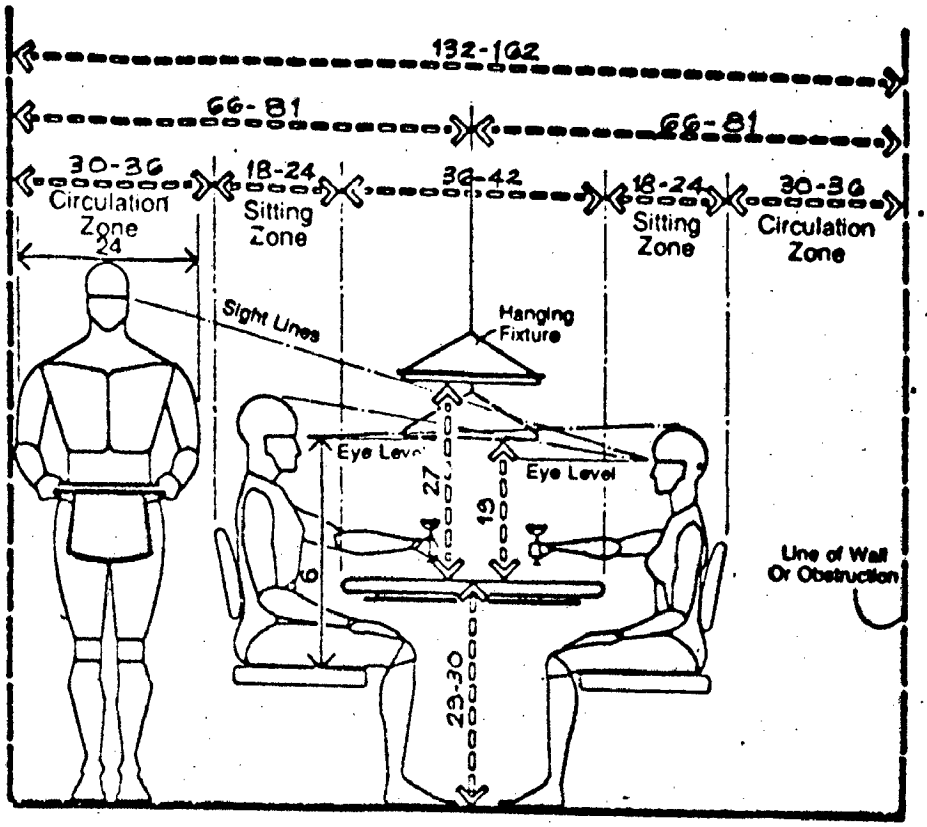


BREAKFAST/ KITCHEN TABLE FOR FOUR

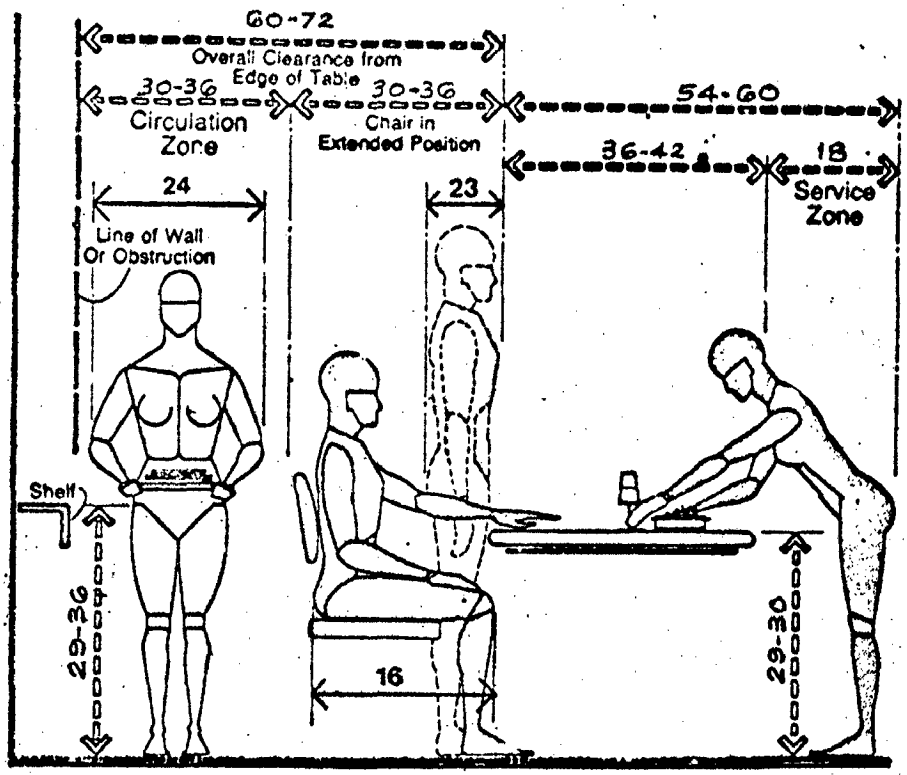


MINIMUM CHAIR CLEARANCE / NO CIRCULATION

PLATE 5d

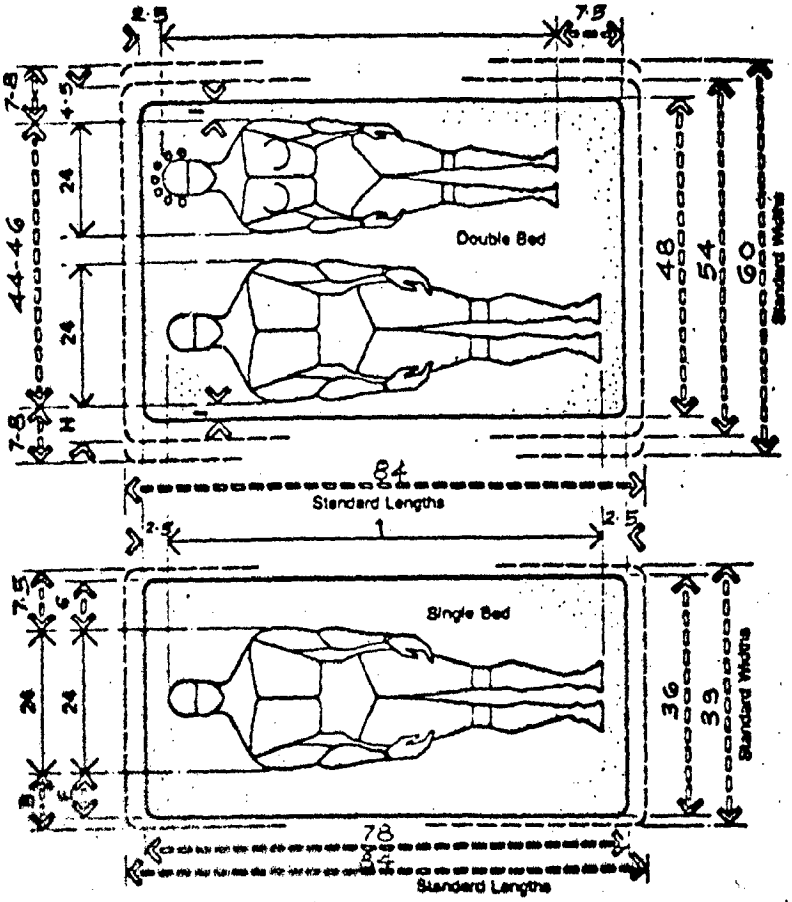


MINIMUM DINING AREA WIDTH

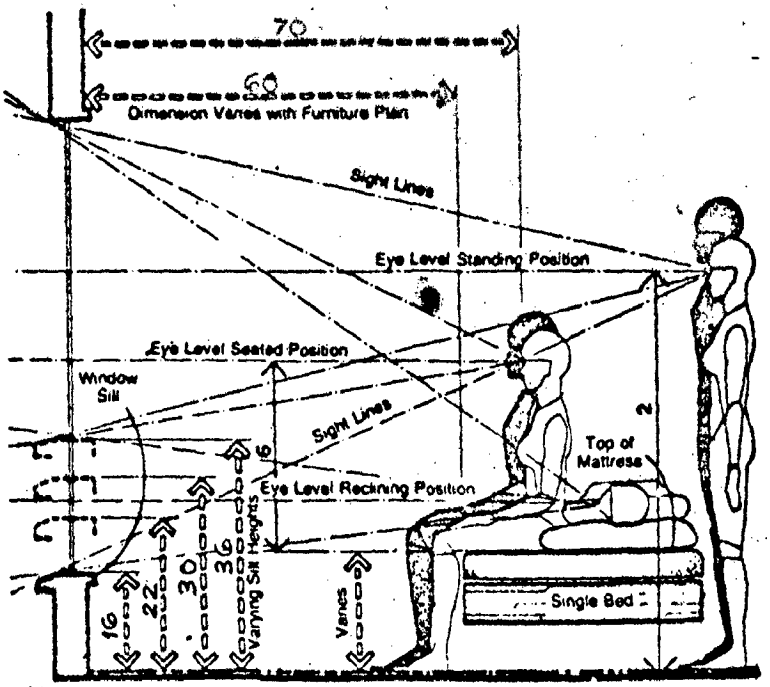


MINIMUM CLEARANCE BEHIND EXTENDED CHAIR

PLATE 5e

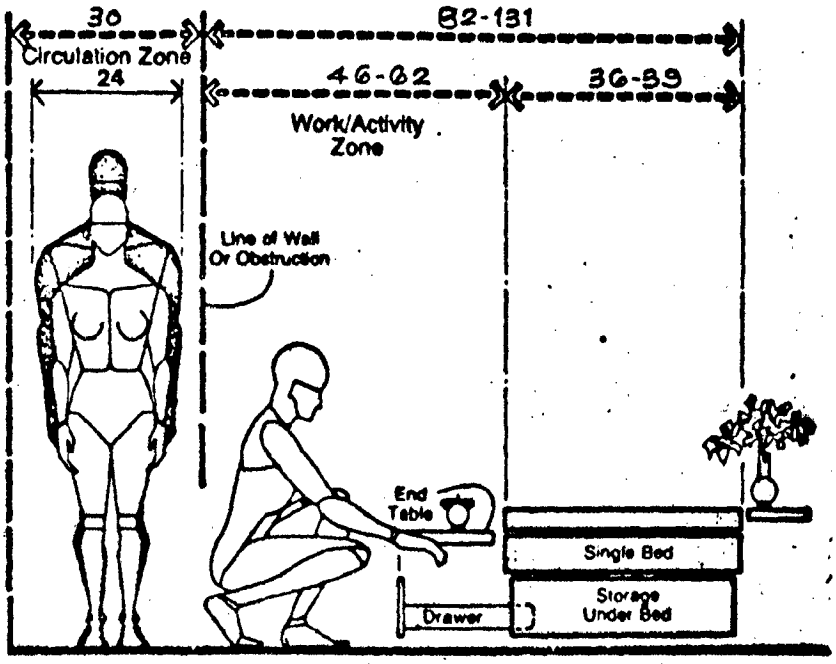


SINGLE AND DOUBLE BEDS

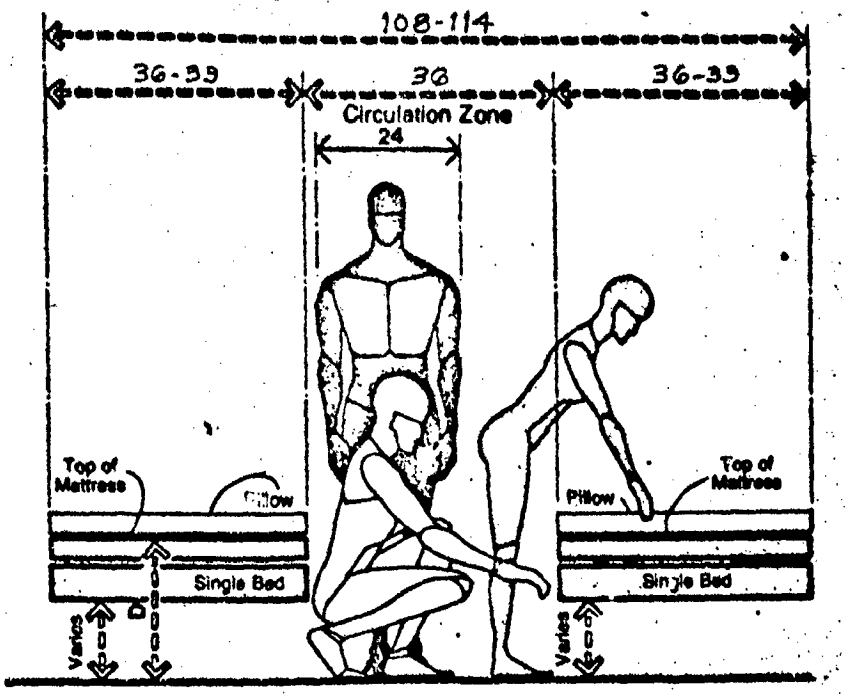


BEDROOM / VISION AND SIGHT LINES

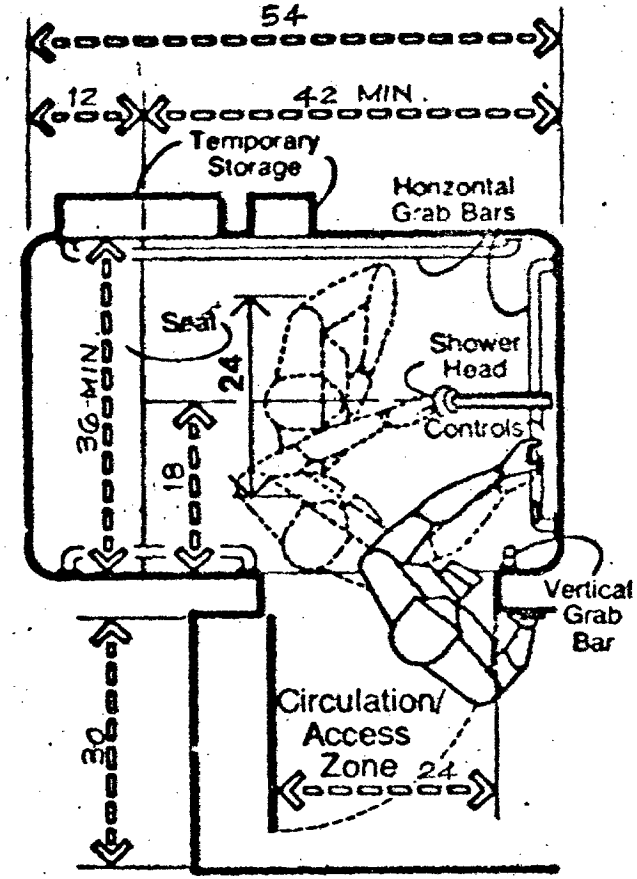
PLATE 5f



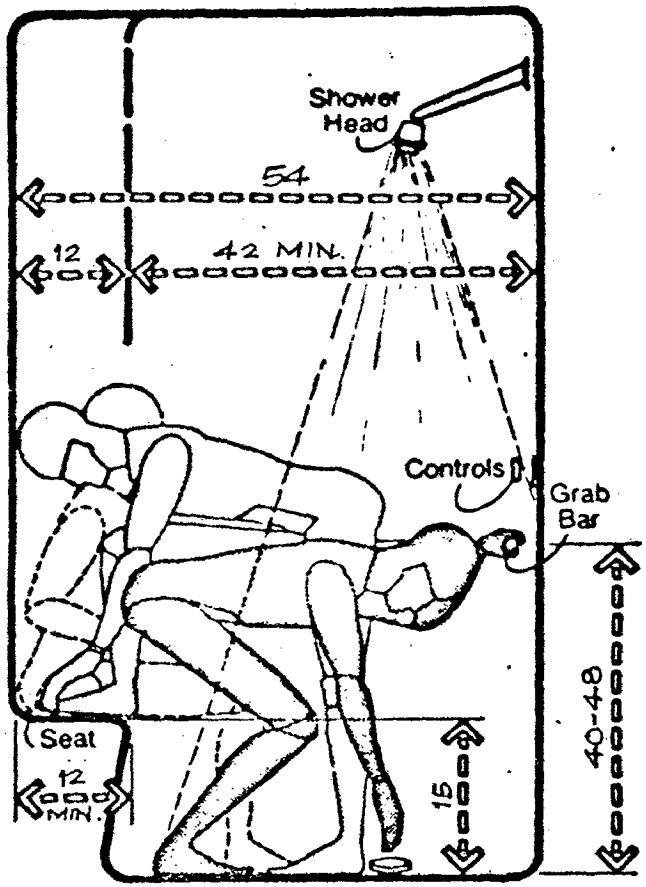
SINGLE BED/CLEARANCES AND DIMENSIONS



TWIN BED / CLEARANCES AND DIMENSIONS

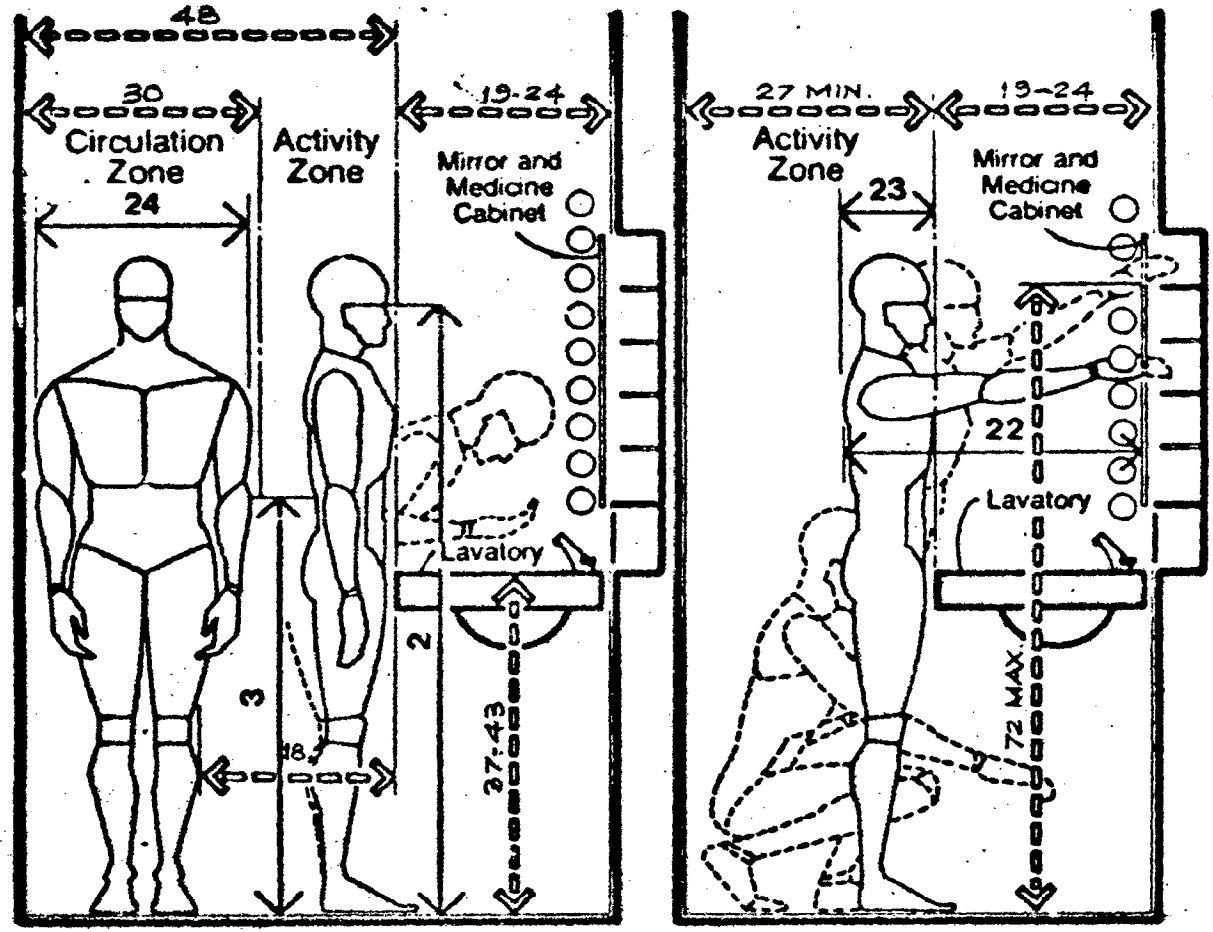


MINIMUM SHOWER CLEARANCES



MINIMUM SHOWER CLEARANCES

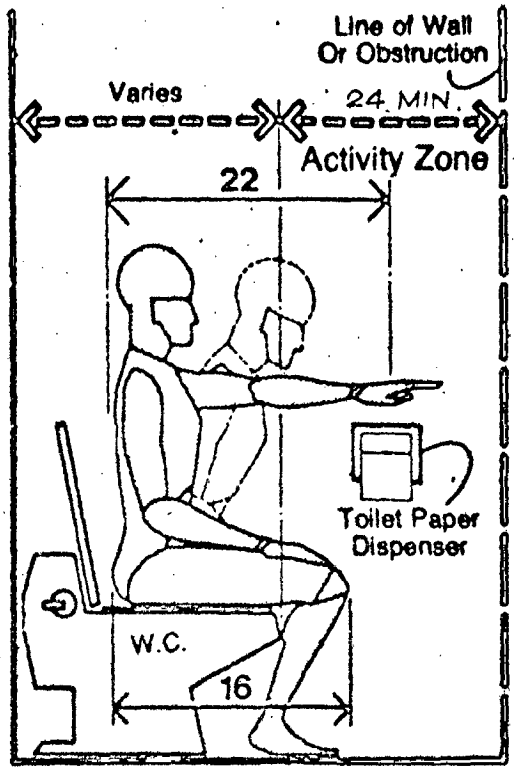
PLATE 59



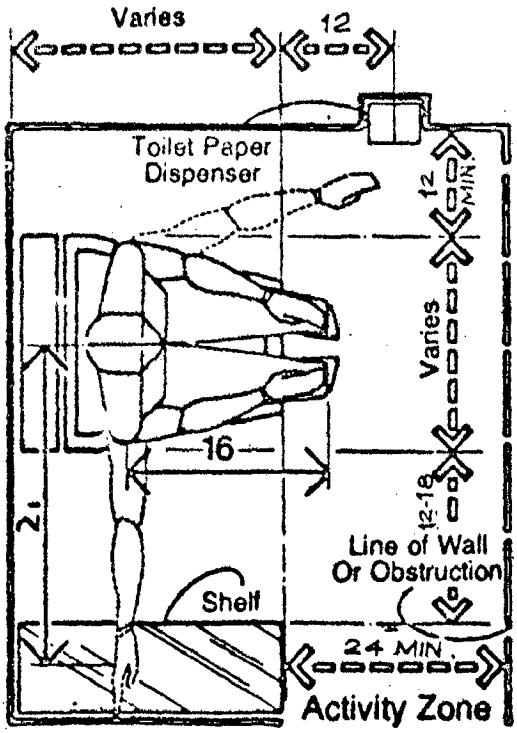
LAVATORY / MALE ANTHROPOMETRIC CONSIDERATIONS

PLATE 5h

PLATE 5i

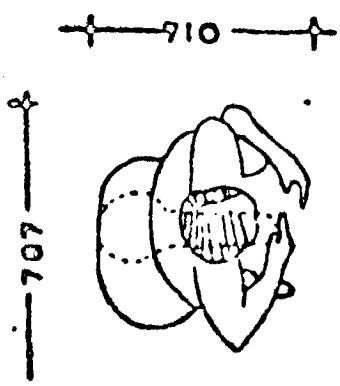


WATER CLOSET

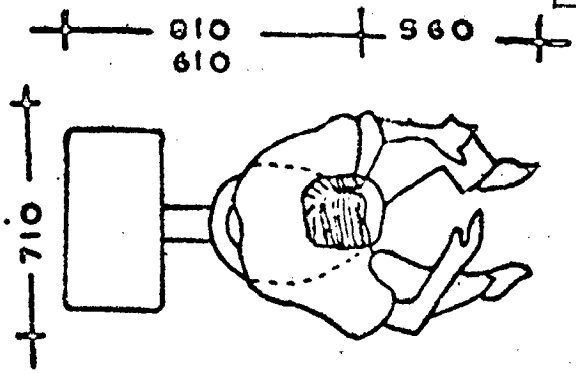


WATER CLOSET

PLATE 5J



INDIAN PAN



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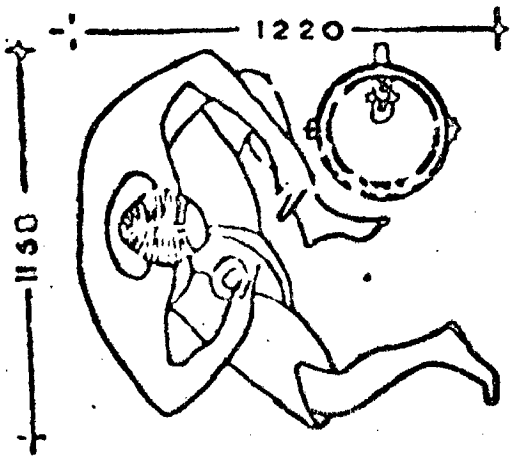

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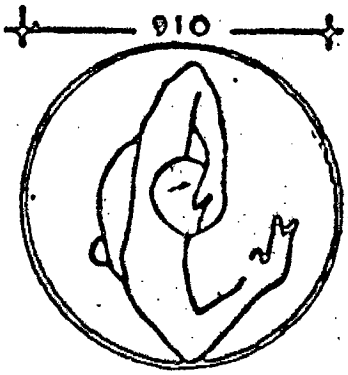
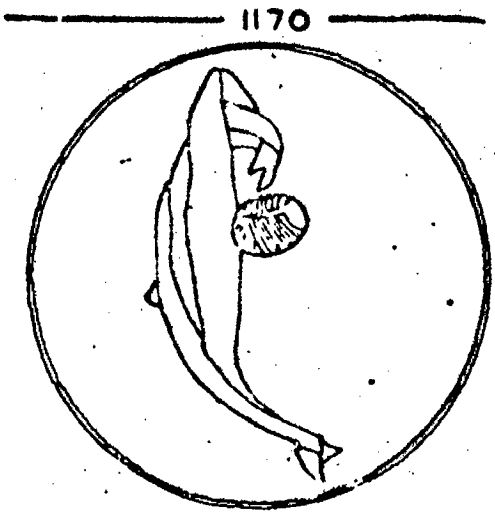
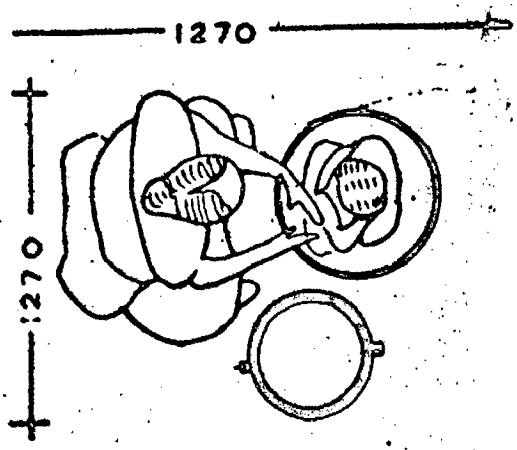


SHOWER

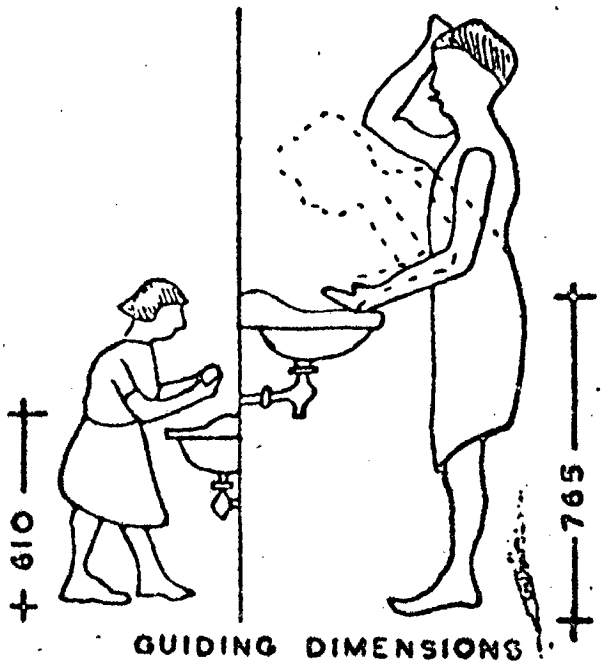


DRYING BODY

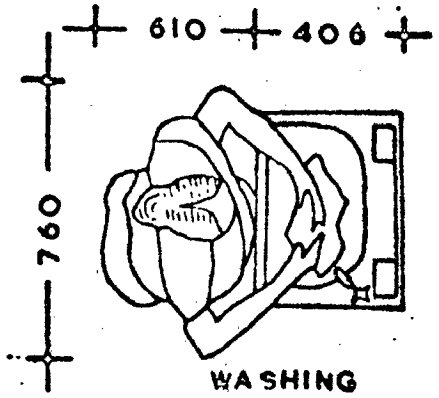


BATHING INFANT

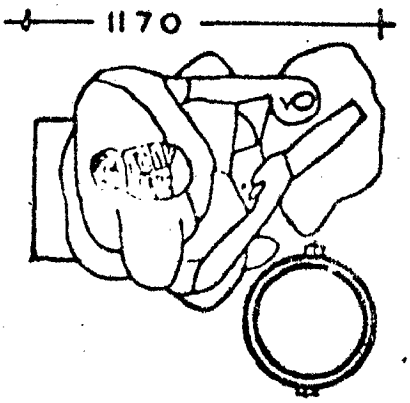
PLATE 5k



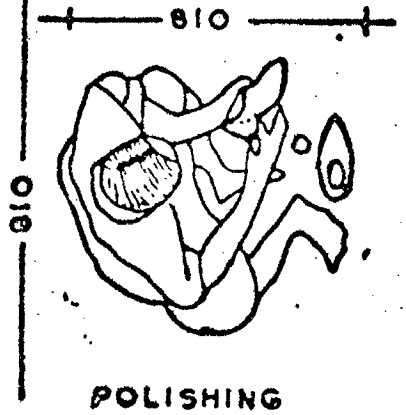
GUIDING DIMENSIONS



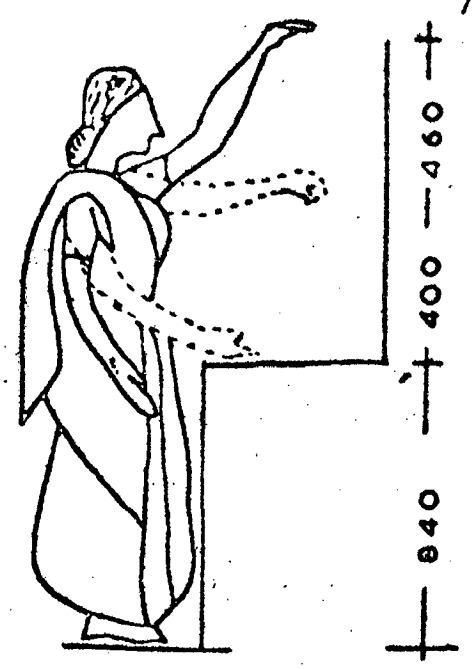
WASHING



WASHING CLOTHES



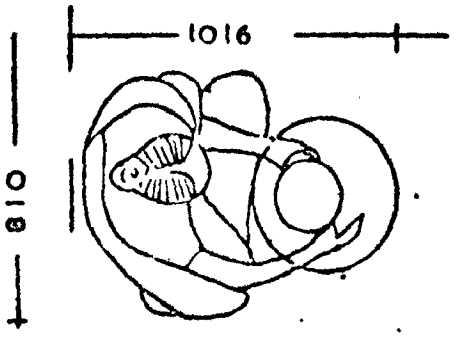
POLISHING



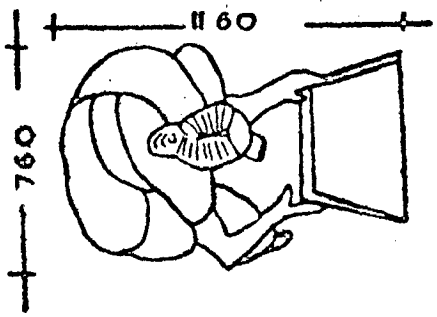
LIMITING DIMENSIONS

LIGHTING STOVE

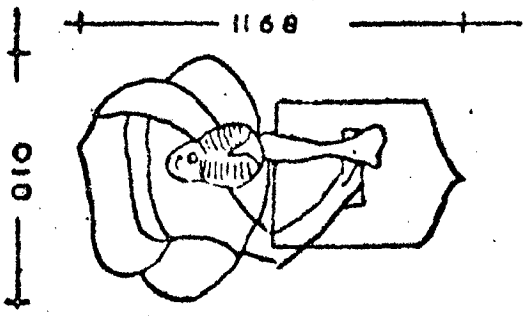
PLATE 51



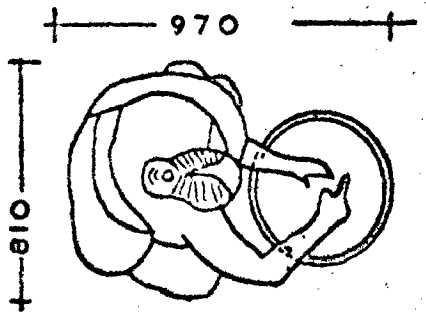
SIEVING



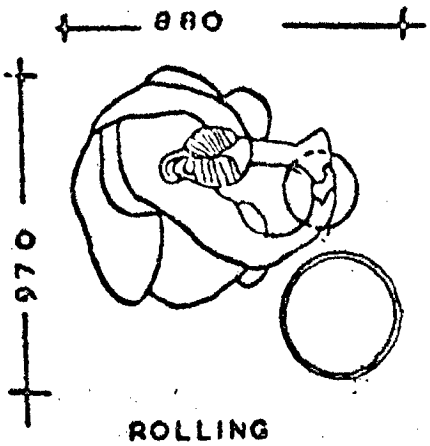
WINNOWING



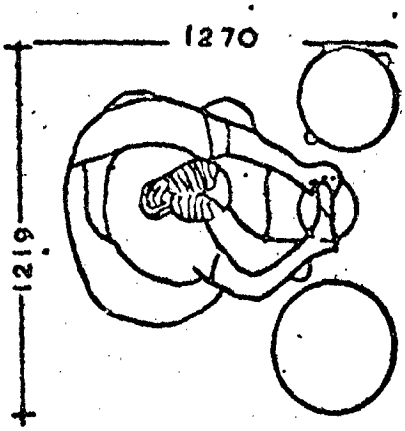
GRINDING



MIXING

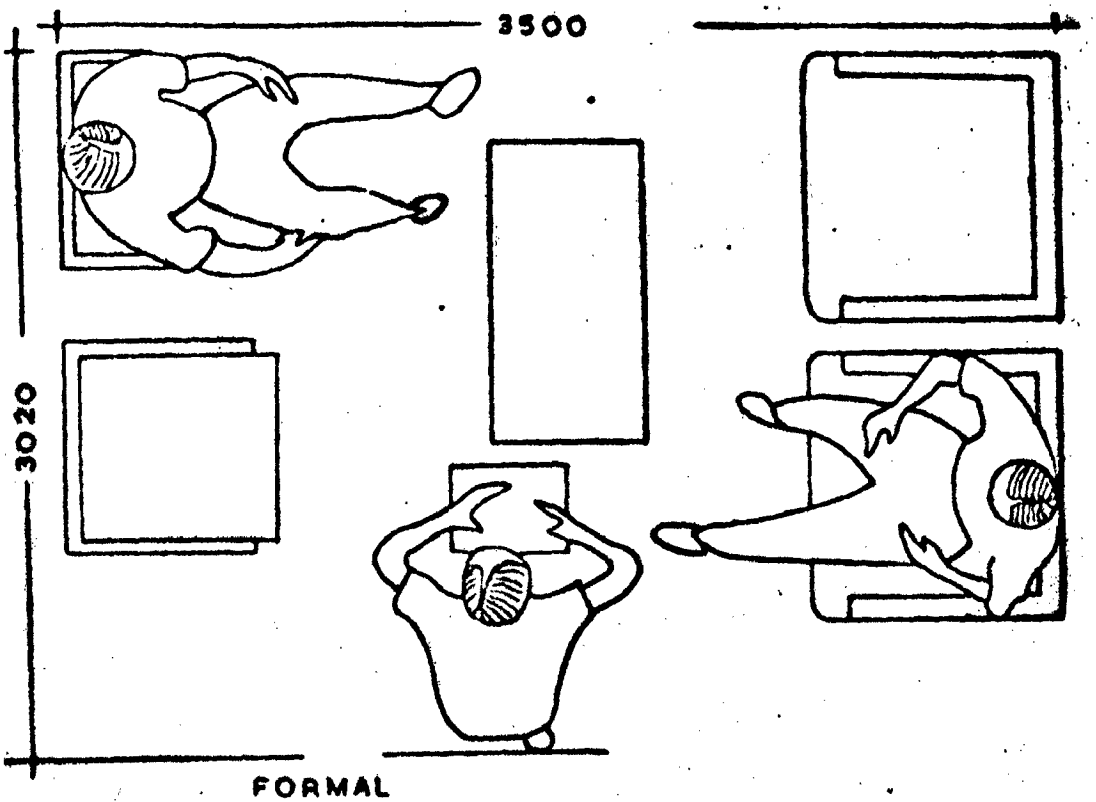


ROLLING

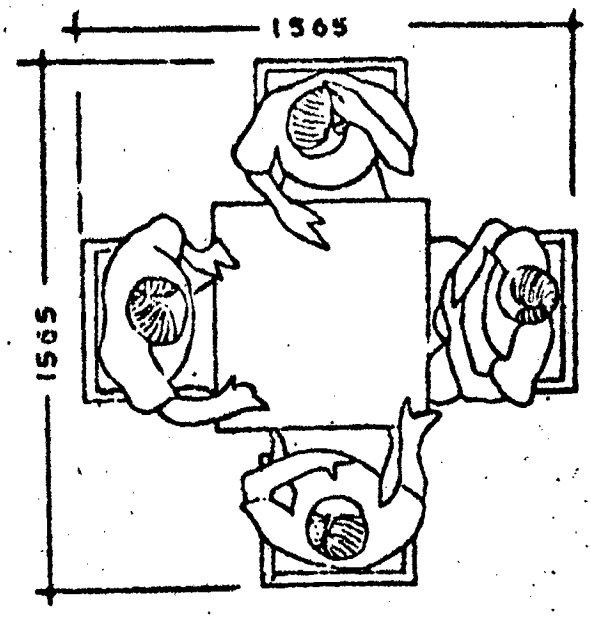


COOKING

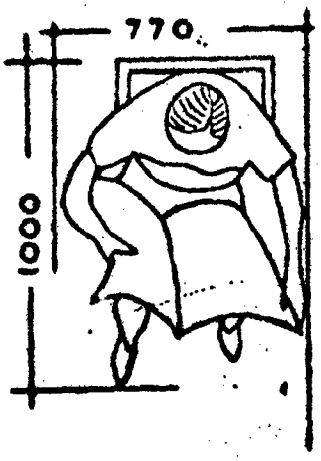
PLATE 5m



FORMAL

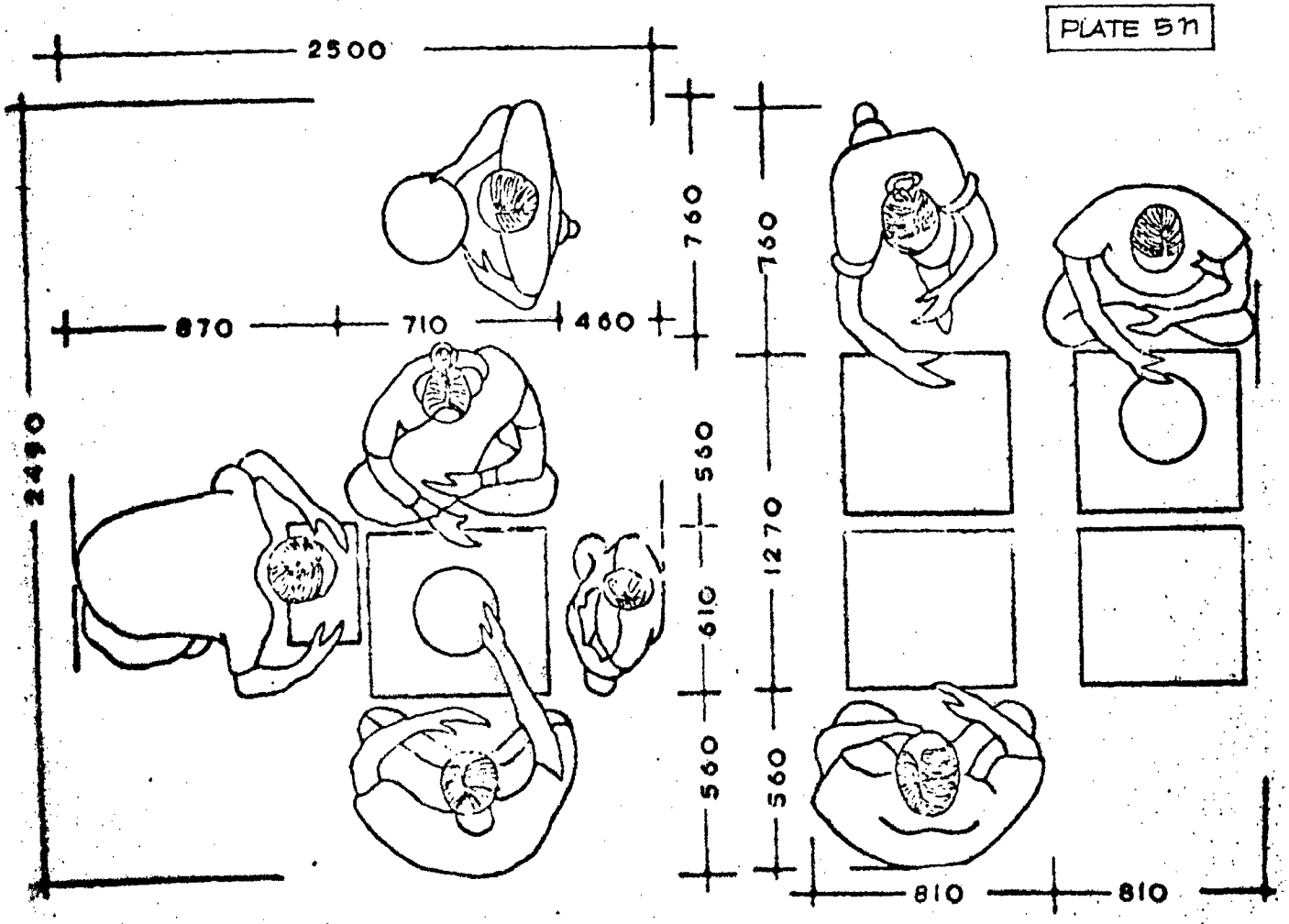


PLAYING CARDS



. LIGHT . READING

PLATE 51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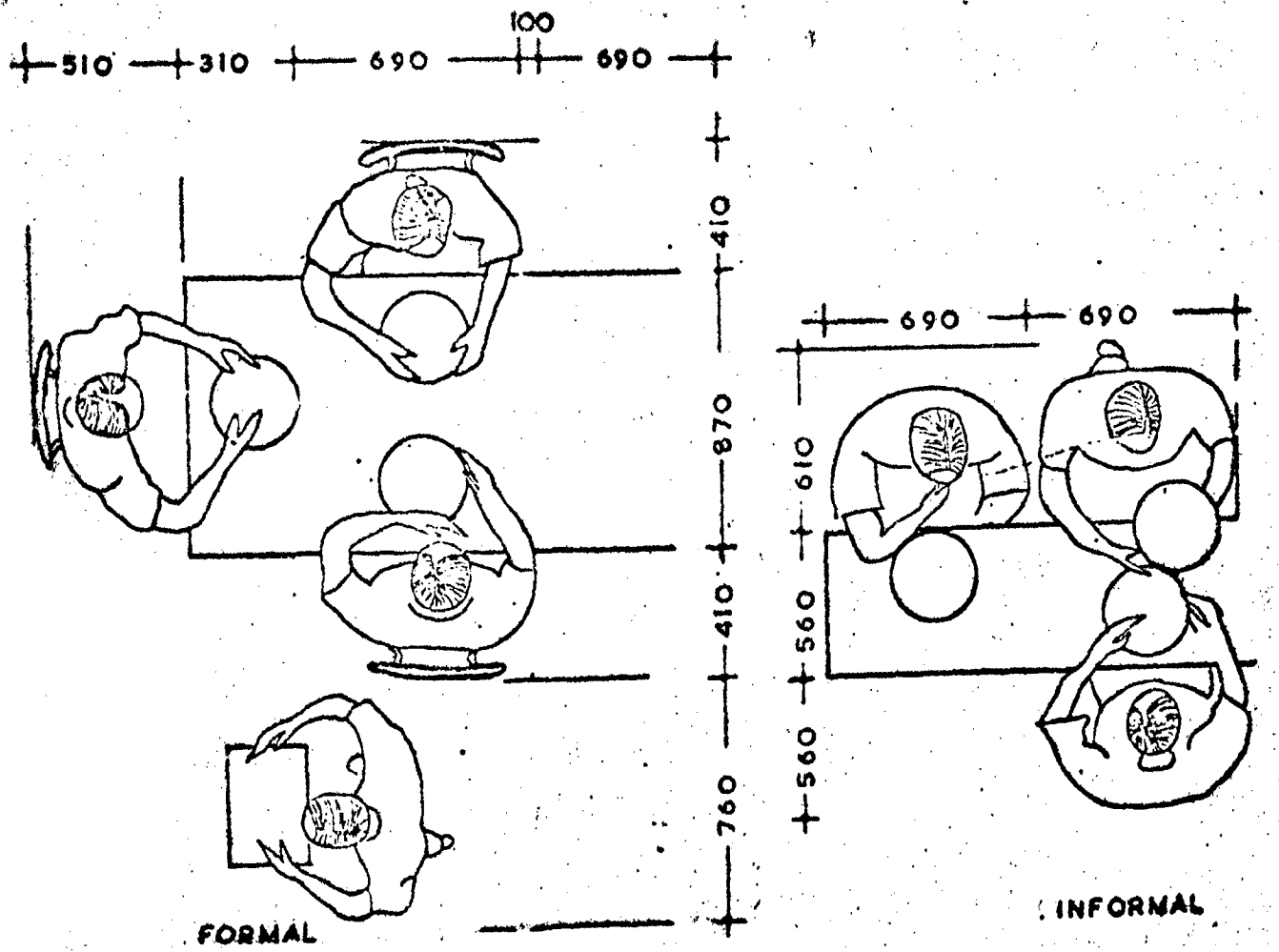
760
870
710
460
550
610
560
INFORMAL
760
750
1270
560
810
810
FORMAL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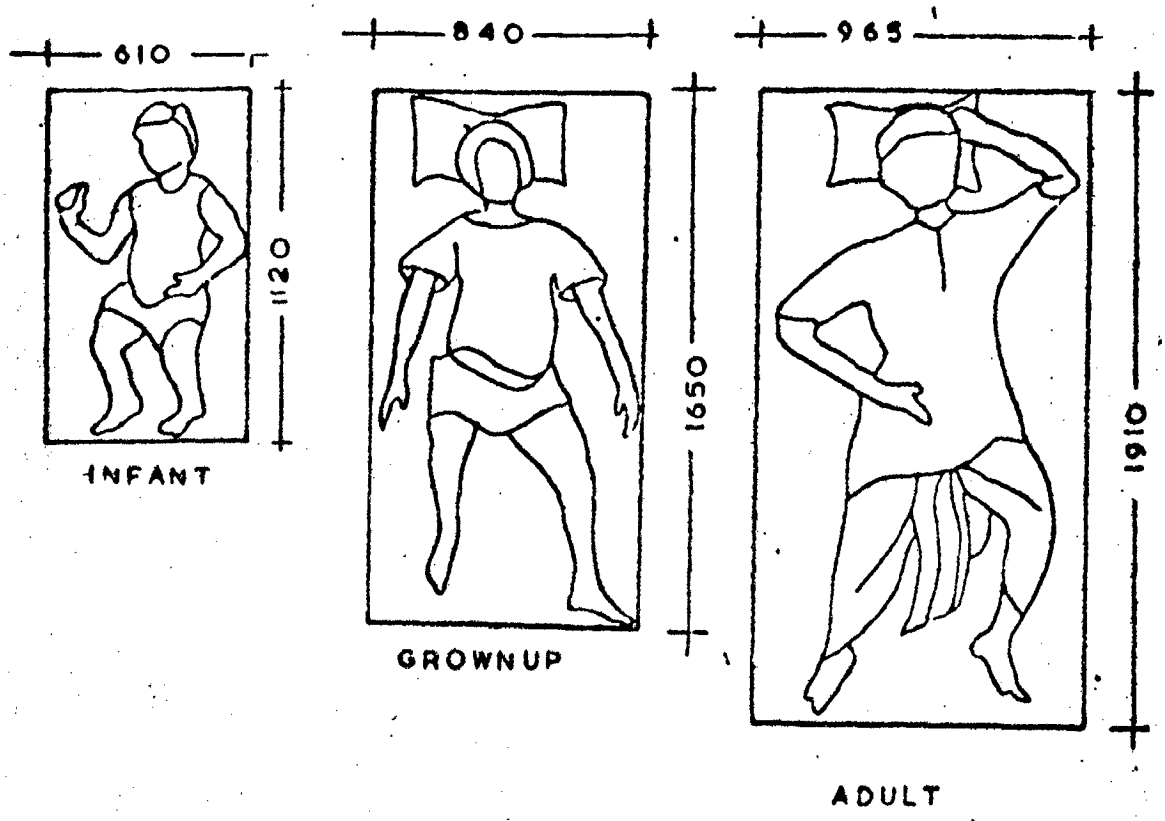
510
310
690
690
410
870
410
760
FORMAL
690
690
610
560
560
INFORMAL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1120
INFANT
840
1650
GROWNUP
965
1910
ADULT

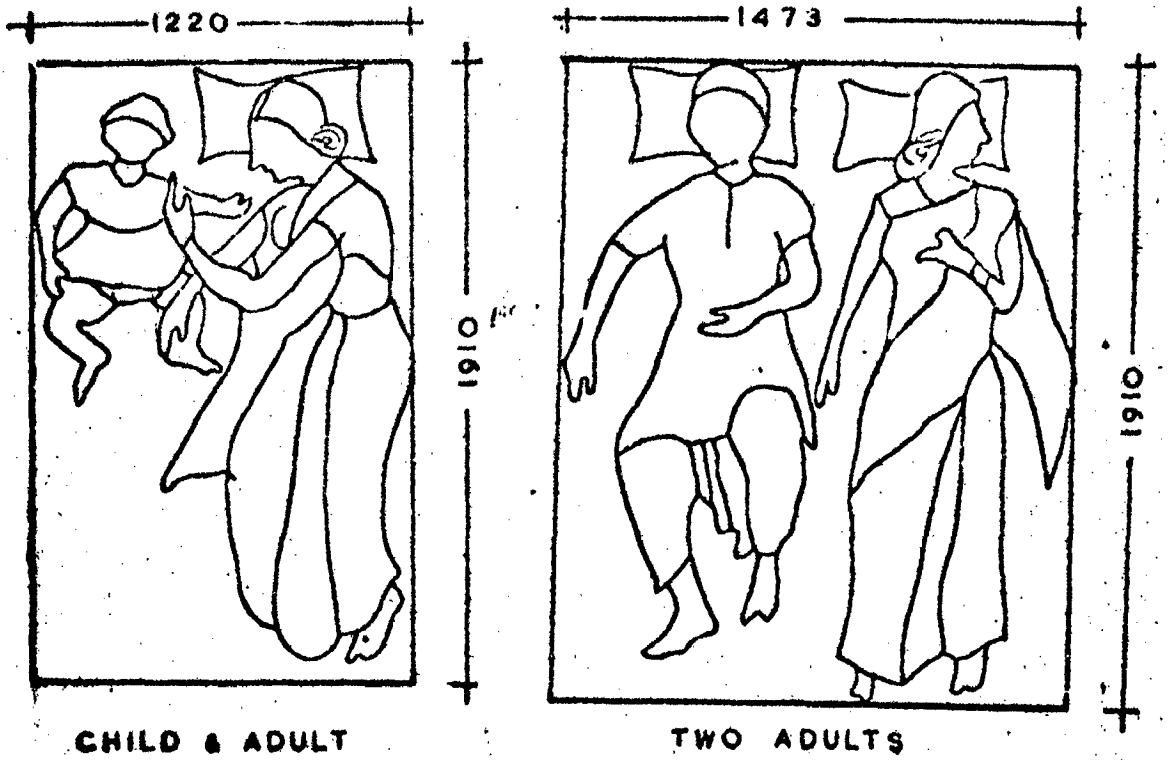
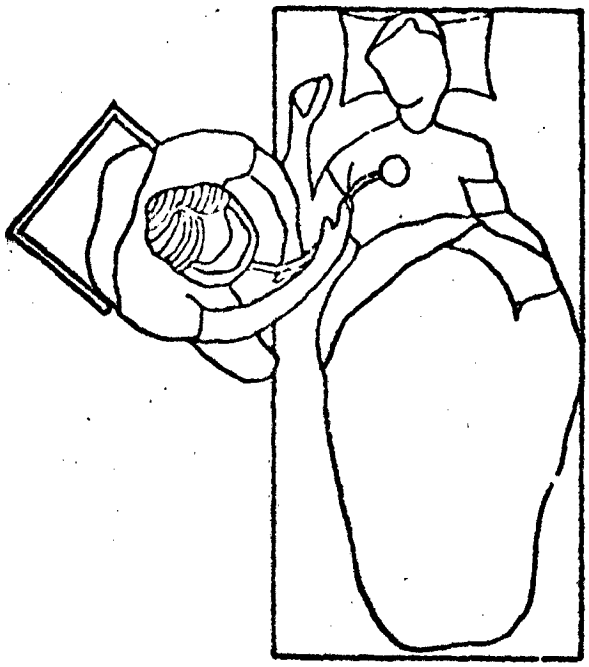
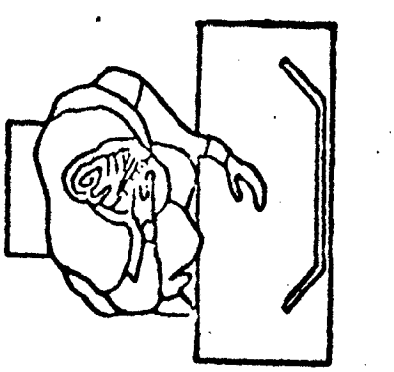

1220
1910
CHILD & ADULT
1473
1910
TWO ADULTS

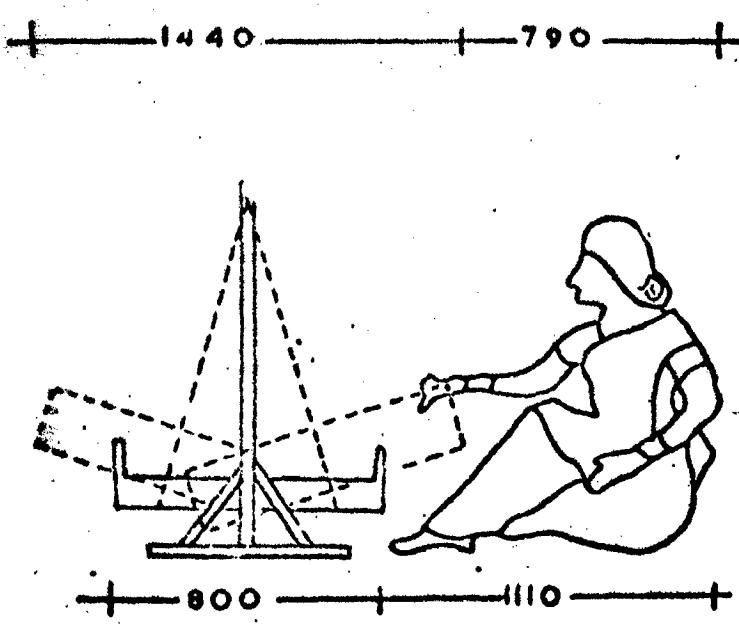
PLATE 5P



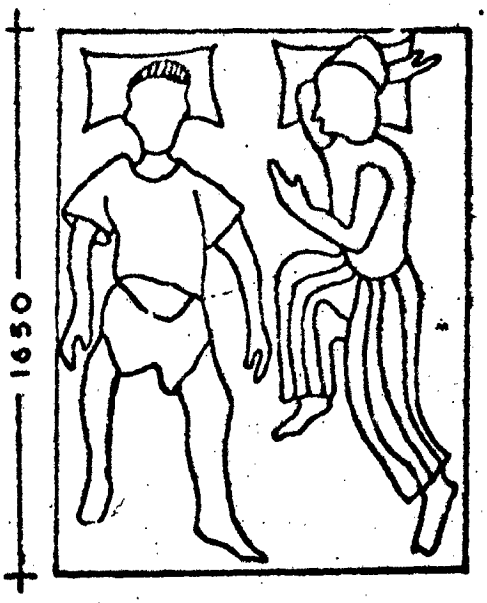
DOCTOR ATTENDING



DRESSING



INFANT IN CRADLE



GROWN UPS

GENERAL CONSIDERATIONS AND STANDARDS
SPACE STANDARDS

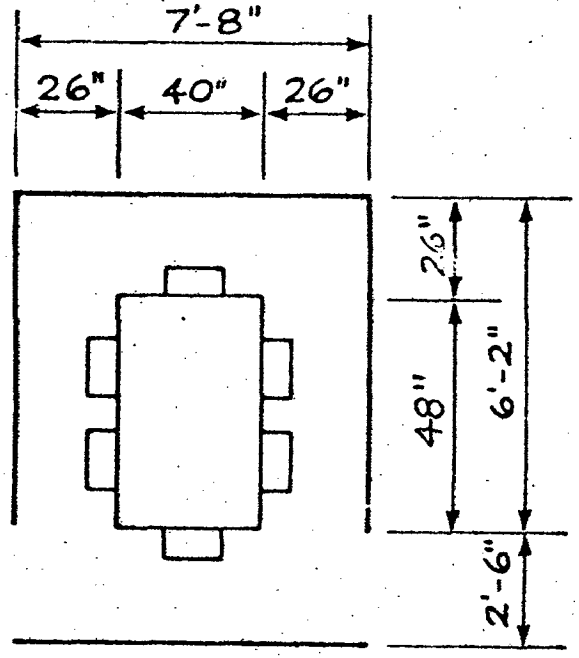
Minimum Floor Space Required for Household Activities, Furniture, Equipment and Storage In Square Feet

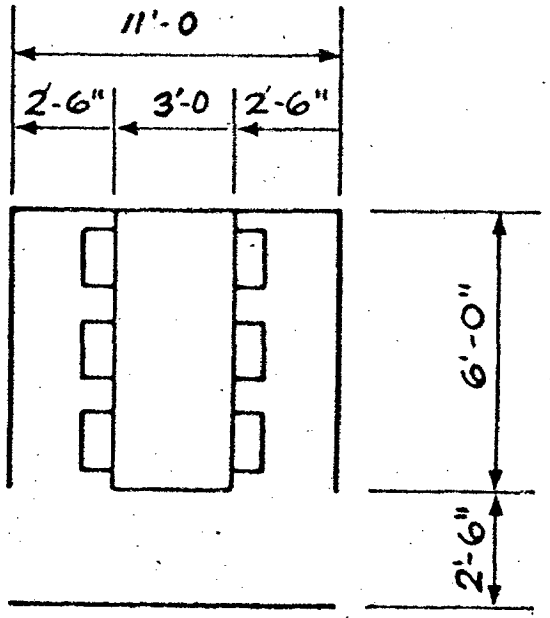
FOR BASIC ACTIVITIES	NUMBER OF PERSONS					
	1	2	3	4	5	6
Sleeping and dressing	74	148	222	296	370	444
Personal cleanliness and sanitation	35	35	35	70	70	70
Food preparation and preservation	8	76	97	97	118	118
Food service and dining	53	70	91	105	119	146
Recreation and self-improvement	125	164	221	286	357	383
Extra-familial association	17	17	34	34	51	51
Housekeeping	48	91	110	127	146	149
Care of the infant or the ill	—	124	124	124	124	124
Circulation between areas	20	20	35	35	45	45
Operation of utilities	—	20	20	20	20	20
Total Basic Dwelling Unit Area	380	765	989	1159	1450	1550
FOR OTHER ACTIVITIES						
Laundry	36	48	65	80	96	112
Household Maintenance	—	42	42	42	42	42
Circulation, two story	—	32	32	32	32	32
Total With Other Activities	416	887	1128	1313	1590	1736

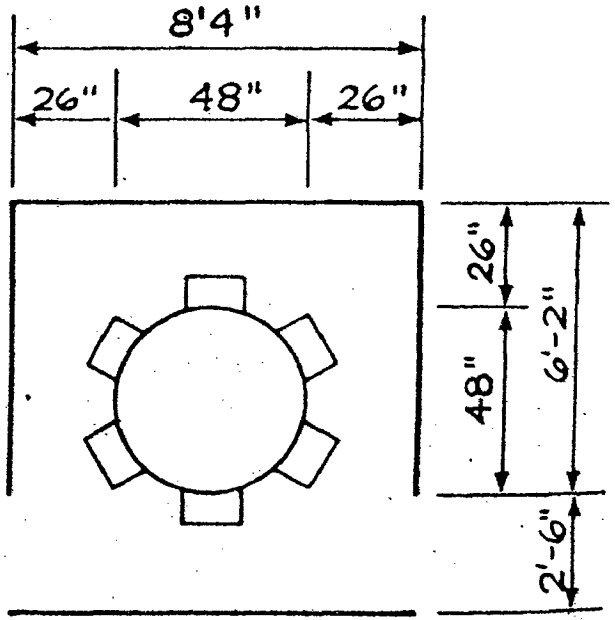
"Planning a Home for Occupancy"
Standards for Healthful Housing
Public Administration Service, 1950
American Public Health Association, Committee on the Hygiene of Housing

PLATE 5Q

DINING ROOMS



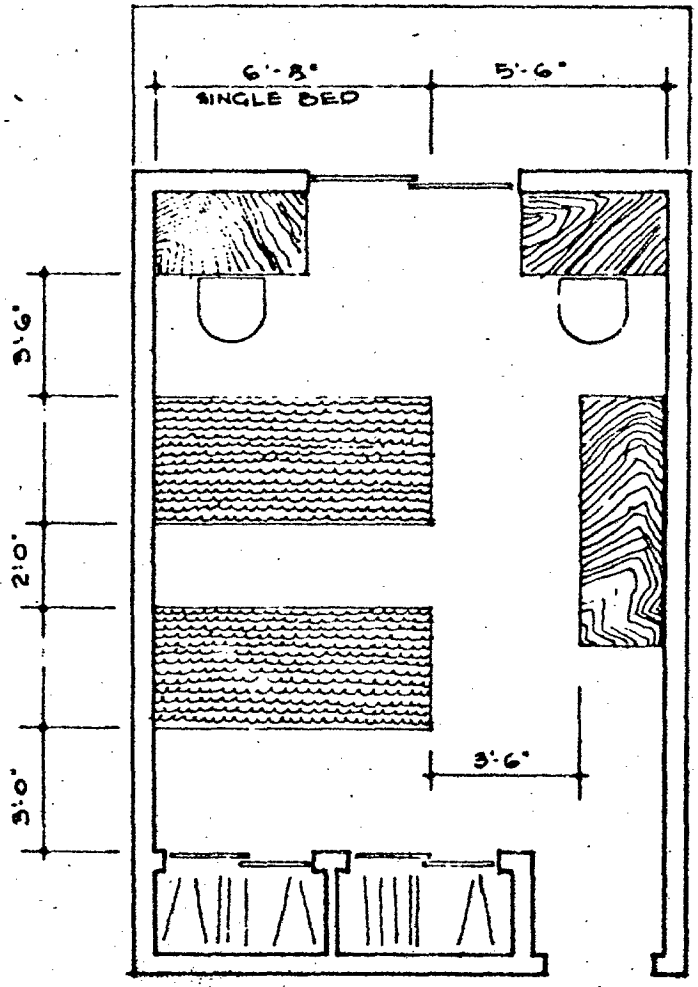




The Performance Concept: A Study of Its Application to Housing–Vol. III, John P. Eberhard, Institute of Applied Technology, Wash. D.C. 1969

PLATE 51

Bedroom for Two Children–Minimum Furniture Requirements



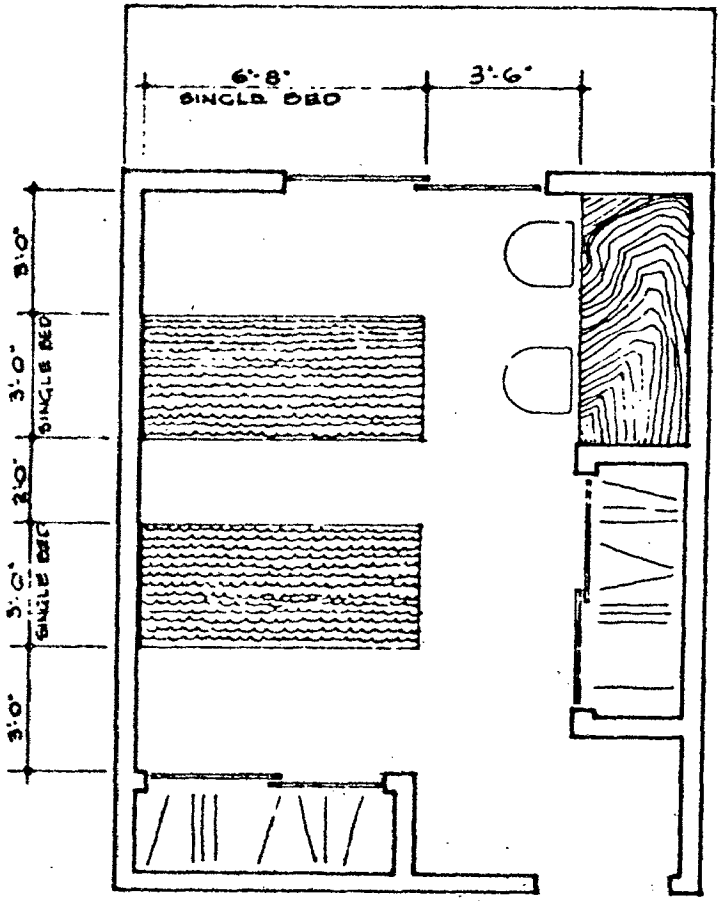
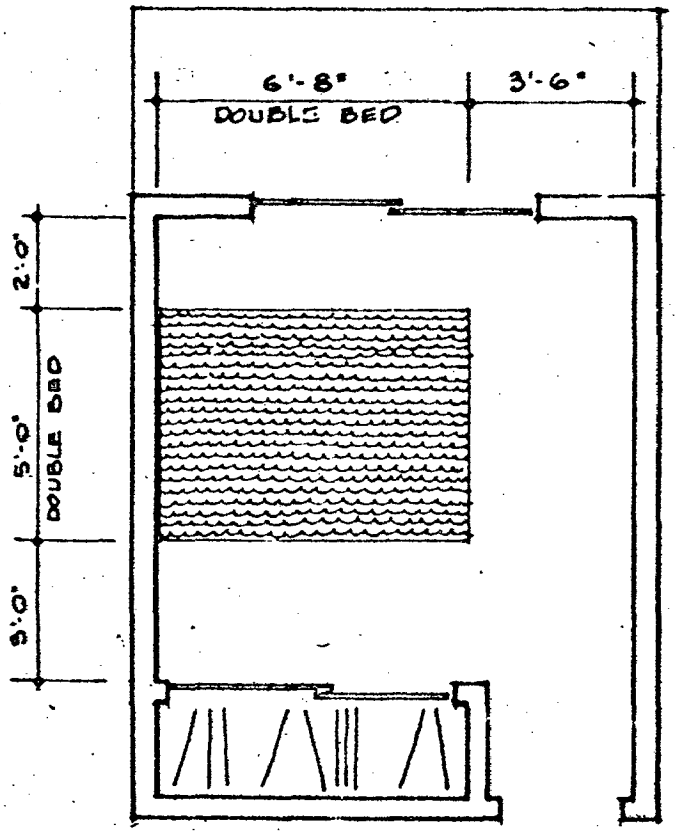


PLATE 55

Master Bedroom–Minimum Furniture Requirements



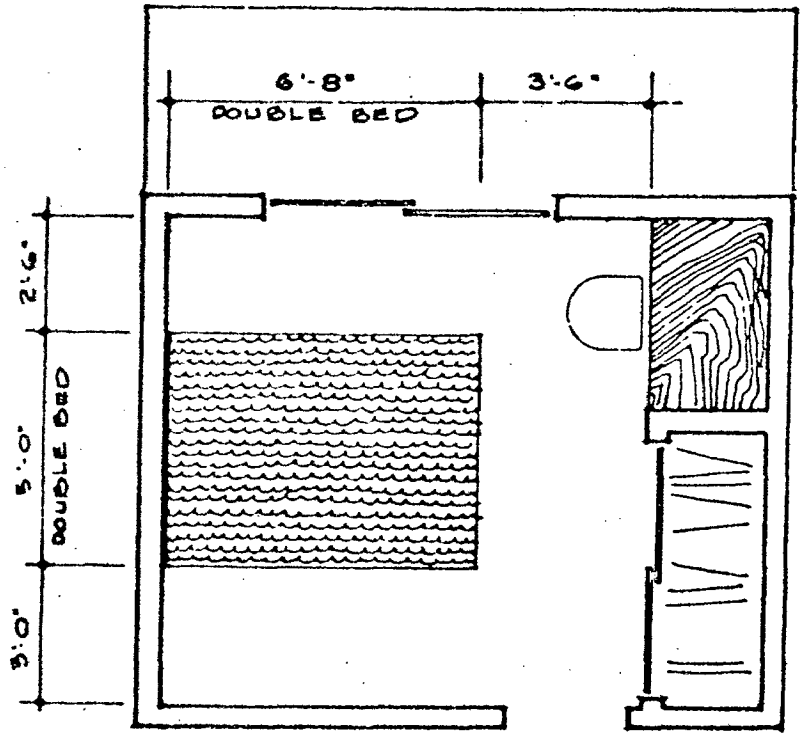


PLATE 5t

house that appears suitable and desirable to a young couple in the first years of marriage, may seem completely inade quate and inappropriate when they enter the expanding stage. Depending upon the age, sex and interests of children, the expanding years may require remodelling the available space or moving to a more spacious house. In the contracting stage, parents may consider moving into a smaller house that is easier to maintain.

Variation of spatial needs is also marked with different income levels, e.g. : the desired kitchen size varies from lower income group to higher income group as per the extra space needed for refrigerator, cooking gadgets and other specialised needs. Where the lower income group may find a kitchen that is much smaller than the prescribed minimum standards quite adequate, the higher income category finds the same very much inadequate.

Difference in the spacial needs is also seen for different age groups. e.g. the 3'x 4' water closet can quite comfortably be used by children and youngsters, but elderly people may not find the same comfortable. Moreover, the prescribed minimum standards are not necessarily adequate to perform the intended function of the room/space. e.g. the minimum permissible water closet area is not adequate for the provision of European type water closet, as the door will be blocked by the water-closet itself. (as shown in fig. 5.1.2).

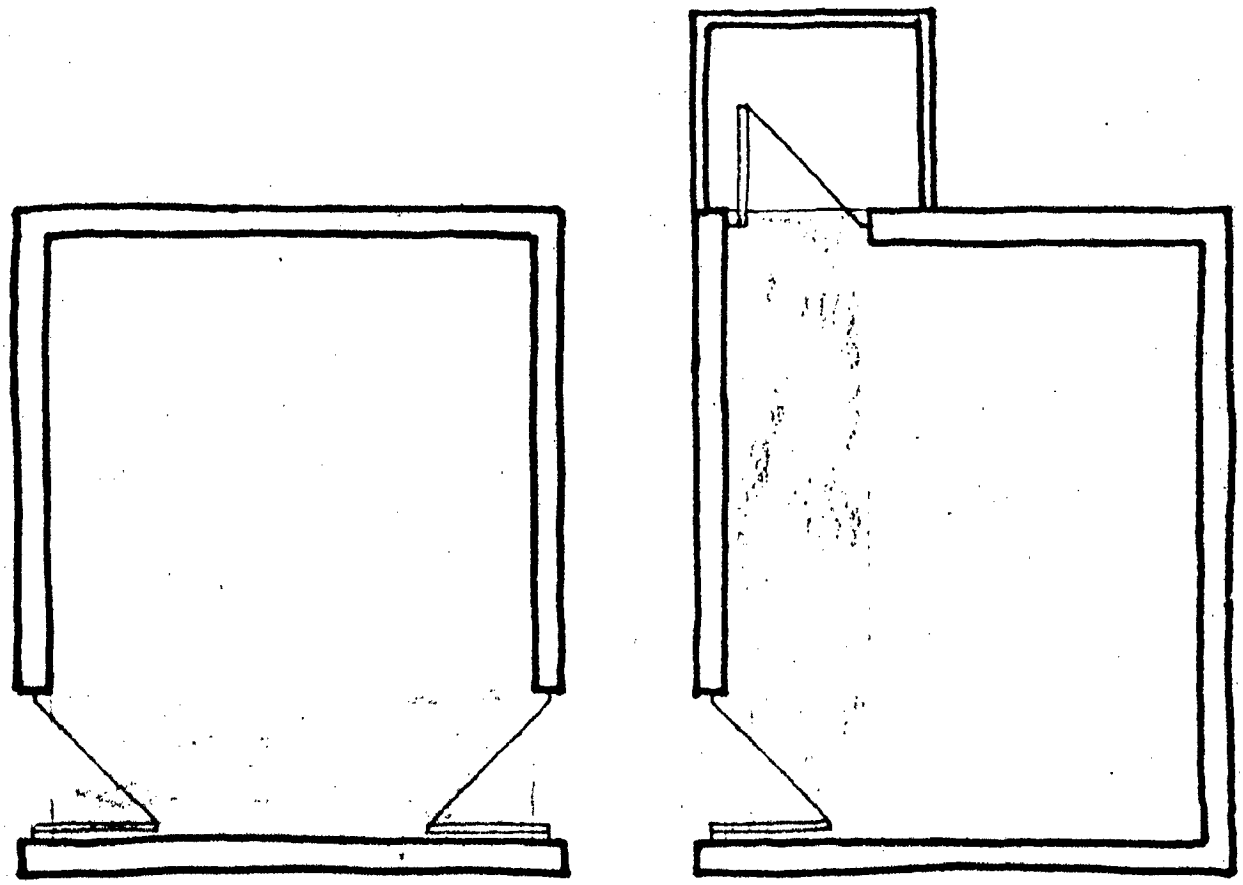


FIG. 5·1·1 ACTUAL USABLE AREA OF A ROOM

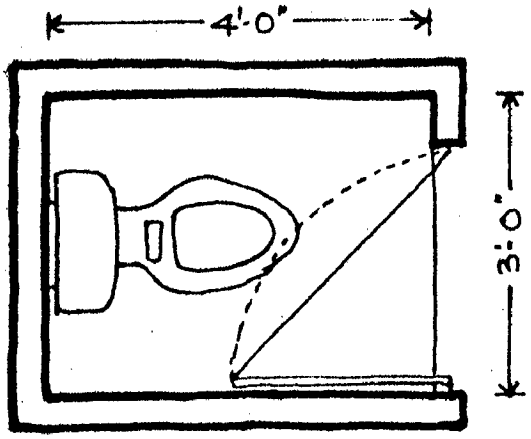


FIG. 5·1·2 EUROPEAN TYPE W.C. IN MINIMUM STANDARD DIMENSIONS (i.e. 3'x4')

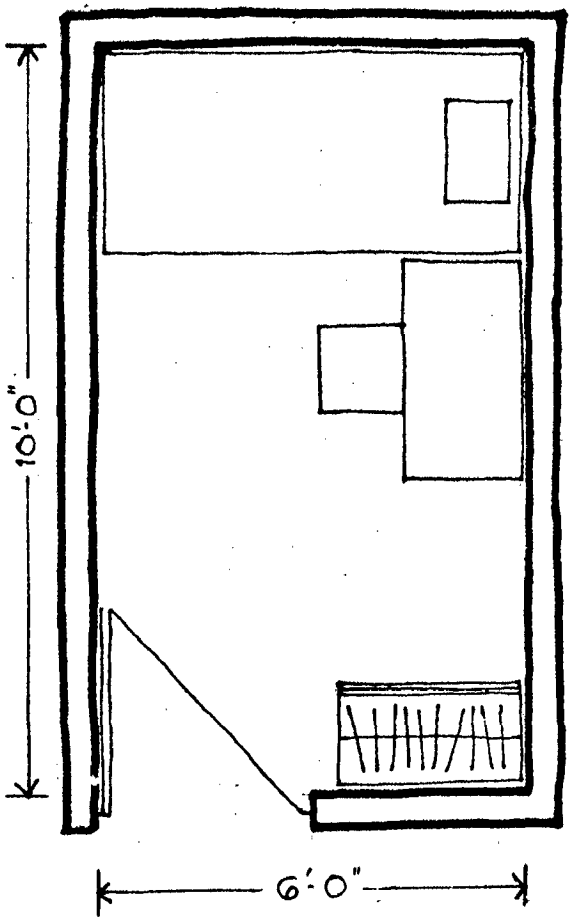


FIG. 5·1·3
A SMALL HABITABLE ROOM OF 60 SQ. FT. (6'x10')

On the other hand, the minimum prescribed area for a habitable room is 100 sq.ft.. But if the room is to be used only by a single person or a child, a 60 sq.ft. area seems fairly adequate (as shown in fig. 5.1.3).

However, the area for mezzanine floor can be increased to 50% from 33⅓ of the floor area (as specified) if sufficient headroom is provided below the mezzanine. The area of mezzanine floor also depends upon the purpose for which the area below the mezzanine is to be used.

Thus, the norms regarding the areas of rooms are difficult to be generalised. Therefore, these should best be left to the discretion of the architect or else these must relate themselves to the variety of needs and this means that the bye-laws should be prescribed in minute details.

From the cultural point of view, Indians are accustomed to use spaces for multipurpose activities. Especially in a city like Bombay where acute space shortage prevails, overcrowding in the dwelling makes multiple usage of each room an obligation. Hence, instead of having a clear-cut space division (like living, kitchen, bed) and then using the spaces for multipurpose activities, principle of "multi-purpose" rooms or interchangeability of individual rooms should be incorporated at the design stage itself so that the whole dwelling can be used as flexibly as possible. At the most, the function of the parts of the house can be

divided into two general categories -

a) Formal-adult-passive area which includes entry, living room, formal dining and master bed room.

b) Informal-child-active area inclusive of kitchen, dinette, family room, play area, children's bed room and utility room.

The formal area should not exceed one-third of the floor area, for what is of importance is the quality of the formal area and not the quantity.

Home is a place to remember. If the question is asked as to what our children will remember about the place that was their home, it can be pointed out that merely dividing 600 sq.ft. into two bed rooms, toilets, living room and kitchen will not create a memorable space for living. The Behaviorist School of Psychology maintains that a particular setting incluences all the individuals in it. Behaviorists further maintain that one's genetic inheritance is less important in predicting behaviour than the physical environment. If this is indeed true, the activities and possibilities that a house provides, take an enormous significance. It is essential to design with a thought beyond the provision of a unit of space per person. Architects have to know about the nature of physical and social environment they are going to deal with and include in their designs, factors which will make life more bearable and perhaps even pleasant for people, in spite of having to live close together.

Housing is not merely a physical problem which can be solved by clear division of space or development of quickest construction method with lowest cost. It is more a socio-environmental problem concerned with the quality of life.

5.2 SPACES MENTIONED IN BUILDING BYE-LAWS :

Old : Living, Kitchen, Habitable Room, Bath, Water Closet, Toilet.

Revised: Habitable Room, Kitchen, Kitchen-Dining, Pantry, Bath, Water Closet, Toilet, Store-Room, Loft, Mezzanine floor.

Civilised man no longer looks upon his house as just an abode..... rather he views it as a home. There is a great void in the basic philosophy of what a house should provide. The void is partially and inadequately filled with some inept elements that do more to destroy family interactions than to enhance them. There is no mention in the building bye-laws of many spaces where some of the vital activities are carried out. With the economic pressures described earlier, the general tendency is not to provide these spaces but to accommodate these activities in other spaces. Therefore the provided spaces cannot be used effectively. This can be seen in the following examples -

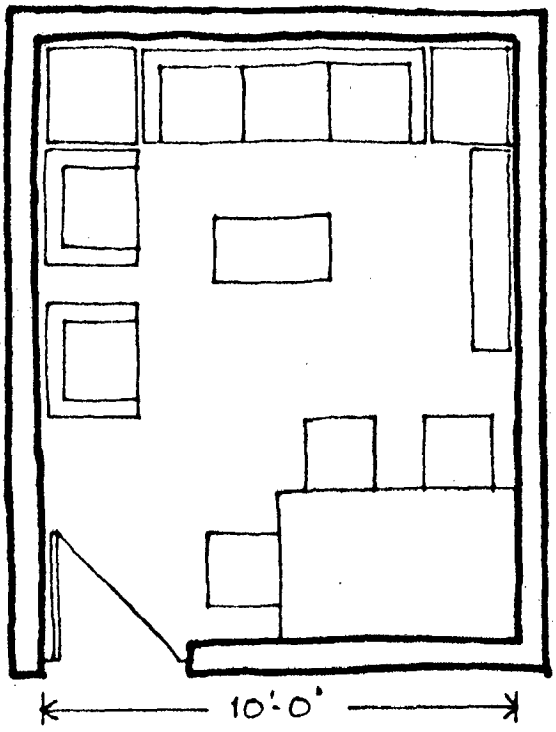
* There is no mention of dining space in the building bye-laws.

Therefore, the dining activity is accommodated either in

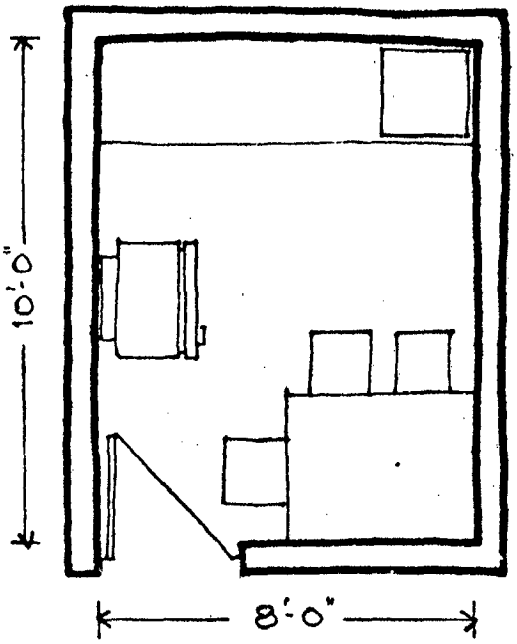
living or in kitchen, making the respective rooms congested. It is seen from the illustrations of living room and kitchen of minimum standard sizes, both accommodating dining activity (fig.5.2.1), that neither the living room 120 sq.ft. nor a kitchen of 80 sq.ft. can adequately facilitate dining activity.

Hence, the mention of spaces in the building bye-laws should be clearer with specific uses such as living, living-dining, kitchen and kitchen-dining. The attempt made in the revised bye-laws to differentiate between kitchen and kitchen-dining space requirements is appreciable.

Majority prefers dining at the table to dine on the floor in a hectic routine of Bombay, since the later consumes more time in arranging and cleaning the space and at the same time is a cumbersome process. But with the spatial constraints described above, it is difficult to accommodate the dining table in the minimum sizes of living or kitchen. If at all a dining table is used, it cannot be used effectively to its fullest potentialities, i.e. it may not be possible to use the table from all the four sides, one or two sides have to be kept touching the wall, reducing its utility value. Folding dining tables are gaining popularity to utilise the space occupied by the dining table when the dining activity is not carried out. Counter type dining tables are also not uncommon.

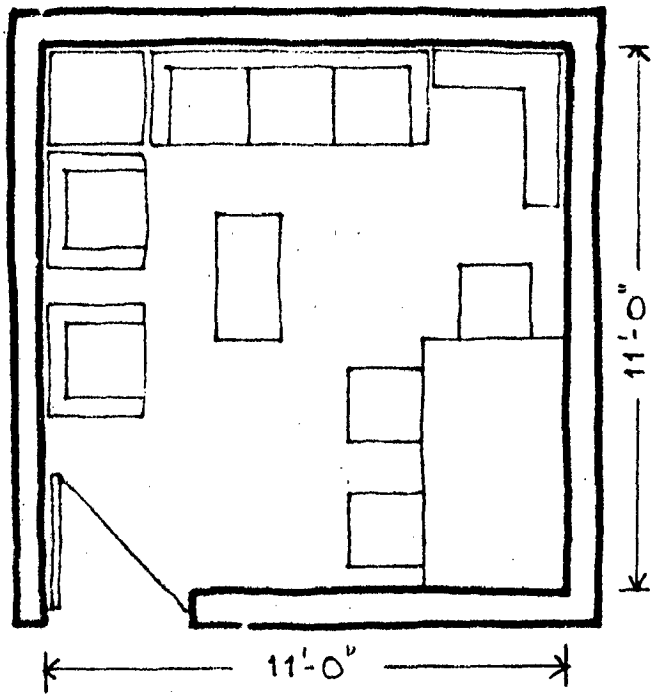


MINIMUM AREA OF LIVING WITH NO DEDUCTION OF CIRCULATION AREA



MINIMUM AREA OF KITCHEN WITH NO DEDUCTION IN CIRCULATION AREA

FIG. 5·2·1



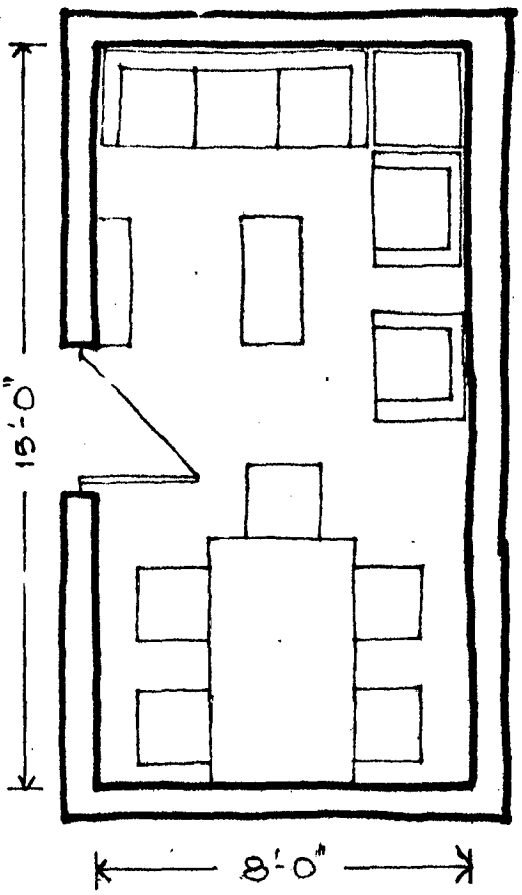


FIG. 5·3·1
8'X15' LIVING ROOM ACCOMMODATES DINING ACTIVITY MORE COMFORTABLY THAN 11'X11' ROOM.

Such arrangements cannot offer a vital, imaginative, productive environment for a creative family living. Dining table is a place to dine and not to feed. Dinner time is a part of the day when the family gathers naturally. There can be no better time to enjoy each other's company. Formal dining rooms are not necessary but it is essential for the dining area to be warm and inviting as a gathering place.

A family room can serve the purpose best. The basic theory behind the family room was a place for the family to congregate and for the children to play. Though it redundantly superimposed itself on the concept of the living room, it negated the need for the formal 'don't touch' living room. A multipurpose area related to kitchen is very important for middle-class Indian culture, which can function as dining area, play area and a family room. Parents and children are usually fond of such area as it is possible for them to spend their time there, without being under the restrictions presented by the living room which still maintains societal-presentational functions. Research has shown that small children like to play near the caretaker (who is usually the mother in the middle-class population). Provision of such a space can reduce the minimum space standards for living room and kitchen. It can also be used as an informal living room when there is a simultaneous arrival of a number of guests.

Usually Indians prefer doing most of their household activities in a group. Therefore, utility rooms are desired

in our kind of social set up,where family members can sit together while carrying on various house-hold chores. The family room described above can also be used as a utility room. An added advantage again is possibility of keeping a check on children at play while performing other household tasks. Since such spaces cut down a vital component i.e. a play area (which occupies more space) from children's bed room, provision of such spaces eliminates the need for children's bed room. A small sleeping and study area for children can serve the purpose.

* Provision for a wash-basin is not mentioned in the building bye-laws.

Bombay routine is very busy. Most of the family members go out during day time as the difference in the occupational rate decreases between men and women, increasing the population of working ladies. The morning period, during which the family members have to get ready for going out, has a narrow margin. This necessitates the provision of a wash-basin, since there is a strong possibility of simultaneous use of bath as well as wash-basin. Wash-basin is not made compulsory as per building bye-laws. As a result, only a bath and a water closet are provided as per the minimum requirements, without leaving any space for installation of a wash-basin. Being a necessity, people get the same installed, usually after occupying the dwelling. Generally it is installed in a

passage or a toilet lobby affecting the circulation pattern of these spaces.

Taking these facts into consideration, a thought should be given to make the wash basin, a compulsory feature (not for the economically weaker section of the society) so that due consideration is given at the design stage itself to the space occupied by the wash-basin and the user of the same.

* The provision for servants' accommodation as per the building bye-law is not appropriate.

The increasing number of working ladies prolongs the presence of servants inside the dwelling unit. Full-time servants are also becoming quite common. No provision for servant's resting or toilet, in spite of such circumstances, is made in the building bye-laws. If at all, a room for servant is to be provided, it is required to be of the minimum standard for habitable room. It is obviously beyond the means of the middle class residents to provide a room for a servant of the same dimensions which they themselves are using.

Such a situation, quite naturally, leads to the manipulation of the municipal drawings, whereby other spaces of the desired size can be converted into a servant's room or a resting place. Usually a small space is provided as a lobby near the entrance or a kitchen, however meaningless it may appear to perform the function of a lobby. After acquiring the approval, this space is converted into a servant's room.

Practices of such sort manifest the lacunas in the building bye-laws. It also indicates that the bye-laws are not framed as per the real requirements of the residents and hence architects have to search for some convenient loophole in the building bye-laws to serve the residents as per their needs.

These inherent defects spoil the image of building bye-laws in the eyes of architects, especially of those of younger generation. Hence it is quite essential that a small (about 4'x 8') resting space for the domestic servant is mentioned in the building bye-laws. As far as possible, this space should be attached with a small (say 3'x 5') toilet with an Indian type water closet and bathing space for a servant. This is particularly essential in the buildings where upper middle-class is going to reside. Otherwise a common toilet for servants can be provided somewhere in the building with a common resting room. The cost of this common facility can be distributed over all the tenements, with a concept of super built-up area.

* There is no facility for drying of clothes.

No space is provided for this important daily activity, since it is not mentioned in the building bye-laws. Clothes are generally dried in the passage or in the balcony. Drying of clothes in the passage is not effective in the humid climate of Bombay and at the same time drying in the balcony spoils

the elevation of a building. But the residents have no other alternative. Therefore, a provision of drying verandahs is essential. Such verandahs can be provided with a masonry grille to utilise the breeze of warm-humid, sea-facing city. The same verandahs can also be used as a servant's room. Thus, use of spaces for multi-purpose activities will reduce the cost of a dwelling unit with provision for more facilities.

* There is also no provision for a small habitable room which can be used as a study room, store room or a bed room for a child. In the revised bye-laws, mention of store room is made but a restriction is put on its maximum area (3 sq.m.).

The minimum prescribed area for a habitable room is too large either to be used by a single person or as a study room. Of course, such a room should not be provided as a bed room, in a single bed room flat.

The most important aspect of such a room is that just with a little extra cost it provides scope for enjoying privacy from the other members of the family. From the psycho-social aspects, it is today agreed that privacy has positive functions in the development of personality. The possibility of voluntarily detaching oneself from the group, makes the individual willing to return to full activity within the group. There is a danger to harmony in the social inter-relationships when privacy disappears. Osmond has distinguished between two basic kinds of space -

a) Socio-petal which brings people together

b) Socio-fugal which removes people from one another.

The consensus among behavioural scientists is that the spatial organization of the optimal dwelling unit must be such as to permit the family, both, interaction and privacy and should therefore include both the elements.

5.3 MINIMUM STANDARDS FOR WIDTHS OF ROOMS/SPACES :

	Old	Revised
Habitable Room	9'-0''	4.4 m
Kitchen	7'-0''	1.8 m
Kitchen-Dining	-	2.4 m
Bath	3'-6''	1.2 m
Water Closet	3'-0''	0.9 m
Toilet	3'-6''	1.2 m
Corridor	3'-0''	1.0 m

Width of a room is viewed in relation to its other dimensions i.e. the length and height of a room. The psychological feeling of crampness is produced among inhabitants, when the width is much smaller than length or height. Precautionary measures must be taken to avoid such feelings, while designing the space inside the dwelling unit. e.g. : when the height is comparatively much more than the width of the space, the ceiling on its top should be lowered with a provision of loft or a mezzanine. The area above such spaces can be suitably utilised for storage.

With the prevailing minimum standards, there is no scope for any room/space to become excessively long compared to its width. At the same time, a room rectangular in shape usually becomes more effective in use than a square shaped room. e.g. : A 9'x 13'-6'' living room is certainly more effective than an 11'-0''x 11'-0'' living room. Thinking in this direction, one feels that an 8'x 15' living room can accommodate dining activity more comfortably than a 10'x 12' living room (as shown in fig.5.3.1). Therefore, the minimum width of the habitable room can be reduced to 8'-0''(2.44 m). A width less than this may introduce difficulties in furniture and equipment arrangement. Similarly the kitchen width can be reduced to 6'-0'' as shown in the illustration (fig. 5.3.2). However, minimum width of 8'-0'' is essential if the dining activity is to be incorporated in the kitchen. A bath 3'-6'' wide, is quite adequate as a minimum, so also a water closet 3'-0'' wide. But for the combined toilet, the revised rules are appropriate in providing minimum width of 1.2 m, i.e. 4'-0''. From the author's viewpoint, the corridor width should be increased to 4'-0'' minimum to have a proper circulation space.

5.4 MINIMUM STANDARDS FOR HEIGHTS OF ROOMS/SPACES :

	Old	Revised
Habitable Room and Kitchen	9'-0''	2.75 m clear
Bath,W.C.,Toilet	7'-6''	2.20 m clear

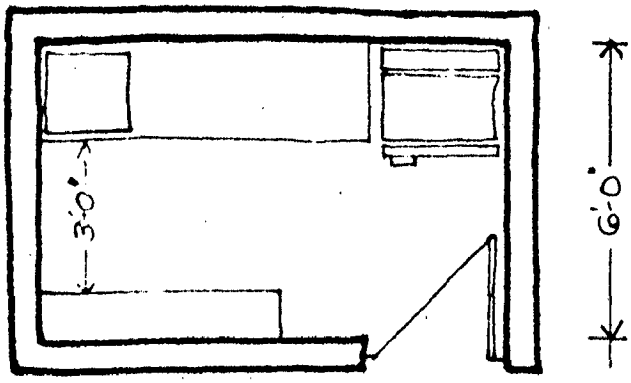


FIG. 5.3.2. KITCHEN OF 6' WIDTH

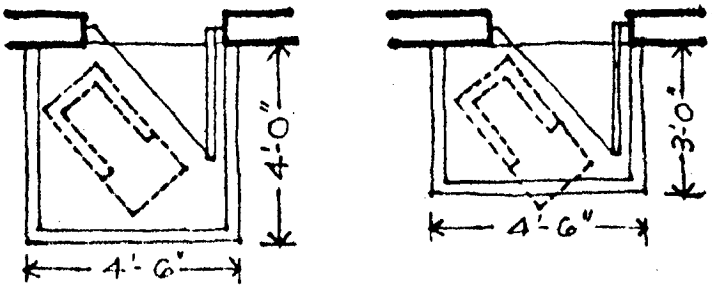


FIG. 5.5.1 RESTRICTIONS ON BALCONY DIMENSIONS AS PER OLD & REVISED RULES

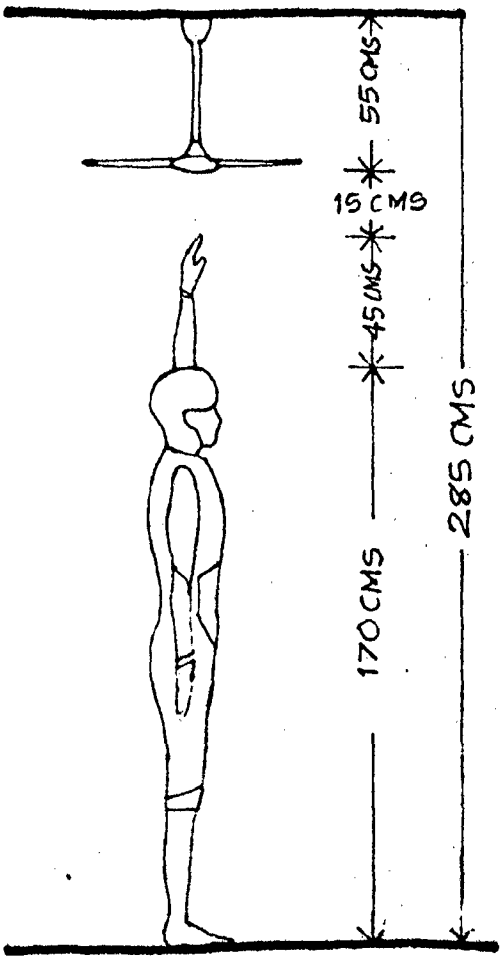


FIG. 5.4.1 HEIGHT OF ROOM WITH RESPECT TO AVERAGE HEIGHT OF AN ADULT INDIAN MALE

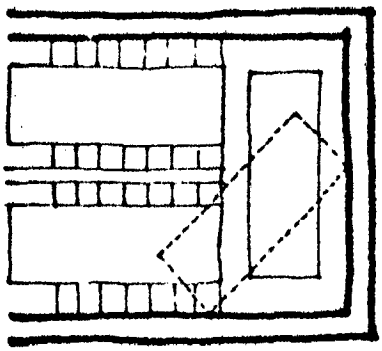


FIG 5.6.1 DIFFICULTY IN FURNITURE TRANSPORTATION DUE TO NARROW WIDTH OF LANDING & STAIRCASE FLIGHT

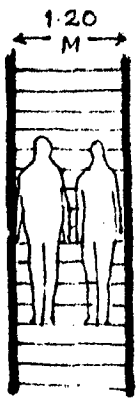


FIG. 5.6.2
MIN. WIDTH OF STAIRCASE FLIGHT FOR COMFORTABLE CIRCULATION

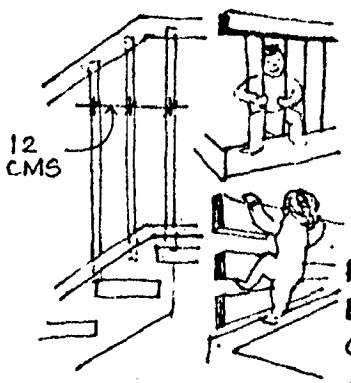


FIG. 5.6.4
BALUSTERS HAVE TO GUARD AGAINST SUCH 'CHILDISH' HAZARDS

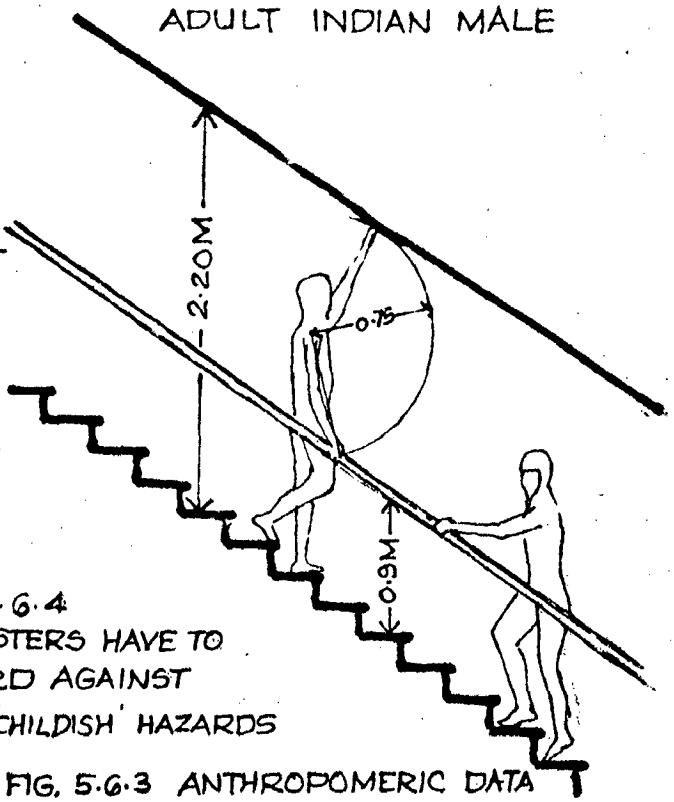


FIG. 5.6.3 ANTHROPOMERIC DATA REGARDING HEIGHT OF HANDRAIL AND HEADROOM OF STAIRCASE FLIGHT

As per the revised bye-laws, loft may be provided over kitchens, bath rooms and corridors, built up to an area 25 percent over kitchens and full space of bath rooms, water closets and corridors and the maximum height of a loft shall be 1.5 m.

Comfort conditions indoors largely depend upon the ventilation which is related to number of air changes in a given room. These, in turn, depend upon the cubic contents of the room. It is essential to know the area and height of the room to know its cubic contents. Since the area of a room is a variable factor, it is advisable to fix the height of the room.

One has to go beyond the ground storied structures to accommodate the population in a city like Bombay where acute space shortage prevails. Hence it is advisable to have optimum floor to floor height and nothing extra to save upon the climbing efforts of the residents and also upon the construction cost.

The factors governing the height of rooms are -

* Average height of an adult Indian male
* Height of appliances used by occupants like ceiling fans
* Psychological feelings of the user.

Bombay falls in the hot humid region of the tropical belt. With an annual average temperature of 31^{o}C and an annual average relative humidity of 77%, the city dwellers

tend to perspire profusely. Ceiling fans are pressed into service to relieve this discomfort. The ceiling fans have a maximum efficiency, if the depth of the fans is strictly observed according to the manufacturer's specification. This depth from the ceiling (usually between 50 to 55 cms.) needs to be taken into account while deciding the height of the habitable rooms, failing which there is a danger of inhabitants' hands crossing the path of the rotating blades of fan while performing various acts like changing clothes.

Assuming the height of adult Indian male as 170 cms. (approx. 5'-8'')- if he raises his hand above his head, it would go upto about 45 cms. at its full stretch, added to the depth of ceiling fan (50-55 cms.), the total works out to be 265-270 cms. In order to have clearance of at least 15 cms., the clear height of the room (i.e. from top of the floor to bottom of the ceiling) is desired to be 285 cms. (as shown in fig.5.4.1).

Taking psychological feelings into account, height of the room is viewed with respect to the area. So it is logical to have different heights for different areas. On the other hand, to simplify the structure and also to reduce the cost of construction, it is advisable to have same heights for different spaces on the same floor. From psychological viewpoint, people do not like very low ceiling heights for normal sizes of rooms. At the same time, they are not satisfied with the same ceiling height for small areas like water

closet, bath etc. A person using an Indian type water closet does not desire the feeling of approximately 8 feet of height above his head. So much of space appears to be bearing down upon him. To remedy this situation, the ceiling of water closet and bath should be lowered to the least possible practical height. The normal door height is in extensive use and justifiably so is 2.10 metres. Hence the height of the water closets and baths can in no case be reduced to less than 2.10 metres. The specified standards, therefore, for minimum height of water closet, bath and toilet appear to be quite appropriate.

Another viewpoint is to increase the height to more than the optimum to facilitate the construction of mezzanine floors. The concept of incremental housing (i.e. possibility of expanding the house for future needs) is not incorporated in the type of housing (i.e. apartments) that prevails in Bombay. At the same time, it is difficult for the residents to shift the residence when they are in need of more space, due to financial, social and other constraints. A little extra height of the dwelling unit can serve the purpose in such a situation, which can be used to construct sleeping platforms. Such mezzanines can also be used for various other activities. Storage facility can also be given a thought in this increased height. Free movement inside the loft is essential and a little extra height (than that what is provided) is necessary. The revised building bye-laws seem

to be quite alright in the provision of loft.

5.5 RESTRICTIONS ON BALCONY DIMENSIONS/OUTDOOR SPACES :

	Old	Revised
Total area	10% of floor area	10% of floor area
Width	4'-0'' maximum, 4'-6'' max.if facing a street	0.90 m max.
Length	Half the room width, more if flat is less than 60 sq.mt.	

In hot-humid tropical countries like India, the open space around the building is quite important as outdoor living is possible and desirable for the major portion of the year. It forms an integral part of the lives of the Indian people from social and climatic point of view. The terrace, balcony etc. provide a valuable augmentation of indoor living space. Therefore, a true expression of living conditions can be obtained only by relating the floor space to the total living space indoors and outdoors within the boundary of the plot. However, outdoor spaces cannot be used for sleeping at night as the humid climate induces joint pain especially in combination of sea breeze and early morning dew. Yet the utility coefficient of outdoor spaces (balconies and verandahs) is 80% - This is slightly higher than those of the indoor space.

But the building bye-laws exempt only 10% of the floor area from F.A.R. calculations for balconies. Even this

10% exemption is subjected to numerous conditions as stated in the begenning. Such deterrents in the form of bye-laws prevent the architects from providing luxurious balconies, which are in fact, desirable for the climatic condition of Bombay. Another point, worth noting, is that the number of high rise buildings is increasing rapidly in Bombay. The higher the person goes to live, his contact with 'terra-firma' goes on reducing. He then requires outdoor spaces to get rid of his 'confinement psychosis'. The restrictions on balcony dimensions, of length and especially of width do not permit the effective utilisation of the same as shown in the illustration related to the anthropometric studies (fig.5.5.1).

Moreover such restrictions affect the design and elevational aspects of the building. As the balcony area is given free of F.A.R., the general trend is to consume each and every square foot of the permissible balcony area. At the same time, the restrictions on the length of balcony permit only a small area of balcony for every room and to consume the full area free of F.A.R., these are provided for more number of rooms, increasing the circulation area in each room. Sometimes these are also provided at odd places where the need of the same is not felt at all. Thus, the main factors for provision of balcony like street view or breeze direction are given a slip and the emphasis is only on consuming the whole balcony area that is given free of F.A.R. The half length balconies even tend to spoil the elevation

of buildings compared to the luxurious full length balconies giving gorgeous effect to the buildings.

There is a growing tendency among the residents to enclose the balcony and convert it into an indoor living space. This indicates shortage of indoor living space to acquire which the residents are prepared to sacrifice their outdoor living spaces. The restriction on length of the balcony was introduced to discourage this tendency. But as described earlier, such a restriction reduces the utility value of the balcony and also affects the design of the dwelling by adding to the circulation spaces with more number of balconies.

Hence, the recommended solution to stop the practice of enclosing balcony, is adding the 10% (or whatever permissible) free of F.A.R. area, to the permissible F.A.R. and then using the whole as a total F.A.R., the proportions of indoor and outdoor spaces being the residents' choice i.e. the total outdoor space can be more or less than the 10% floor area (i.e. permissible balcony area) e.g. : If the permissible F.A.R. is 1.00, the total F.A.R. will be 1.10, the whole of which can be used as an indoor space. At the same time, possibility of exceeding the outdoor space to more than 10% is also provided, inducing ample flexibility in the provision of outdoor spaces.

Terrace provisions are usually discouraged, by prohibiting the entry to such terraces. In fact, terraces at

various levels are essential especially in highrise-buildings. These can be used as play areas by the upper floor residents to enable easy supervision on children's play activities. Such terraces can also be used for other household purposes. Sometimes setbacks are provided for tower like structures at upper levels to compensate for the open spaces at ground level. But as per building bye-laws, the terraces formed are not made accessible from the individual flats. Usually the set-backs are at the corners of buildings, the vertical circulation being in the centre. Giving a common entry means wasting a long circulation corridor to reach out to the terrace. Terraces, in such cases, need to be made available for individual flats for residents' use.

5.6 MINIMUM/MAXIMUM STANDARDS FOR STAIRCASE DIMENSIONS :

	Old	Revised
Width	3'-0''	1.00 m. min.
Tread	-	25 cm. min
Riser	-	19 cm. max
Height of handrail	-	90 cm. min
Head room	-	2.20 m min
Width of landing	3'-0''	1.00 m min

Staircase area is not exempted from F.A.R.

Since the area of the staircase is not exempted from F.A.R., the staircase provision usually is of the minimum standards as per the bye-laws or at the most of that of a

little better standard.

Staircase is the only means of vertical communication in buildings, where, there is no provision of a lift. Therefore, it should be designed in such a manner that it provides easy and comfortable accessibility to the user. He should not be unnecessarily strained while climbing the stairs. From the illustrations of anthropometric studies, it is seen (in fig 5.6.1) that the prescribed minimum standards for the staircase dimensions, especially those for the width and landing cause many difficulties. Furniture transportation is often hampered, damaging both, the staircase and the furniture. These also create problems while taking a stretcher or a dead body out from the dwelling units. It should be remembered that staircase also serves as a fire escape.

The following are the major considerations that need to be given a thought while designing a staircase -

* Width of the tread and height of the riser.
* Width and run of the staircase flight
* Length and width of the landing
* Perpendicular headroom
* Handrails and balusters
* Lighting and ventilation

* Width of the tread and height of the riser :

The dimension of an adult foot vary from 22 to 25 cms. Therefore, the tread of 27 cms. is quite comfortable and essential. The height of the floor has been prescribed

as 275 cms., coupled with a slab thickness of 10 cms. and a floor finish of 3 cms., the total works out to 288 cms. (as per the revised bye-laws). This is the precise height reached by two flights of eight steps each i.e. 18 cms.(riser height) x 16 steps = 288 cms.(total floor height). Thus, the riser height, too, is satisfactory.

* Width and run of the staircase flight :

In a residential building, the width of the flight of the staircase should be such that it would allow two people to ascend or descend abreast of each other. Based on this assumption, the clear minimum width of a staircase flight should be 1.20 m(as shown in fig.5.6.2). This width in combination with the length and width of the landing would also enable the comfortable movement of furniture.

The length or the run of the staircase flight should be limited to a maximum of 12 steps, since this is what a person can climb at a stretch. Therefore, it is imperative that there will be a landing after every 12 steps to enable the climber to regain his breath. Similarly flights of less than 3 steps should be avoided as they can be easily overlooked.

* Length and width of the landing :

The length of the landing should not be less than unobstructed width of the staircase, the obvious reason being,

the dangerous offsets that would otherwise arise. Similarly the width of the landing should not be less than the unobstructed width of the staircase flight. The minimum width, therefore would be 1.20 m, which is the minimum recommended width of the staircase flight. Such a length and width of the landing can also facilitate the transportation of furniture and stretchers.

A thought should be given to extend the staircase landing to use it as a space for social communication, since this is the only place where neighbours try to communicate in flat type accommodation. The same space can be put to many other uses apart from improving the social relations among the residents. The space can also be used for children's play facilitating keeping a check, being on the same floor.

Such a provision, in these days of inflation and profit making, can be made only if staircase and landing area is exempted from permissible F.A.R.

* Perpendicular Headroom :

Headroom should be decided on the basis of anthropometric data. It is seen from the same (fig.5.6.3) that the minimum perpendicular headroom required should be 2.20 m. This would also allow a 2.10 m high door in passages below landings if so desired. On the other hand, unlimited headroom is best for furniture transportation, but 2.20 m is the optimum that has been suggested.

* Handrails and balusters :

The height of the handrails from the top of the tread shall be 90 cms.(once again based on anthropometric data). Handrails should be provided on both the sides if the width of the staircase flight exceeds 1.20 m.

If balusters are used, the centre to centre distance of the balusters should not be more than 12 cms. This is to prevent kids from forcing themselves through. Similarly, to avoid balusters from being bent by children, the diameter of the baluster at its thinnest point should not be less than 2 cms. Horizontal boards shall not be used as balusters since they tempt small children to climb up (as shown in fig.5.6.4).

* Lighting and ventilation :

Dark stairs in dimly lit stairwells greatly increase the danger of falling. Therefore treads should either be light in colour or light edge strips should be used to indicate the front edges of steps. Lighting should not be too sharp either. Open-riser stairs allow light to pass through and give an overall lighter effect. A minimum illumination of 100 lux is sufficient for residential stairs.

The period of occupancy of stairs is extremely short. Hence no special consideration is required as far as ventilation of the staircase is concerned. An opening of minimum 0.5 sq.m. per landing is quite sufficient. Fire prevention

and fire fighting requirements should be carried out to the satisfaction of the authorities.

5.7 MINIMUM STANDARDS FOR LIFTS :

Lift is made compulsory for a building height more than 52' (as per old bye-laws) and 16 m(as per revised). Two lifts are required for buildings more than 70' in height. If a building is on stilts, 75' of height can be constructed with single lift.

When the height of a building exceeds a certain limit, the climbing of stairs to reach the higher floors becomes a physically tiresome task. Lifts are essential in such curcumstances. They too are a means of vertical communication and augment the services of staircases. Lifts come as a relief to the tired legs.

Lift is provided in a building which is more than 52'-0'' in height. This means that ground plus four storeyes are permitted without lift. Fifth floor can be constructed without lift only in existing building having balance (unused) F.A.R., the area of the fifth floor being limited to 1200 sq.ft.

As a matter of fact, a normal healthy human being finds it extremely tiresome to climb ground plus three floors, leave alone ground plus four. Old people, small children, persons coming home after a busy day at office and housewives loaded with groceries after hectic shopping,start

palpitating on reaching the third floor itself. Even the survey results show that most of the fourth floor residents and some of the third floor residents prefer to have lift and are prepared to bear the extra cost for the same.

A lift installation costs approximately Rs. 2 lakhs. Under the present clause of lift provisions, lift is compulsory for ground plus five stories, i.e., if there are four tenements per floor in a six storied structure, the cost comes to about Rs. 8350/- per tenement. If the lift is installed in a ground plus four storeyed building, cost is distributed over twenty tenements, that means an additional burden of Rs. 1650/- per tenement, as compared to ground plus five.

Thus, financial considerations play a major role in the provision of lift. However, when the residents are ready to bear the extra cost, provision of lift should be made for ground plus four storeyed structures too. Here, the bye-laws should be flexible in keeping with income levels, the height limit of a building for making the lift provision compulsory, being inversely proportional to the income level.

Area of lift well is not exempted from F.A.R. Therefore, the lift dimensions are usually of minimum possible standards as per manufacturers' specifications. As a matter of fact, the size of lift depends upon the number of occupants using the same. It cannot be decided only with respect

to the height of a building. For a given height, there can be one tenement per floor or four tenements per floor, differing the number of occupants and the frequency of lift trips.

In every type of building, there is a critical lift traffic period. The type, direction and intensity of elevator traffic during this period determines the extent and quality of elevator service for a particular building. If the lifts serve traffic well during the critical time, they should be capable of satisfying traffic at all other times. Critical traffic periods vary with building types. In apartment houses, the critical traffic period is usually in the morning when practically everyone is leaving for work, as well as late afternoon or evening period.

In case of a building with stilts having seven upper floors, not exceeding 75'-0'' in height, the provision of second lift is not insisted upon. That means eliminating the first floor residents, there will be total 24 tenements considering four tenements per floor i.e. 120 occupants using the lift. If three members of each family are presumed to leave in the morning, 72 persons leave the building in peak hours (8 A.M. to 9.30 A.M.). This works out to a frequency of one person every 72 seconds. At the same time, there will be others like domestics, grocer, launderer, postman etc. who will also be using the lift. Since the residential buildings do not go in for fast lifts, the waiting time is greatly enhanced. Thus, the law should relate the size or number

of lifts to the number of occupants. The following standards can be useful in determining the platform size.

The lift platform - the area on which passengers ride, must be large enough to accommodate a passenger load without undue crowding and allow each passenger, ready access to and from the elevator doors. An average person requires about 2 sq.ft. of floor area, to feel comfortable. Passengers can be crowded however, to about 1.5 sq.ft. for the average man, or to 1.0 sq.ft. for a woman, the combination of men and women requiring about 1.3 sq.ft.

In fig.5.7.1, a car accommodating 16 persons has sufficient room for the person at the back, to pass those in front. In fig 5.7.2, however, the same area with different width and depth leads to awkward loading situations. More number of passengers now make access to the door difficult and generally require someone to step out of the car to let others out. These complications add a time delay to each elevator stop, which accumulates during the total trip and seriously reduces efficiency. The deep and narrow arrangement also leads to the loss in passenger capacity i.e. 15 passengers versus 16 passengers. Thus, not only size but shape of the lift car is also important from the efficiency point of view and therefore the same should be incorporated in specifying the bye-law for lift provision.

Even the size of opening affects efficiency of the

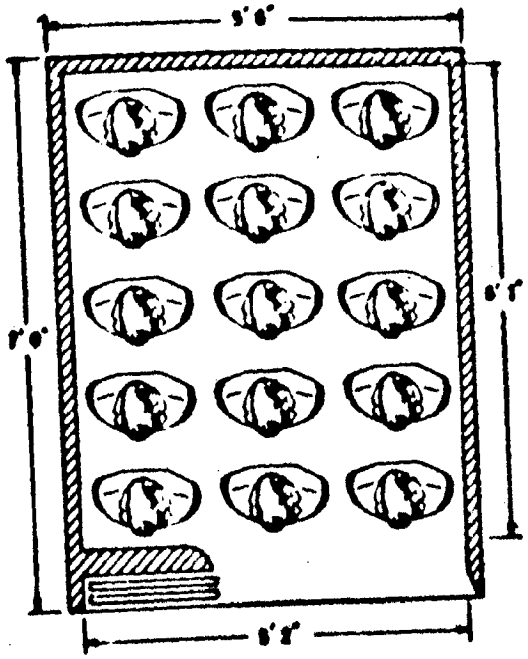


FIG. 5.7.2 SAME AREA OF CAR WITH DIFFERENT WIDTH AND DEPTH LEADS TO AWKWARD LOADING SITUATIONS AND LOSS IN PASSENGER CAPACITY

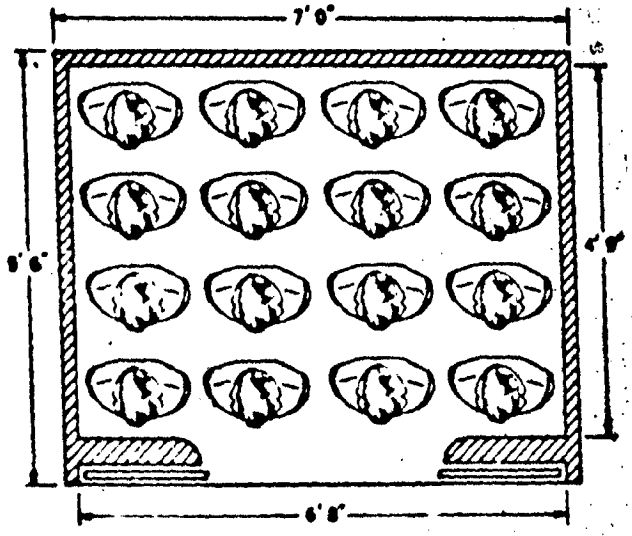
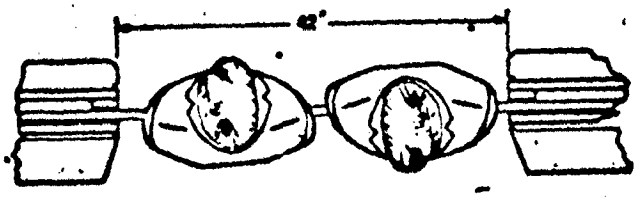


FIG. 5.7.1
LIFT CAR ACCOMMODATING
16 PASSENGERS



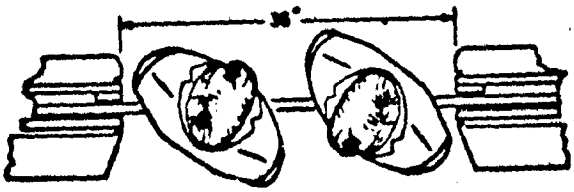


FIG 5.7.3 SIZE OF OPENING AFFECTS EFFICIENCY OF LIFT

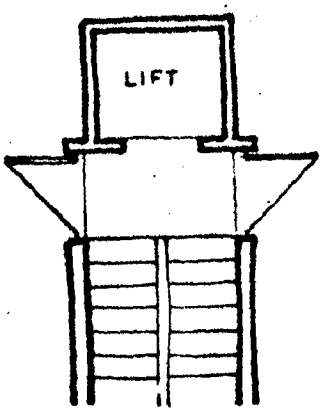
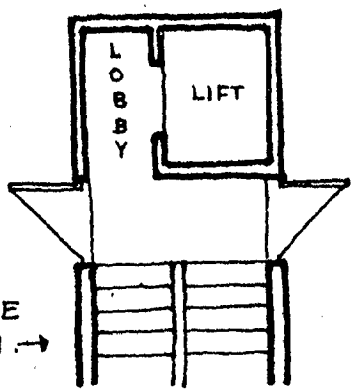
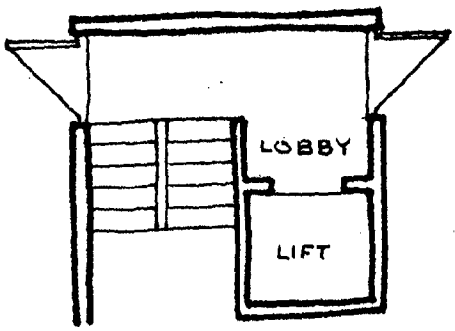


FIG. 5.7.4. NO PROVISION FOR LIFT LOBBY



PROVISION FOR LIFT LOBBY CAN BE MADE AS SHOWN →



lift. The most efficient door is one that allows two persons to enter or leave the lift simultaneously. The 3'-6'' centrally opening door meets most of these requirements and is the most popular for high quality lifts. It is wide enough to allow two persons to transfer simultaneously. Doors narrower than 3'-6'' can be considered one person doors. In fig.5.7.3, it is shown how awkward it becomes for two people to pass each other. But in apartment houses, the economy of the single slide door prevails as passengers are expected to move at a somewhat more leisurely pace. Some efficiency may be justifiably sacrificed for economy.

There is no provision in bye-laws for the lift lobby which is an essential area used during waiting period. Since the size of the lift is usually small due to the constraints described earlier, the waiting period is sometimes considerable. Hence, waiting requires a separate space by itself so that it does not hamper the circulation of the staircase landing, which usually serves as a lift lobby as well (as shown in fig.5.7.4).

Lifts shall have to be maintained in proper working condition. Fire prevention and fire fighting requirements should be carried out to the satisfaction of the authorities and the clause regarding the engraving of respective floor numbers should be adhered to.

All in all, there seem to be better chances of

provision of lifts as per the user needs, if the lift well and lift lobby area are exempted from the permissible F.A.R.

5.8 MINIMUM STANDARDS FOR OPEN SPACES :

Open spaces are to be provided on all the four sides of the building, the dimensions of the same varying with height of a building.

"Home" means more than one's apartment : it also implies a sense of belonging to the surroundings, it is a sum total of the physical and social components that form the flesh and bones of the built up area. Since the open spaces are provided on all the four sides of a building,in a strip form (as shown in fig.5.8.1), none of these spaces can be effectively utilised for landscaping or as a play area. Urban design is primarily concerned with the 'no man's land' which is in reality, every man's land i.e. the space between the buildings. This space has become a focus of attention since it is the scale of environment in which people find their daily activities and their strongest emotions with regard to change. It is the scale for urban design activity.

According to Morris Hill and Rachelle Alterman, "The vacant spaces between the buildings are empty of people and full of rubbish, produce non-identification with the place and produce drifting, helplessness and boredom among the

yonger generation and a tendency to alienation and crime, to revolt against the society.

In 1974, The Stiching Ruimte published a report which lists the demands made on the residential environment, based on extensive study of the literature of the social sciences, psychology and education. The major points are -

* Play and recreational facilities as an integral part of the surrounding of the home
* A thought to all parts of the residential environment with a view to their use.
* A residential environment as a complete and constantly changing unit.

Many highrise buildings have excellent playground nearby, but a very important element i.e., the private yard is missing. Our biological need is for territory and certainly the private yard is its fulfillment. The focal point of the children's lives is the home and its immediate surroundings, the definition of "immediate" surrounding expanding with age. Intimacy is essential for small children and highrise flats tend to lack the same.

It should not be assumed that children play only in established play grounds. Children play everywhere, throughout the residential community. Tidy playgrounds meet the needs of adults, but hardly respond to the needs of children. The privision of planned play spaces as well as the places for spontaneous, incidental play is important in areas with

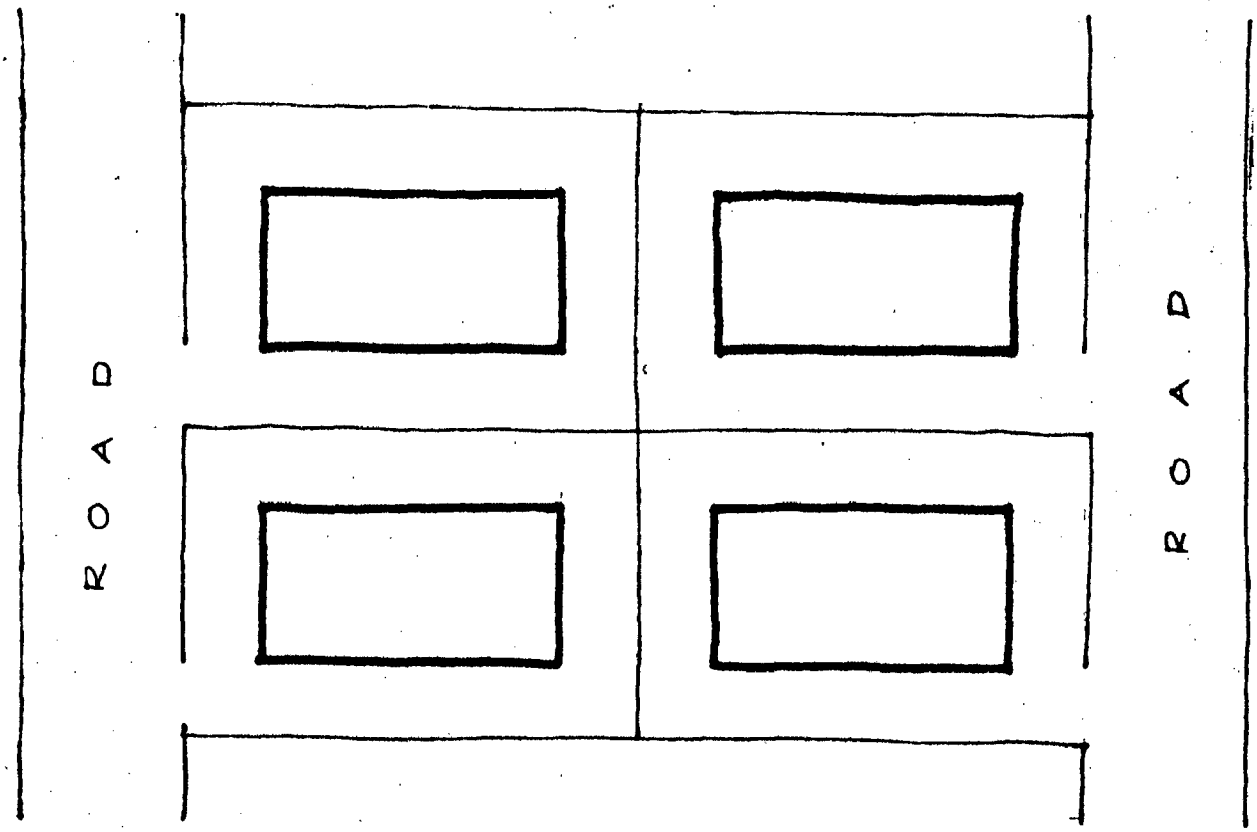


FIG. 5.8.1 OPEN SPACE PROVISION
IN A STRIP FORM

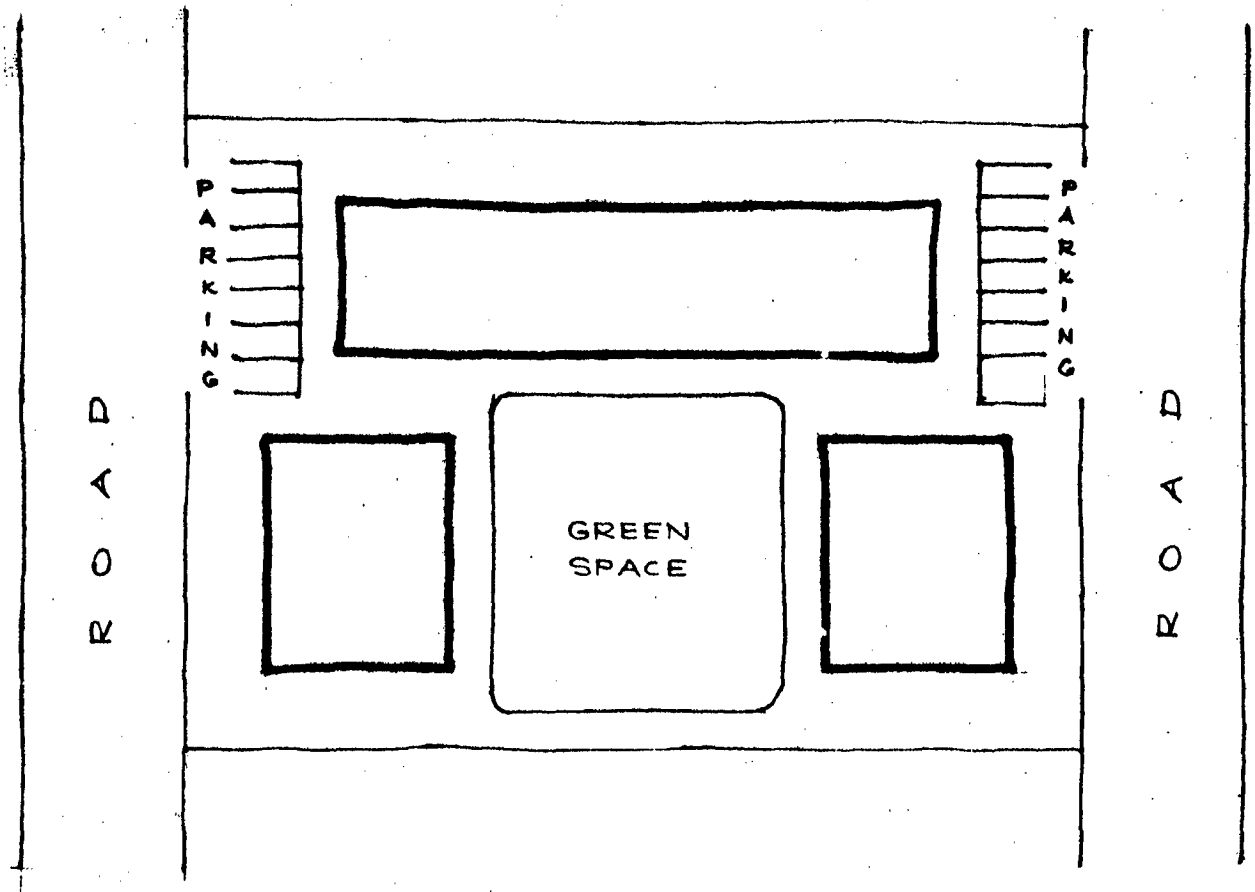


FIG 5.8.2 OPEN SPACE PROVISION
WITH MUTUAL UNDERSTANDING
WITH NEIGHBOURING PLOTS

multiple family dwellings. These rights of childhood are affected when standards are developed for open space allocation.

Legislation is needed to state clearly the legal rights of children within the residential domain, but most building bye-laws and development control rules show victory of mechanical functionalism over human needs. e.g. : Rules for parking inside the compound are stated but the same for play area are not stated.

The total evolution in the pattern of open spaces is needed and it is desirable to work it out with mutual understanding with neighbouring plots in order to provide community spaces between a group of buildings (as shown in fig.5.8.2). Rethinking is also necessary on parking bye-laws with the increasing number of two-wheeler automobiles.(The revised bye-laws have taken note of it). A thought should also be given to increase the height of stilts, since spaces under stilts with very low height do not give a pleasant psychological feeling.

5.9 MINIMUM STANDARDS FOR LIGHTING AND VENTILATION :

Old :

Aggregate opening area of doors and windows

> 1/4th of the area of side of a room facing an open space

> 1/4th of floor area of the room

Area of window opening	>	1/10th of floor area of the room
Depth of the room	<	25 ft. from the side abutting the open space

Revised :

Kitchen window	>	1 sq.m. in area
Aggregate window area for habitable rooms and kitchen	>	1/6 of the floor area
Depth of the room	<	7.5 m from the opening
Water closets and bathrooms	→	can be ventilated through a shaft
Area and minimum side of shaft	α	height of the building

During these days of energy crisis, it is important that the buildings are designed in such a manner that minimum energy is needed during usages. From this aspect, daylight and ventilation become important components of building design.

Lighting :

For lighting the majority of buildings, one of the essential requirements is to ensure that there is sufficient light for efficient visual performance. Variation in the sky brightness, makes it difficult, to use an absolute measure of illumination as the estimate of the quantity of light in a building. Instead a ratio of the internal to external light has been adopted, termed as 'Daylight Factor'. This

ratio remains more or less constant as the sky brightness increases or decreases, since the interior illumination also changes with the exterior daylight. The daylight factor is actually a combination of three main components -- a) Sky component, b) External Reflected component and c) Internal Reflected component and is usually expressed as a percentage.

The total amount of daylight which comes into a room depends on the size and placing of the windows relative to the area of the room, and the amount of daylight at any point in the room depends on the space layout of the room and windows relative to the working point. The projected solid angle of the window subtended at the working plane determines the direct sky component of the daylight factor. There is a precise geometric method of determining the sky component of daylight at a point in a room and so it is possible to deduce the correct size of windows and where they should be placed provided we know the amount of daylight necessary for the job.

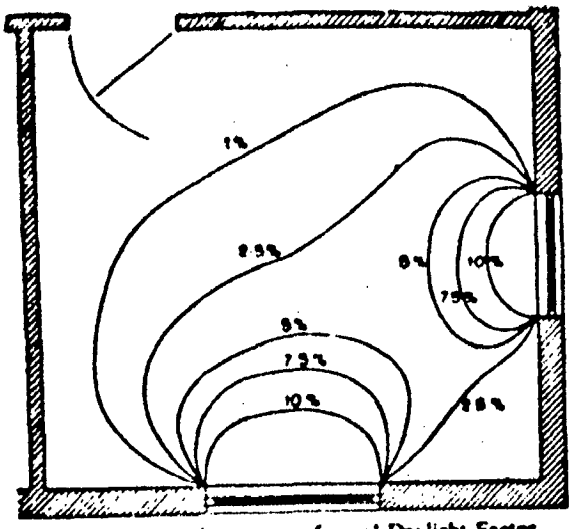
The daylight level is not the only factor which has to be taken into account in determining good lighting. Of equal importance is the problem of glare. Glare is a positive function of the brightness of the glare source. On the other hand, it is a negative function of the surrounding room brightness. Hence, the brighter the sky or the larger the window, the greater the glare, whereas the brighter the surroundings to the windows, the less the glare.

With total single-side lighting, it is impossible to get glare-free rooms all the year round, so some sort of sky brightness control becomes a necessity. Two objectives can be achieved by limiting the size of the main windows and introducing some glazing in an adjacent or opposite wall, first, the amount of sky visible from any one direction reduces, reducing the glare and second, the brightness surrounding the window wall increases because light from one window wall falls on the other window wall, again reducing the glare.

* Window shape and daylight penetration :

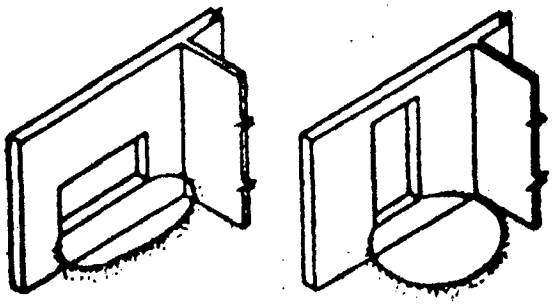
The daylight factor, the basic measure of daylight is much higher near to the window than that in parts of the room remote from it. The contours of these equal daylight factors near the window are approximately elliptical (as shown in fig. 5.9.L_1). When the shape of the window changes, the contour will also change. A long, low window gives a lengthy ellipse with poor penetration, while a very high window gives good penetration to the remoter parts of the room but not very much to the sides (as shown in fig.5.9.L_2).

If the glass is divided into two or three windows along one wall, which are reasonably near to one another, the light from one window will spill over on to the area lit by the adjacent window and give a better distribution of light even though the penetration is not much influenced (fig. 5.9.L_3). If, however, the two windows are on adjacent walls



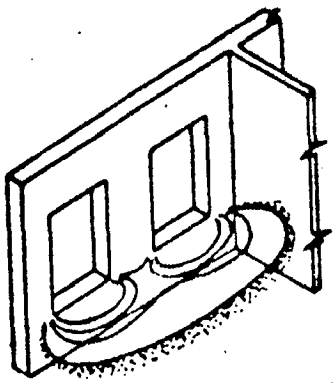
Typical contours of equal Daylight Factor for a room with windows in adjacent walls.

FIG. 5.9.L1



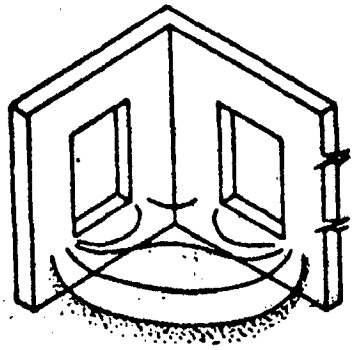
A high window gives better light penetration than a long low window for the same area of glass.

FIG. 5.9.L2



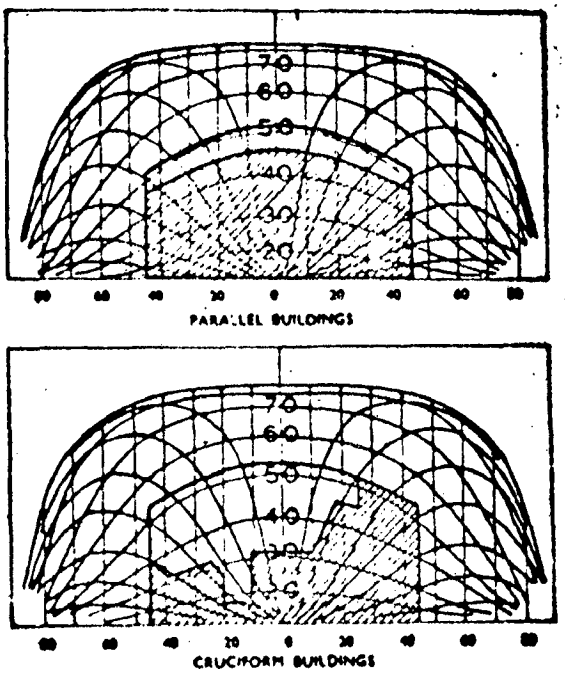
A somewhat better distribution of light results from divided windows, for the same area of glass

FIG. 5.9.L3



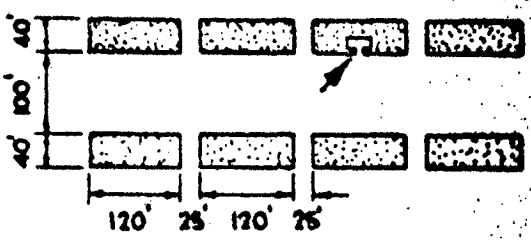
Windows on adjacent walls give good light penetration, and also help to reduce glare

FIG. 5.9.L4

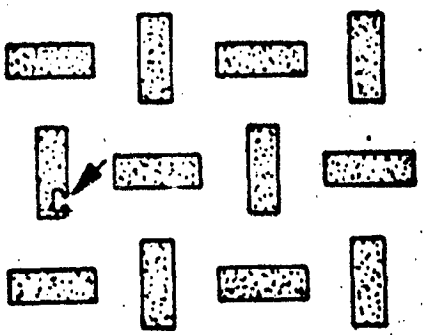


Waldram diagrams to show the view of sky obtained with comparative arrangements of buildings.

FIG. 5.9.L5

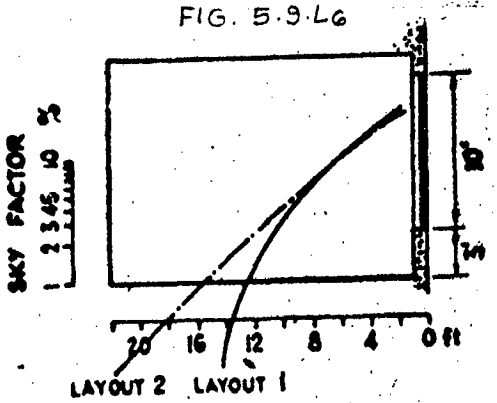


LAYOUT 1



LAYOUT 2

FIG. 5.9.L6



PENETRATION CURVES

FIG. 5.9.L7

at right-angles to one another, there will be both better penetration as well as better distribution of light (fig. 5.9.L_4). The adjacent wall lighting will also improve glare conditions.

But the building bye-laws only relate the area of openings to the floor area of room for acquiring minimum lighting conditions. Packing more number of rooms being the main objective, there is hardly any scope for subdividing the glazing on adjacent walls for better lighting conditions (as described above). However, in fact the picture is much less dismal than might at first sight appear. It does in fact allow a good deal of freedom to the skilful architect.

* Daylight and Town planning :

As said above, the choice of window shape and position is not a matter for haphazard guesswork, but can be determined precisely with the aid of the equal daylight factor contours. If the architect has the freedom and power to govern the positioning of buildings, an overall result of far greater efficiency can be obtained. For this reason, it is important, wherever possible, to design a building not only for itself, but in relation to the other neighbouring buildings which will influence the daylight penetration.

The daylight received inside a room and the effect of the obstructions outside can be very well illustrated with the aid of the Waldram Diagram, which enables the sky

as seen through the window from the working point to be plotted in such a way that equal areas of sky on the diagram correspond to equal amounts of sky factor at the working point. Fig.5.9.L_5 shows the skyline as seen from the working point on the ground floor of building with two different layouts (fig.5.9.L_6) of the buildings. The profile of the skyline as seen from rooms on lower floors will be very different with the first layout when the units are parallel to one another, than with the second layout where every alternate building lies at right-angles to its neighbours. In the first case, the skyline will be a continuous horizontal line, whereas in the other, it will be broken by large gaps. With the second layout, there is an area of sky visible at a much lower angle than with the parallel arrangement and so light will be enabled to penetrate deeper into the room, as shown with the help of daylight penetration curves (fig.5.9.L_7).

It is not always possible to put these ideas fully into practice, because individual property owners may wish to develop their individual plots in entirely different ways. In practice, all that can be done is that recommendations for the respect by one developer of the lighting demands of another should be enforced. Some cities and other planning authorities insist that the general shape, height and spacing of buildings, as they affect daylight illumination, be taken into account in site development and town planning. It has been found that regulations or recommendations based on good

daylight have also achieved a number of other objects such as the satisfactory spacing of buildings to avoid excessive traffic noise.

Ventilation :

In hot humid climates, high rates of air motion are desired for comfort and prime importance is given to good ventilation in the design of buildings. This necessitates the knowledge of the mechanism of air flow in buildings. None of our present bye-laws take into account the wind direction, the rate of air change, and the wind velocity, they just specify the area of openings as a percentage of the floor area. Little do the people realise that, if the area of openings required is all provided in one place, as inlets, without any outlets at all, then there will be no air movement in the room, resulting in the stifling of the occupants.

It is essential to know the air changes required for different rooms. As per the National Building Codes, they are as follows :-

Living and Bedroom : 3 air changes/hour
Kitchen : 12 air changes/hour
Bath and Water closet : 6 air changes/hour

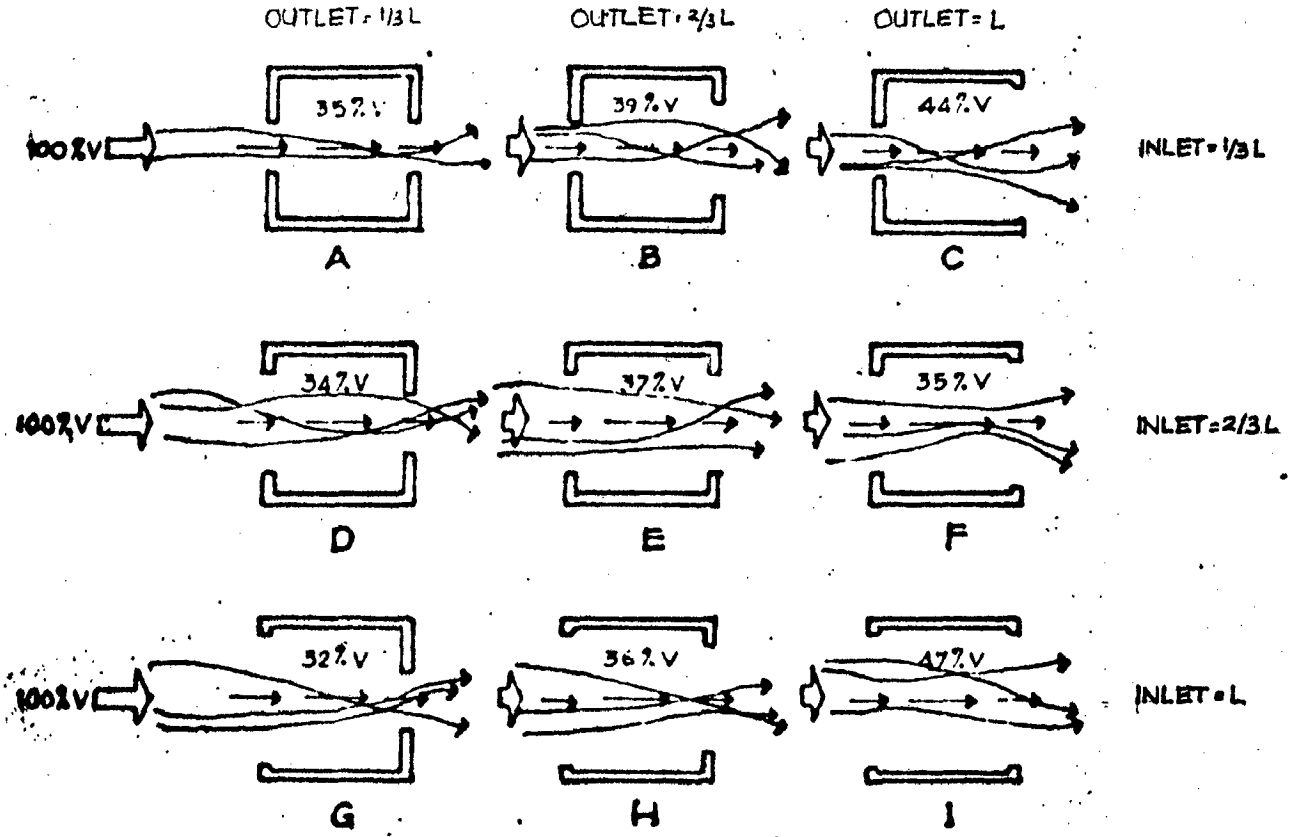
From the above values and the height and area of the rooms, the rate of air change can be calculated (in m^3/hour). Then with the help of the formula $Q = KAV$, the areas of inlets and outlets can be worked out. (Q is the rate of air change

in m^3/hour, A is the area of inlets and V is the wind velocity = 10.5 kmph for Bombay, annual average) K is a constant which varies according to the ratio of the inlets and outlets.

Area of Inlet/Area of Outlet	Value of constant 'K'
1 : 1	1350
2 : 1	4000
3 : 1	4250
4 : 1	4350
5 : 1	4400
3 : 4	2700
1 : 2	2000
1 : 4	1100

For an average dry bulb temperature of 27°C and average humidity of 77%, the desired indoor wind velocity is 1m/sec (3.6 kmph). This is about 35% of the external wind velocity in Bombay. Since the air is deflected due to the positioning of furniture etc., it is desirable to design the openings so that the indoor wind speed is 35-45% of the external wind speed. With the help of the formula and figures $5.9.V_1$, $5.9.V_2$, $5.9.V_3$ and $5.9.V_4$, the areas and the configurations of the inlets and outlets can be obtained to a 'comfortable satisfaction'.

The windows provided in the toilets should be capable of ventilating them at all times whereas about 1/4th of the area of openings in the other rooms should be of the open type (louvres, etc.) in order to ventilate the rooms when the windows are closed (from climatic or security point of view).



OPENINGS ON OPPOSITE SIDES

FIG. 5.9.V1

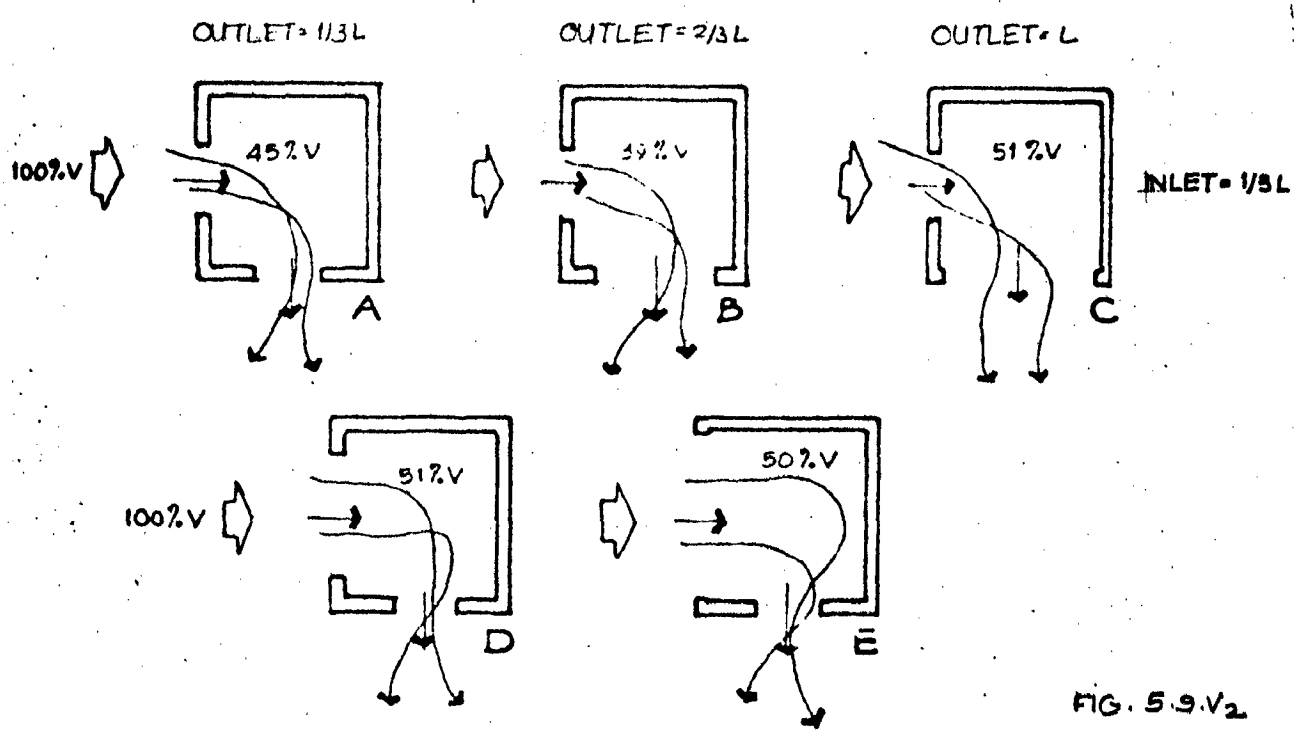


FIG. 5.9.V2

INLET = 2/3 L
OUTLET = 1/3 L

INLET = L
OUTLET = 1/3 L

OPENINGS ON ADJACENT SIDES

WIND PERPENDICULAR TO INLET

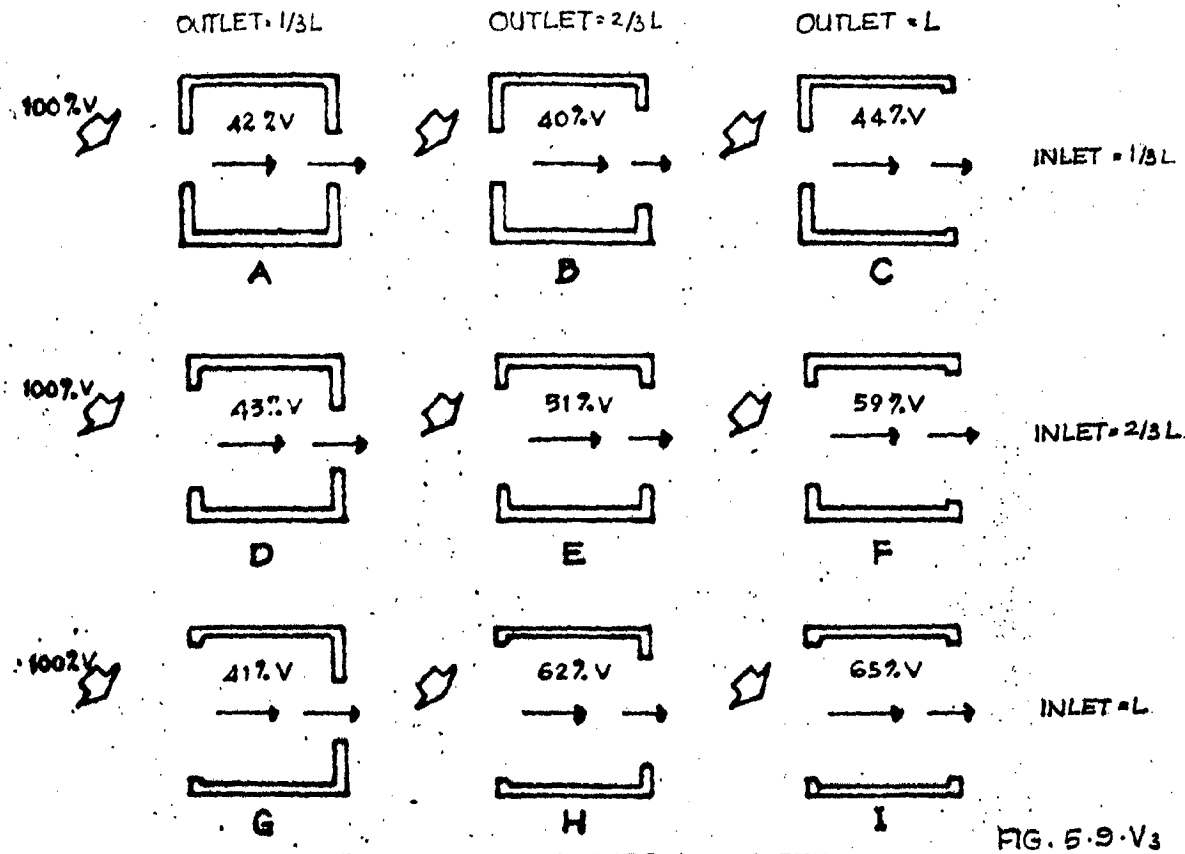


FIG. 5·9·V3

OPENINGS ON OPPOSITE SIDES

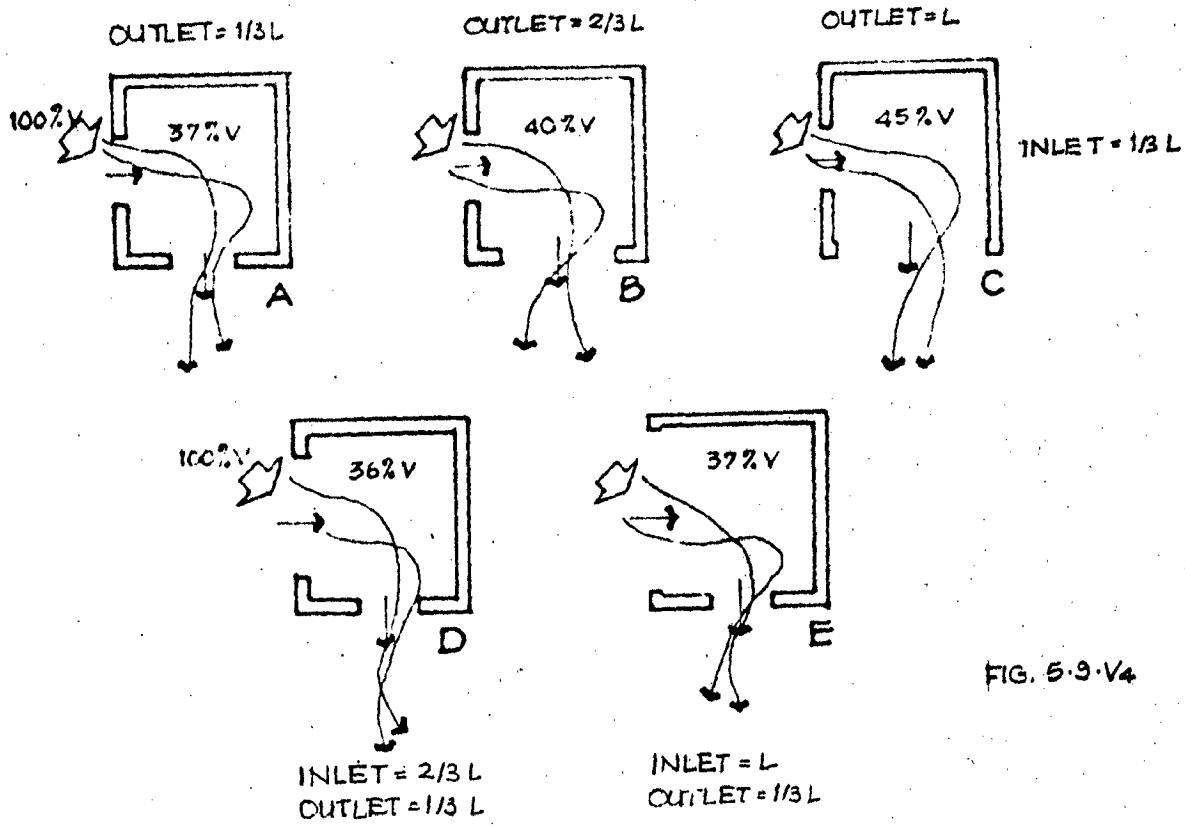


FIG. 5·9·V4

OPENINGS ON ADJACENT SIDES

WIND OBLIQUE TO INLET

The following information provides a simple approach which helps the designer, in assessing probable indoor air motion for a given design and also leads to some simple design solutions which enable the designer in making the best possible use of outdoor wind -

* Buildings need not necessarily be oriented to perpendicular to the prevailing outdoor wind, it may be oriented at any convenient angle between 0^{o} to 30^{o} without losing any beneficial aspect of the breeze.
* At least one window should be provided on the windward wall and the other on the leeward wall.
* In case of a room with only one wall exposed to outside, provision of two windows is preferred to that of a single window.
* Windows located diagonally opposite each other, with the windward window near the upstream corner, give better performance than other window arrangements for most of the building orientations.
* The average indoor air-speed increases rapidly by increasing the width of window upto about 2/3 of the wall width, beyond that the increase is in much smaller proportion than the increase of the window width.
* For a total fenestration area (inlet plus outlet) of 20 to 30 percent of floor area, the average indoor wind velocity is around 27 percent of outdoor velocity. Further increase in window size increases the available velocity but not in the same proportion. In fact, even under ideal conditions, the maximum average indoor wind velocity does not exceed 40 percent of the outdoor velocity.

* The average indoor wind speed in the work zone is maximum when window height is 1.1 m.

* Maximum air-movement at a particular plane is achieved by keeping the sill height at 85 percent of the height of the plane.

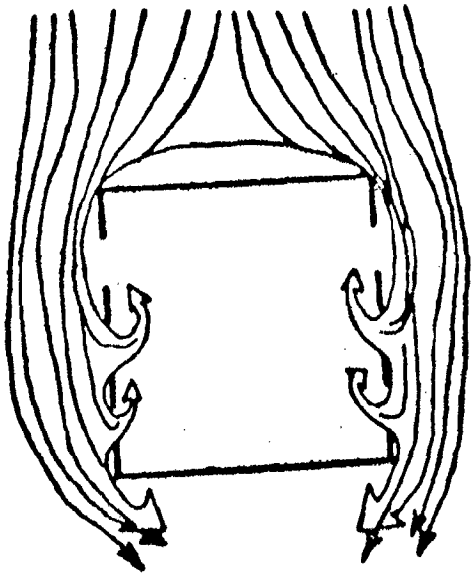
* Since inlets smaller than outlets are more sensitive to change in wind direction, openings of equal sizes are preferred in the regions having frequent changes in wind direction.

* Air motion in a building unit having windows tangential to the incident wind is accelerated, when another unit is located at end-on position on downstream side (fig.5.9.V_5).

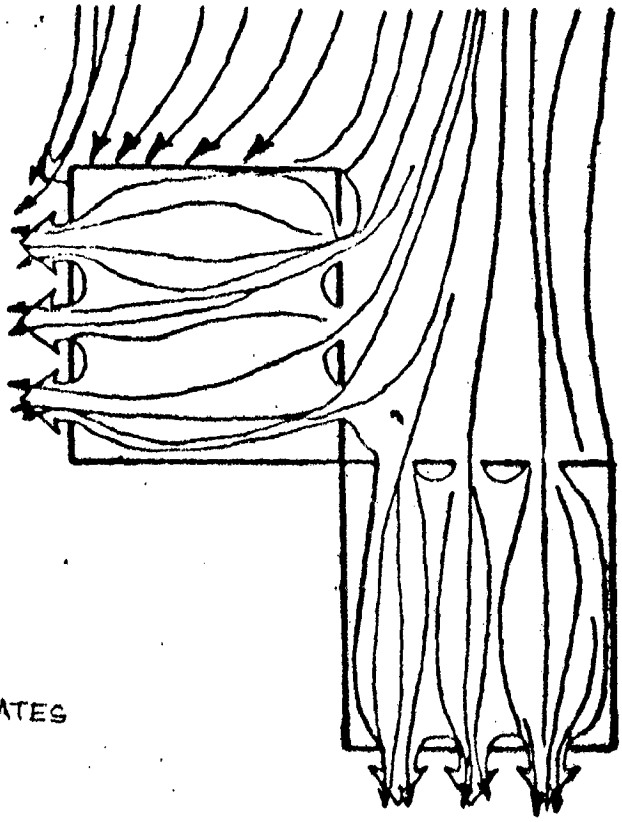
* Air motion in two wings oriented parallel to the prevailing breeze is promoted by connecting them with a block on the downstream side (as shown in fig.5.9.V_6).

* Air motion in a building is not affected by constructing another building of equal or smaller height on the leeward side, but it is slightly reduced if the leeward building is taller than the windward block.

* Air motion in a shielded building is less than that in an unobstructed building. To minimise shielding effect, the distance between the two rows should be about 8H for semidetached houses and 10H for a long row houses. However, the shielding effect is diminished by raising the height of the shielded building.

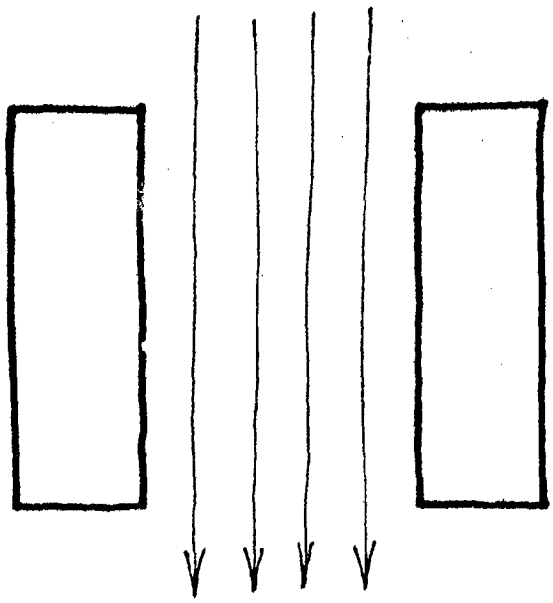


Isolated building unit



Two units located at end-on position

FIG. 5·9·V5 AIR MOTION ACCELERATES WITH ANOTHER UNIT ON. END-ON POSITION



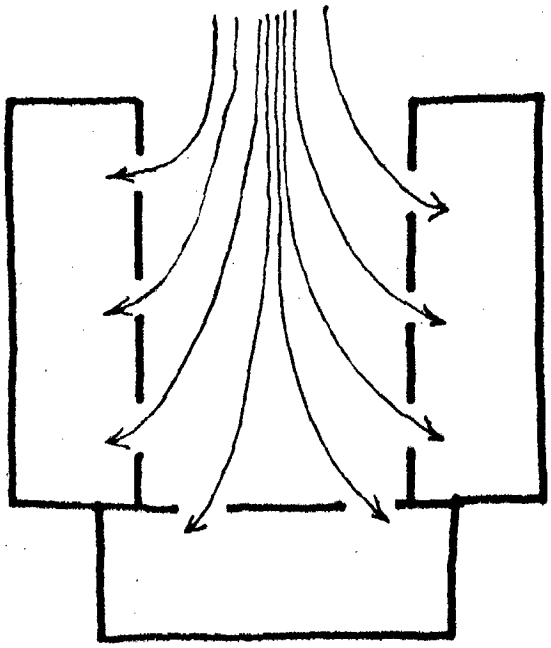


FIG. 5.9.V6 AIR MOTION IN TWO WINGS ORIENTED PARALLEL TO THE PREVAILING BREEZE IS PROMOTED BY CONNECTING THEM WITH A BLOCK ON THE DOWNSTREAM SIDE.

All these aspects are to be considered while framing the building bye-laws, because the motivation is not simply the desire for shelter, but the desire for right kind of shelter. Architecture is a social art and therefore, society should produce in order to live and not live in order to produce. In such a society there will grow an architecture that contributes to the content and enjoyment of life. This is possible if architect becomes aware of the fact that 'ecology begins at home'.

CHAPTER-VI : LAND-USE REGULATIONS--THEIR RELEVANCE

President Lyndon Johnson once said, "Our society will never be great until our cities are great". If cities are to perform their complex functions, they cannot be allowed to deteriorate or decay.

All over the world, people have been moving to the cities, for the same reasons - they can find tremendous opportunities, improved incomes and diversity of options, many possible forms of cultural experience and life style. That what the great urban dilemma is : It is the cities that people can find and create opportunities, yet it is in the cities that the quality of living is deemed to be deteriorating.

The major problems of Bombay causing deterioration of the city, are increasing slums and crowding, deteriorating public transportation, sprawling suburbs, swelling welfare costs, increasing alienation, violence and crime, air and water pollution and severe fiscal pressures. The solution to these complex problems will require a wide array of talents - architects, urban planners, home economists, social reformers, engineers, designers and scientists - each motivated by the humanistic imperative of improving our overall well-being.

The urban residential land housing markets are indeed very large, about 3/4th of privately developed land is being developed to residential use in urban areas. Critics such as urban sociologist Herbert Gans assert that land-use regulations

usually reflect the interests of the suppliers rather than the users. Typically such norms are handed down as 'rule of thumb' from one situation to the other adapted by cumulated experience. More rational approach is needed which recognizes that norm-setting must be flexible enough to enable the planner to face the real-life situations.

6.1 ZONING :

Old rules :

Greater Bombay has been divided into the following classes or zones :

1) (a) Residential (b) Residential with shoplines along streets
2) Commercial
3) Industrial (a) General (b) Special
4) Green or No development zones.

Revised rules :

i) Residential Zone - Purely Residential (R_1)
- Residential with shop Lines at Ground Floor(R_2)

ii) Commercial Zone - Local Commercial Area (C_1)
- District Commercial Area(C_2)

iii) Industrial Zone - Service Industries (I_1)
- General Industries (J_2)
- Special Industries (J_3)

iv) Green Zone (No Development Zone)

v) Special Reservations

With the world population expected to double by the 21st century, cities will undoubtedly experience explosive growth. Work of Doxiadis points out that, " For a high quality of life to be promoted, this expected growth must be effectively planned rather than be allowed to take place haphazardly.

Zoning is the regulation of the use of land and buildings. It can be an useful tool in establishing the patterns and quality of life. The first zoning regulation was passed in 1916, in response to the over-development of certain portions of Lower Manhattan. But it was the earlier Tenement Law of 1901 that made first comprehensive attempt at improving the quality of life.

Zoning ordinances have two kinds of effects on supply functions. The most obvious is that by disallowing certain land uses in given areas, they restrict the supply of land which is available to that use. This raises the price of land and consequently of services flowing from the land and the structures that can be put on it. In addition, of course, it lowers the price of land in the use toward which rezoning has been aimed.

The building bye-laws have specific requirements for housing but virtually no requirements for slums. As a result, their excessive requirements have increased the cost of standard housing, while allowing cheap, sub-standard, often hazardous housing in the form of transitory homes, to be provided

free of inspection requirements. At the same time they have placed a heavy tax on the home-owner, while the transitory home has remained relatively tax-free. In this way, conversely they have encouraged the transitory home and discouraged better housing.

By adopting principle of "Zoning", urban spaces have been split up into isolated parcels of housing, work, leisure and transportation and have thus deprived our new developments of the sparkling urban life. Human life cannot be divided into well-defined, isolated, self-contained cages. It is an uninterrupted flow from one state of living into another. In the historical towns, there was no such division and all urban activities were concentrated in a relatively small area. True, nobody wants to live in a hubbub of continuous activity for twenty four hours a day, devoid of privacy and quiet areas which are essential parts of active urban life. But that does not mean that residential areas need to be separated with a shop or a cafe at twenty minutes walk. To isolate living space from the working, shopping, school and entertainment space is undesirable even from sheer traffic viewpoint. Separating school from every day social activity does tend to develop school resistance among pupils, but there is no mention of educational zone in the development control rules. With the result, educational buildings can be seen even along the railway lines. Separate zones are essential, especially for buildings meant for higher education.

In the past, expansion has been regulated with a few or no laws. Many prescriptive planning formulae are based on needs and consequently planning policies come into conflict with social demand. Successful planning is likely to depend increasingly upon an accurate assessment of future housing requirements rather than on the more basic urban functions because housing is the largest space user and is no longer the simple residual urban element - an element that follows rather than leads.

Instead of allowing the builder to build just any where, local government should insist on master-planning new developments into completed neighbourhoods and creating new towns and then connecting them to the parent city with a rapid transit system. The minimum planning requirements of local government must include human necessities such as green space and community and recreational facilities. Creative builder and talented architect must work closely with local government to become a strong promotional force. It must take its responsibility seriously and not be willing to give in to the same old ways of doing things or become enamored of quick and easy solutions.

Zoning regulations of Bombay, compared to other cities in the country, do not tend to reduce the effect of sparkling urban life, since these do include the category of 'Residential zone with shopline along streets'. However, a composite development should also be given a thought especially for a

high rise building which includes a bit of commercial area on lower floors to provide ample facilities for the residents and also to reduce the traffic load.

Another point which cannot be overlooked while laying down zoning regulations is that the rich and the poor cannot be separated although these two worlds are quite separate territories, because of the fact that rich and poor enjoy a symbiotic relationship. The rich need the poor to run their own households as well as to run the city as a whole.

6.2 PLOT SIZES :

- Plots less than a certain width/depth are considered to be narrow plots on which concessions for open spaces are given upto a particular limit. The restriction is put on width/depth and height of the building situated on such a plot.
- Semidetached structures may be permitted on two such adjoining plots and row houses may be permitted in a cluster of very narrow plots.
- According to revised rules, row housing, semi-detached and detached development schemes are permitted with the increase in area and width of the plot.

Row housing and semi-detached housing need not be permitted only on narrow plots, but should be allowed on all plot sizes, to save upon the open spaces around the buildings.

Today, the amount of urban space one controls, is directly proportional to one's status and/or income. It has no connection with actual family size. This space differential therefore cannot be justified in human terms, but only in economic ones. In contrast, in cities of Australia, almost every family has a quarter-acre lot - no more, no less. Australia is locked into equality-it can never become elitist. The same is true for the Russian system. Despite all our rehetoric about social justice and equal opportunity, we are locked into inequality and our cities make sure of that. A policy of Equity Plots would have the added advantage of not pre-determining social and economic mix in the neighbourhood or across the city.

Role of land-use controls is to regulate the size of different clusters in such a fashion that, equality of prices results without lacking intimacy. Plot sizes should be worked out with a provision of combining the plots for development of clusters. This will keep a check over proportions of different plot sizes, leading towards homogenous development.

6.3 SET-BACK LINES :

Certain set-back (front open space), is required to be left between the building line and the road. The minimum specified set-back is 10' or 15' depending upon the road on which the plot is located. A wider set-back (of 25') is to be left from the highways

and other wide roads (wider than 175') and that of 20' from roads 70' or more.

height of building < 1/2 (width of street + front open space)

If the determination of set-back line is left to the individual owner, each owner may build to his fancy, which may be touching the road line. This will tend to destroy harmony and may also not admit required amount of light and ventilation. It is desirable, for these reasons, to have control over set-back lines. The main purpose of set-back lines is to provide sufficient space, thereby ensuring adequate light and air, space for landscaping to reduce spread of fire, to make provision for children's play and to reduce the traffic noise.

It should be seen whether the set-back lines serve the purpose for which they are provided. Most often it is seen that the front open space is so less that it does not help reducing traffic noise, nor does it make provision for childrens' play or landscaping. It only makes provision of lighting and ventilation along the streets, to a certain extent.

Set-back lines, usually are viewed in relation to the height of the building. Therefore, it is logical that these differ as per the same. Set-back lines should be deliberately altered for adjacent buildings, to break the effect of monotony. (as shown in fig 6.3.1)

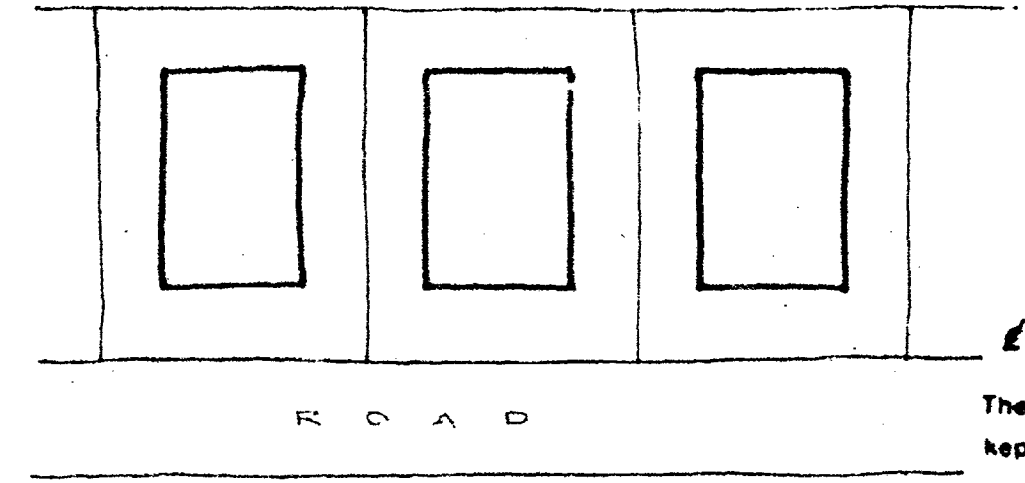
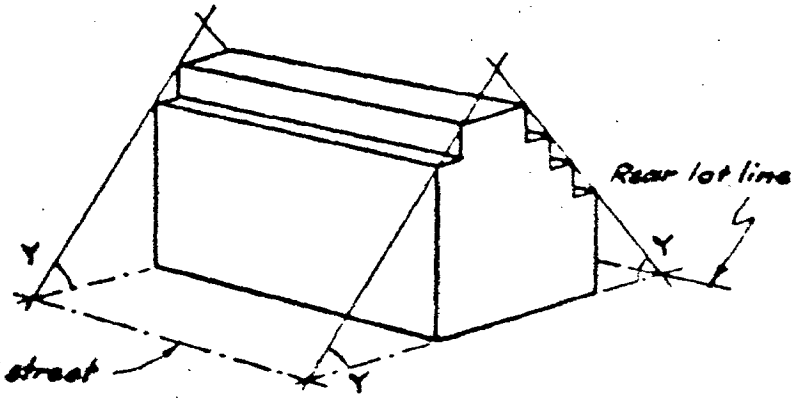
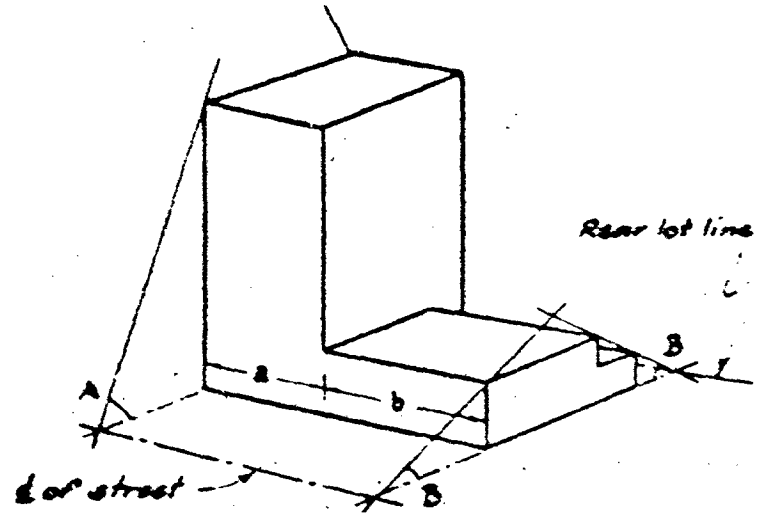


FIG. 6.3.1 VARIATION IN SET-BACK LINES OF ADJACENT PLOTS TO BREAK MONOTONY



The Angle of Light Obstruction Y may be kept constant along the whole street frontage.



or averaged by the formula $Y = \frac{Aa + Bb}{a + b}$

FIG. 6.3.2 ANGLE OF LIGHT OBSTRUCTION

Another solution for creating interesting forms is specifying the height of a building by means of the angle of light obstruction (ALO), so that adequate open air and light may reach the streets and rear yards. ALO is measured from the centre line of the street and from the rear lot line. It is similar to many present regulations of height and set-backs, though expressed in angles instead of vertical and horizontal distances. However, to give more freedom of design and allow for more efficient building shapes, without sacrificing light and air, the ALO may be ''averaged'' so that some sections of a building may rise above the allotted angle line, provided that an equally large or larger section drops below it (as shown in fig 6.3.2).

6.4 PLOT COVERAGE :

Plot coverage is related to the F.A.R. permissible in the area.

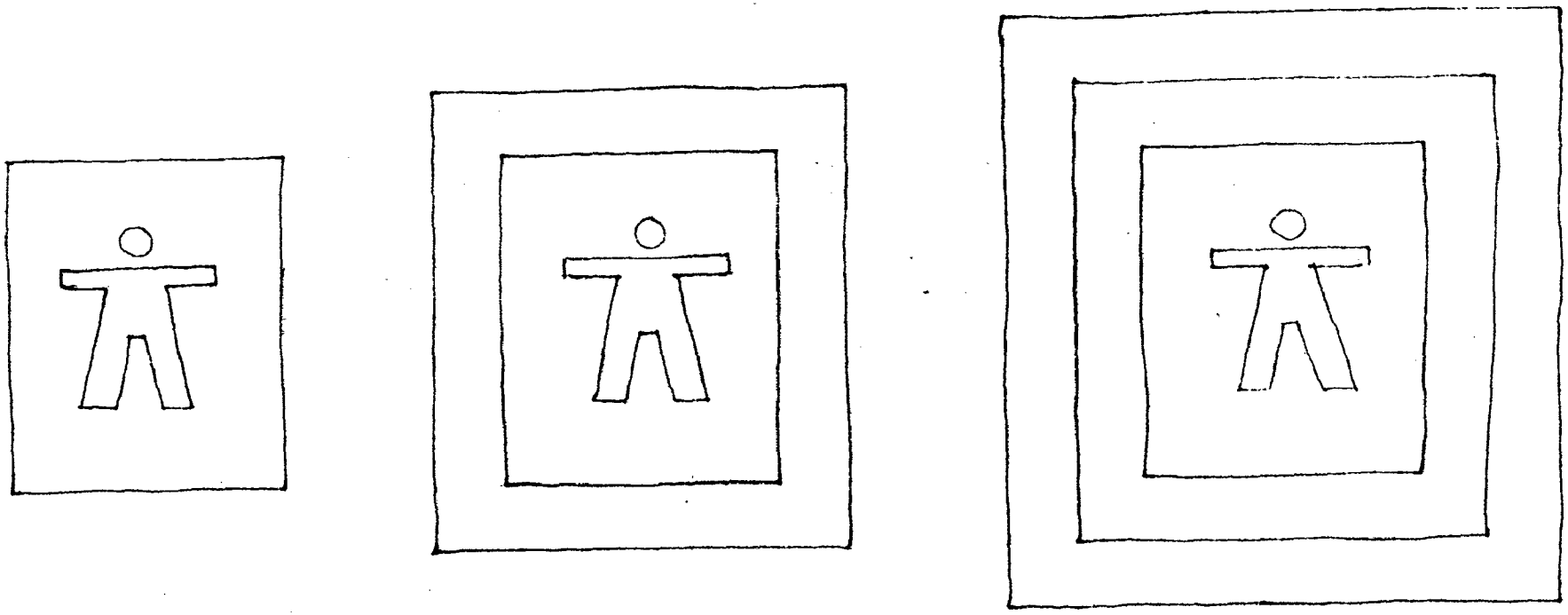
For a plot more than 3000 sq.yd.s or 0.3 hectare in area, 15% of plot area shall be reserved as a recreational space, as for as possible in one place. The minimum dimension of such a space is specified along with restriction on its length in relation to its average width.

Urban forms are those where man-made environment dominates the natural environment. In fact, the natural environment has become largely subordinate to the built environment, which can range from a hodgepodge of blighted, runied segments

to an aesthetically pleasing architectural whole. Unfortunately, much of the human imprint on the natural environment today upsets ecological balance. Therefore, to establish a satisfactory relationship between the natural forms of the land and the geometrical forms of the buildings placed on them becomes a major problem.

The numerical size of the living unit is not the key design criterion for dense housing. What matters most is the design of the basic unit in relationship to its overall social environment. A man living in a large floor area is not necessarily happy if he is surrounded by social and economic disorder and an unpleasant physical environment. The expanding parameters of environment should be taken into account while deciding about the plot ooverage. (as shown in fig 6.4.1). Thus, it becomes apparent that private territory plus cooperative territory are imperative to a healthy society.

But the type of dwelling that prevails in Bombay, there is hardly any scope for provision of private territory. Moreover, the cooperative territory is divided on all the four sides of the built area, affecting the utility and quality of the space. Therefore, a thought should be given for provision of private yards or terraces for each dwelling unit, wherever possible and to create community spaces for every plot or in combination of adjacent plots. The requirement for provision of recreational space should be made compulsory for all the plot sizes. The emphasis should not be on its being



APARTMENT DWELLER

A PRIVATE YARD PROVIDES AN EXPANDED PARAMETER OF INFLUENCE FOR THE INDIVIDUAL

COMMON OPEN SPACE STILL EXPANDS THE PARAMETER AND INFUSES THE FEELING OF COMMUNITY.

FIG. 6.4.1. THE EXPANDING PARAMETERS OF ENVIRONMENT

at one place, because it is advisable to separate out tot-lots for small children, from the active play area.

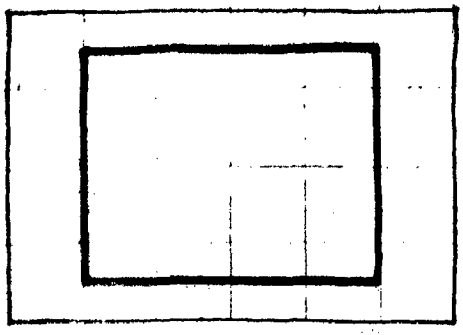
6.5 FLOOR AREA RATIO PROVISIONS :

- Floor Area Ratio (F.A.R.) remains same for residential and commercial zones in old as well as revised bye-laws.
- According to old Development Control Rules, different F.A.R. is specified for different parts of the city varying from 1.00 (in suburbs) to 3.50 (in reclamation areas of Backbay and Queen's Barracks). Revised rules have the same F.A.R. (1.33) all over the city and 1.00 in suburbs.
- For Industries and storage buildings, F.A.R. is 0.5 whereas for Institutional buildings, Cinema theatres, Assembly halls and Mangal Karyalayas (i.e. Wedding Halls), it is 1.00.

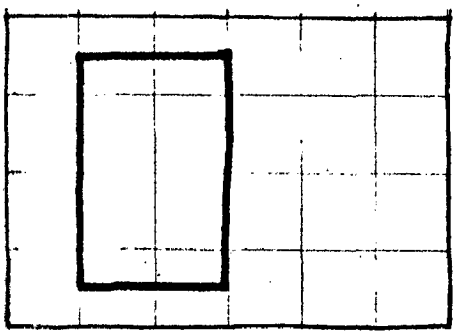
6.5.1 Nature of F.A.R. :

Only for the last decade or so, major cities of India have adopted the new concept of 'Floor Area Ratio' to regulate densities and control over-crowding in the dwelling units. The Floor Area Ratio (F.A.R.) is the ratio of the total floor area to the area of land in use. It limits the total area of the building in relation to the plot area (as shown in fig 6.5.1). This means irrespective of the number of storeyes, the total built up area per plot remains the same. Thus, on a particular plot, if a 20 storeyed structure is constructed,

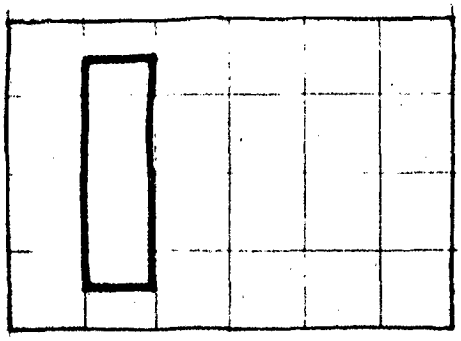
PLOT AREA • 2400 SQ.M., PERMISSIBLE F.A.R. • 1



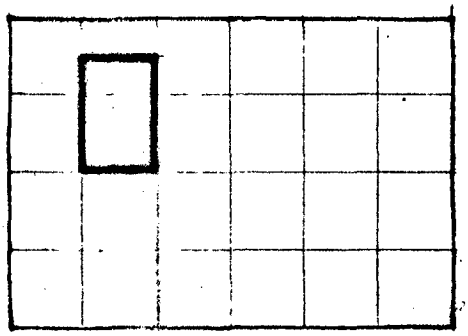
PLOT COVERAGE • 1200 SQ.M.
HEIGHT OF BLDG - GROUND+1 FL.



PLOT COVERAGE = 600 SQ.M.
HEIGHT OF BLDG. • GROUND+3 FLS



PLOT COVERAGE • 300 SQ.M.
HEIGHT OF BLDG. - GROUND+7 FLS



PLOT COVERAGE = 150 SQ.M.
HEIGHT OF BLDG. - GROUND+15 FLS

FIG. 6·5·1 F.A.R. LIMITS THE TOTAL AREA OF THE BUILDING IN RELATION TO THE PLOT AREA. IRRESPECTIVE OF THE NUMBER OF STOREYS, THE TOTAL BUILT UP AREA PER PLOT REMAINS THE SAME.

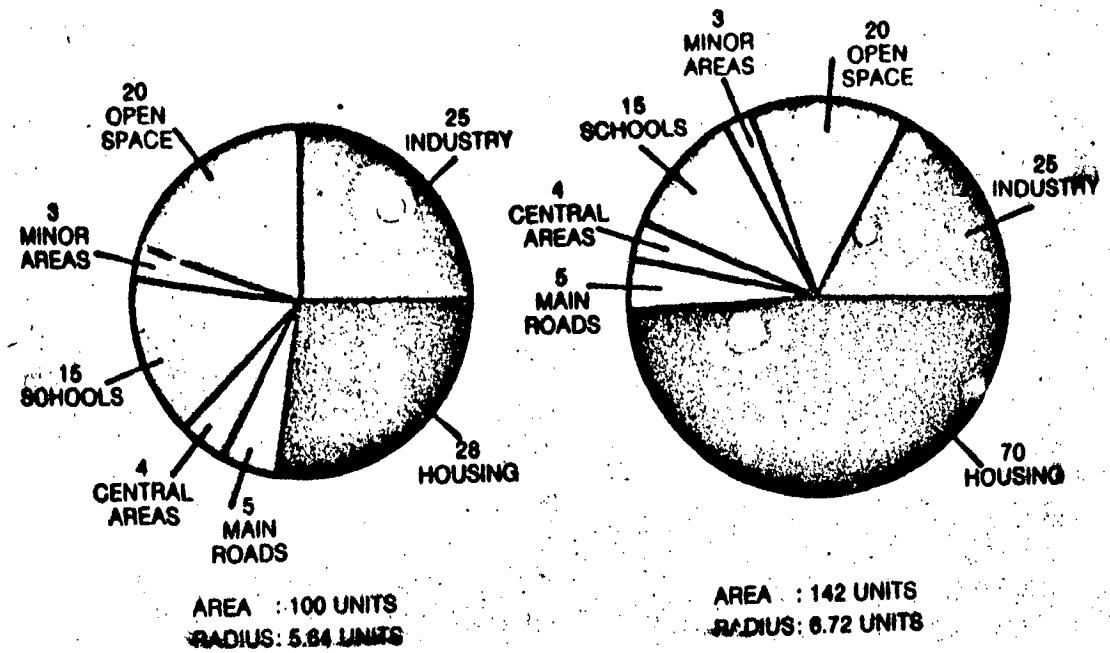


FIG. 6·6·1 EFFECT OF VARIATION OF DENSITY ON AREA OF TOWN

the built up area per floor will be half as compared to a ten storeyed structure.

This concept provides the architect, full freedom to choose the number of floors that suit the project, provided the area on all floors does not exceed the built-up area available for the plot under the prescribed floor area ratio, leaving the required front, rear and side open spaces as per height of the building.

6.5.2 Purpose of F.A.R. in Urban Context :

Cities might be looked at as unique, human dominant ecosystems, which have inputs in the form of population resources from the physical environment, financial resources and human resources. Other inputs are technology and codes and laws that affect housing and the environment. Resources are processed as through-puts such as transportation communication, education, housing and household operations. The output of the system, in total may be viewed as the quality of life, experienced by the residents. Crime, overcrowding are among negative outputs while satisfaction with the home and its environment would be classified as positive output. Overload occurs when inputs enter the system too rapidly or unpredictably. With such overload, the metropolitan cities in developing nations are under tremendous pressure due to number of reasons. Such pressure in developed countries is less acute. In fact, population of larger cities like New

York, Chicago, London has nearly remained static over the last decade against a phenomenal rise in population of cities like Bombay.

In under-developed countries and especially in cities like Bombay, space in a dwelling unit is exploited to the utmost, in response to the economic pressures. In such a situation, it is advisable to adopt an exact measure of accommodation - a measure like Floor Area Ratio. The basic factor of the economy is the cost of land. Land is clearly not scarce in the absolute sense, but there is a shortage in the sense, that there is a competition for the available supply in areas where people want to live i.e. in and around the office area (Southern Tip of Bombay). The movement to the suburbs is a response in large part to the quest for less expensive land for an expanding population.

6.5.3 Occupancy Rate :

When the Floor Area Ratio is adopted as a measure of accommodation, the rate at which the accommodation is to be occupied by people has to be decided upon. This rate is called the occupancy rate, it means the amount of square feet of floor area per person. The occupancy rate is a good means to control the density of population in combination with the F.A.R., under normal conditions. But this rate may vary from 20 to 150 sq.ft. per person, depending upon the economic conditions of the people and the available volume

of housing. Therefore, it can help only to a certain extent to decide the density of population at the planning stage. So long as housing is in short supply, overcrowding in dwelling units is bound to occur.

Under section 379 A of the Municipal Act, the Municipal corporation of Greater Bombay considers a dwelling unit to be overcrowded if, an occupancy rate of 25 sq.ft. per person is not maintained. However, this rate is rather low, and it should not be less than 50 sq.ft. per person. But looking at what is ideal and what can be achieved on a realistic basis, and considering the backlog of housing, it is the utmost that can be realised for many years to come. Occupancy rates have, therefore to be chosen after taking into account, the existing social and economic conditions. A very optimistic view in this respect is more likely to result in failure.

There is another method of determining the occupancy rate. It is based on the number of persons to be accommodated per habitable room. This is a variable factor because the areas of habitable rooms can vary considerably. This concept can succeed only in the European countries, where, people move into larger houses when there is an addition to the family. In Bombay, the number of habitable rooms and the number of persons accommodated in these is inversely proportional. This obviously leads to the collapse of the infra-structural facilities.

6.5.4 Population Density :

Control can also be exerted over the Floor Area Ratio by specifying the same in coordination with the net population densities. But it will materialise only if detailed population surveys are taken of each and every locality. As the density for every locality is likely to differ, so will the F.A.R. specified for that particular locale. Consequently, the density of the whole area can be maintained at a pre-determined level.

6.5.5 Urban Land Ceiling Act :

The rapid increase of population in metropolitan cities led to the shortage of houses and created speculation and hoarding of developable vacant land in large metropolitan areas. This in turn, led to abnormal rise in prices of land leading to profiteering and racketeering, hitting in ultimate the common man. The Urban Land Ceiling Act was passed mainly with a view to solve this problem. The act proposes to impose ceiling on vacant urban land in all the cities of India with a population of over 2 to $2\frac{1}{2}$ lakhs. It divides the urban agglomerations into four broad categories and fixes ceiling limits varying from 500 sq.mt.s in category 'A' to 2000 sq. mt.s in category 'D'. People are required to submit the statement of their holdings and surrender the excess vacant lands to the Government. It has provisions for exempting vacant land from operation of ceiling limits only if the holders of

vacant land put houses for weaker sections of the society.

Unfortunately this has not worked. Firstly, because the law can be evaded by sub-dividing the property. Secondly, the surplus land comes in little bits and pieces all over the city- very often in locations, quite unsuitable for low-income housing (because of lack of access to jobs, mass transport etc.). Moreover the development programme has to be constantly readjusted since the land keeps coming in bits and pieces. What is needed is not an acquisition act, which nets haphazard little parcels of real estate, but one which delivers large chunks of land at a scale and in locations, which would allow the cities to undertake the re-structuring, they so desperately need.

Urban land is viewed as an economic commodity, one that escalates faster than most other investments. Expropriating this for low-income housing does not always work, since the disparity between the subsidised price and the actual market value is considerable and tempts the poor to illegally sell their dwelling units and move back out on to the pavement.

There could have been simpler alternatives such as taxing the excess vacant land instead of imposing the ceiling on holding. The tax should increase with the passage of time and can vary according to the category of the city and importance of the location of the plot within the city. This would discourage investment in urban land and hence would bring

down land prices. Secondly, the large sum generated by way of tax could be utilized to subsidise schemes for weaker sections of the society.

6.5.6 Determination of F.A.R. :

For determining the F.A.R., the first step is to determine the size of the population to be accommodated. The next is to assume the number of persons that have to be accommodated per habitable room. This should be consistent with the rent paying capacity of the 'would be occupants' and in consonance with healthy living conditions. This figure may vary for different localities or for different portions of the same locality, depending upon the income group to be accommodated. The number of habitable rooms that can be built in the area is then obtained by dividing the total population figure by the number of people to be accommodated per habitable room. Then, based on studies, the area required for a habitable room is ascertained. This is also done by dividing the plot area by the number of habitable rooms (This figure takes into account, other ancilliary areas in the building, wall thickness etc.). Multiplying the total number of habitable rooms by the area required per room gives the total floor area of all the buildings in the layout. And finally the F.A.R. is arrived at, on a realistic basis, by dividing this total floor area by the total residential area of land in the layout.

The only catch in the above method of determining

the F.A.R. is that, it can be done very effectively for new developments only, where densities can be comparatively easily controlled. But to regulate the crowding in a megapolice like Bombay is a Herculean task. The Bombay Municipal Corporation did start out with honourable intentions by awarding higher F.A.R. in lowly populated localities. Unfortunately, the whole scheme boomranged in the Corporation's face. It only succeeded in fabulously increasing the land values in areas where high F.A.R. was granted.

Taking environmental factors into consideration, it is advisable, to reduce the F.A.R. to somewhere between 0.5 to 0.8 in residential zones. But at the same time, problem of accommodating the increasing population cannot be overlooked. Since the population of the city is increasing day by day, the basic point for the determination of F.A.R., is itself in motion. Therefore, no outright statement in the face of such a complicated and controversial issue can be made and subject is looked at from a general point of view. Employment generation is the key to all urban growth and it is essential to take the pressure off Bombay, by creating new city centre that attracts the offices that are otherwise proliferating at the southern tip of Bombay. Thus, there is a need for economic planning policy, to place the problem of housing, within the overall framework of the national economic development.

6.6 DENSITY CONTROL :

Different tenement densities are allotted for different parts of the city varying from 80 to 175 tenements per net acre.

6.6.1 Nature of Density Control :

Density is a central concept in design of cities and residential environments, which is believed to have far-reaching effects on many aspects of the quality of life. In a broad sense, density is a measure of the intensity of land-use. It provides the expression in simple mathematical terms of people or amount of housing in a specified area of land. Density can be measured in relation to a whole town, a neighbourhood or a particular housing layout.

6.2.2 Types of Density Control :

Concept of density has more than one definitions - Overall residential density is applied to a town as a whole. It is the residential population of the town divided by the acreage it occupies, regardless of how the land is used-excluding undeveloped or agricultural land but including industrial land, all public open space, all schools and other types of developments. It is not generally used for local planning purposes.

Gross residential density is applied to a neighbourhood of the area divided by the acreage including all the land covered by dwellings, gardens, roads, local shops, primary

schools and most of the open spaces but excluding all other urban uses such as industrial land, secondary schools, town-parks and town centres. It is used in the preparation of the development plan but is of no direct significance for development control.

Net residential density is applied to a particular housing layout and is the normal basis for development control. It is the population (or accommodation) divided by the acreage including dwellings, open spaces between buildings, garden patches, internal roads and half the width of the surrounding roads upto 20'.

Apart from these, Zlutnich and Altman have distinguished between ''inside'' dwelling unit density and ''outside'' dwelling unit density, which generate four situations -

a) High inside and high outside density (crowded dwelling in a highly populated neighbourhood)

b) Low inside and high outside density (luxury apartment in an urban setting)

c) High inside and low outside density (rural situation of crowded dwelling)

d) Low inside and low outside density (suburban setting)

Density in various parts of Bombay is mainly of the first two ('a' and 'b') types. It is essential to consider both''inside'' as well as ''outside'' dwelling unit densities, because the definition of a good homeis not only one that is physically sound, but also one that does not crowd the inhabitants and one that is located in an environment suitable for family life.

6.6.3 Use of Density in relation to Development Control :

Density control, if wisely used can be a valuable weapon in the planner's armoury but its indiscriminate use has revealed some limitations. The main purpose of density control is to implement the key factors in development plans. These policies must be based upon up-to-date population projections, adequate knowledge of house hold types and size, and as accurate estimate as possible of the amount of land likely to be available to meet future housing needs. The amount of land required to meet those needs will depend primarily on the density policy adopted both for new development and for redevelopment.

The need to keep total neighbourhood population within pre-determined limits is a crucial element in planning policy because the structure of land uses and community services may be severely disrupted if the population of the area substantially exceeds that stipulated in the plan. It is however, one of the most difficult factors to forecast with any precision or to control with any certainty except in large self-contained area of new development. The density policy for particular areas, will therefore, need to be reviewed from time to time, particularly in areas of existing development, where the rate of redevelopment is accelerating, in order to ensure that the planned population is not greatly exceeded. Alternatively it may be right, to provide for some expansion of neighbourhood facilities to meet the increased population.

6.6.4 Limitations of Density Control :

Once a land-use and population policy has been established within the frame work of a broad density policy, it is important that planning authorities are aware of the limitations of density control while considering detailed applications. Density control is not something to be applied as bye-law control. If precise density figures are applied too rigidly in controlling development, the result might well be to produce uniformity and create unnecessary obstacles to the more intensive use of urban land. Density cannot be a very accurate control. It is conditioned by many variables.

Especially speaking in terms of tenements per acre (as specified in development control rules), ignores the fact that the size of tenement varies. When the average household size is taken as the basis, it certainly makes difference in terms of persons per acre. It is difficult, therefore, to achieve homogenous development with the use of tenement density. Moreover, overcrowding within dwellings cannot be prevented by density control, since it limits household size or determines living habits. Similarly, density control cannot ensure adequate standards of light and air for individual homes. These depend primarily on design and layout of the buildings.

In development control, what is important is not to apply some pre-determined density control but to consider proposals in relation to the particular site and its surround-

ings, the proposed layout and the dwelling types. The factors which local authorities need to consider are -

a) light and air

b) possible traffic hazards, standard requirements for car parking

c) quality of design and layout for which specific standards cannot be laid down but insistance should be on high standard of design and layout and planning control should be used in a positive way to secure real improvements.

d) relation to neighbouring property which is probably the most difficult aspect to assess objectively from the varied points of view of the developer, the prospective residents and those who already live in the area.

6.6.5 High Density Development in Urban Context :

Ever since the 19th century, density has had a bad connotation. It has been associated with slums, unsanitary conditions and sub-standard housing. In a classic study of the effects of crowding on rats, Calhoun found that crowding distoned the normal courting, nest building, sex behaviour, social organization and physiological functions of experimental animals. Human responses to crowding are more complex. In fact, under certain circumstances, living in close proximity may have beneficial effects that need to be considered in urban planning and design. Freedman points out that high-density living is an intensifier of both good and bad behaviour and there are benefits in high-density cities due to economics of

scale in dealing with mass problems.

There is a relationship between density and services that people can get within a given distance. Higher density may increase the choice of shops, schools and other services. Moreover higher density enables the development of a more compact city resulting in shorter travelling distances and lower transportation costs. Obviously one way to economise on the increased cost of land, transportation costs, is to crowd the population into a smaller area i.e. to increase the density. However, increasing the density has its own drawbacks. It will result in housing conditions that are less pleasant and well-being of the residents will decline. In the terminology of economists, the population will suffer a loss of utility. In an optimal city, this loss of utility in a high-density area should be balanced against savings in transportation costs. Similarly the advantages of living in a lower density should be balanced against the conditional transportation costs involved.

The growing demand for homes and the shortage of building land has already resulted in a trend towards higher densities in many parts of the city. Since a large number of people living per acre suggests overcrowding, it is commonly thought that higher densities are evil and lower densities are desirable. This is however, not wholly true and density values should not in every case be related to the quality of living conditions in a locality. Depending on prevailing conditions, a high density development can be more livable

than one having a much lower density. Skilled design can create a good environment at relatively high densities. On the other hand, it may well be true that it is easier to produce poor results at these levels of density than at the lower levels. Equally the higher densities afford opportunities for more flexible and varied layouts, imaginative landscaping, new ways of coping with car-parking and scope for producing more neighbourly and close-knit housing groups. The means to achieve a good environment by ensuring adequate privacy, light and air, a pleasant setting, sufficient play space and a lay-out that avoids the monotony has itself been the subject of much study and experiment. The relation of building heights and extent of town, with density is studied in following examples -

The relationship between building heights and overall densities depends on number of factors, including the size of the housing units and the community space per family. e.g. : for Indian urban conditions, (i.e. an average housing unit of 25 m^2 and a community area of about 30 m^2 per family for tot-lots, health centres etc.), it is seen that ground floor housing can accommodate per hectare about 125 families, each on a plot of 44 m^2. Five storey walk-up apartments double this figure to about 250 families, Twenty storey buildings will double it again to about 500 families. Thus, as the building heights increase twenty-fold, gross neighbourhood densities increase only about four-fold.

Studies undertaken three decades ago for Hook New Town in the U.K. demonstrated that for a circular town, reducing residential densities from 250 persons per hectare to 100 persons per hectare would increase the area of the circle by 42% and the radius (i.e. the distance from periphery to city centre) by only 19% (as seen in fig 6.6.1).

6.6.6 Density in Relation to Cost of Development :

The effect of increasing density on land and building costs is a very complex subject, but certain broad conclusions can be simply stated -

* the cost of land per acre will tend to increase as the permitted density is increased, although the cost of land per dwelling will tend to decrease ,
* building costs per dwelling tend to decrease as the density is increased,
* service costs (roads, foot paths, water and sewerage lines) also tend to decrease with more compact development ,
* once density is increased beyond about twenty dwellings (sixty persons) per acre, development above two storeys becomes increasingly necessary and building costs begin to rise sharply.

The need for more economical use of land does not mean whole sale increases at all levels of density. Total land savings diminish at the higher densities. The amount of land needed for open space, schools, etc. depends on the number of people living in the area and not on the amount of land

taken up by their homes. Therefore, as densities increase, these other requirements bulk larger and larger in the total land needed and the benefit from increased housing densities becomes less and less.

For too long have we allowed the densities of our cities to be determined in the narrowest context by the random (and self-interested) decisions of individual commercial developers- higher densities triggering off higher land values, and vice versa. Today, almost the entire building industry in all our major cities is turning out a product that only the middle and upper classes can afford, forcing half of our society out on to the pavements. In their confusion and desperation, architects and engineers start searching for new ''miracle'' technologies. The problem of housing the vast majority of our urban people is not one of finding miracle building materials or construction technologies, it is primarily a matter of density, of re-establishing land-use allocations.

The blind belief in engineering and failing to understand the meaning of 'architecture' has in the past led to engineers taking control of town planning. Our cities have 'city engineer' but not 'city architect'. As suggested by Doxiadis, multidisciplinary approach to the problems of urban sprawl and population pressures is needed with a view to reordering and rearranging existing and future cities for the benefit of humankind.

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CHAPTER VII : CONCLUSIONS AND RECOMMENDATIONS

* Building bye-laws should be simpler, shorter and clearer. As far as possible, these should be presented in a table form, for quick and easy interpretation.

* Residential buildings are primarily designed to serve users' needs. Therefore, these needs (which are physical, social and psychological in nature) should be examined systematically and in depth, before framing the bye-laws. This will result in changes, not only in the form of buildings but also in the atmosphere and organization of the urban fabric.

  Moreover, users' needs show gradual, but constant change in their configuration. Hence, periodical case studies are needed to be carried out for each and every bye-law to check the performance of the same and the laws should be updated accordingly. The revision should be done in proper perspective i.e. not just by way of patchwork but by way of radical change, if required.

* More rational approach is needed in framework of bye-laws, which recognizes that norm-setting must be flexible enough to enable the architect to face the real-life situations while applying these in practice.

  Flexibility can be achieved by incorporating the concept of multi-purpose spaces, instead of clear-cut space division.

* The norms regarding the areas of rooms are difficult to be generalised and hence these should be left to the discretion of the architect, or else these must relate themselves to the variety of needs, such as -

  a) Provision of different minimum standards for different building types-depending upon income levels, as in certain cases, even if the financial situation permits better standards, the general trend is to stick to the minimum standards, which are often less than the optimum requirements. The building types can be categorised as per the cost of construction per dwelling unit.

  b) Construction of dormitories for the working class population coming from out, who are residing in Bombay without their families.

* A mention of many other spaces like dining, servant's accommodation, drying area, study, guest accommodation, family room and utility room should be made with specific requirements for each. All these spaces should not be generalised in a single category of habitable rooms.

* The minimum widths of living and kitchen can be reduced to 8'-0" and 6'-0" respectively, for effective utilisation of spaces. However, minimum width for corridor should be increased to 4'-0" for comfortable circulation.

* The minimum recommended height of a room from anthropological point of view is 285 cms (i.e. 9'-4")clear,

whereas 381 cms (i.e. 12'-6") clear height of room is desirable for incremental housing, with the idea of providing sleeping platforms as means of future expansion.

The prescribed height for bath, water closet and toilet is satisfactory.

* The permissible balcony area should be added to the total F.A.R. and the proportion of outdoor and indoor spaces should be purely of residents'choice.

The dimensions of the outdoor spaces, as far as possible, should be left to the discretion of users. Architect is expected to come out with a generalised solution, if different choices of the users tend to spoil the elevation of the building. If at all, restrictions are put on the dimensions, the minimum width of a balcony should be 4'-6" for sitting comfortably and minimum length should be 6'-6", so that it can also be used for sleeping purpose. The terrace provisions should be encouraged by building bye-laws, especially for high-rise buildings.

* The staircases, lift shafts and common corridors should be exempted from F.A.R. calculations, or else incentive for excluding these areas should be provided as suggested in 'PEATA publications'.

The minimum width of staircase flight and landing is

recommended as 1.2 m instead of 1.00 m prescribed.

* The size and number of lifts should be in relation to the number of occupants and provision of lift lobby should be insisted upon.

* The total evolution in the pattern of provision of open spaces is needed. Provision of community spaces and play areas should be encouraged by mutual understanding with neighbouring plots.

* A more technical outlook is necessary for specifying the minimum requirements for lighting and ventilation, instead of just relating the area of openings to the floor area.

* Implementation of the rules for zoning should be strict. Provision of educational zone should be made. Composite development should be encouraged in highrise buildings, by introducing a bit of commercial area on lower floors.

  Rich and poor should not be separated by means of zoning regulations.

* If possible, practice of equity plots should be followed. Row housing and semi-detached structures should be made permissible on all plots, irrespective of the dimensions of the plot.

* Variation of setbacks (front open spaces) should be made compulsory for adjacent plots, for breaking the

effect of monotony.

* Provision of plot coverage should be specified with intention of providing recreational space, which can be commonly used by a cluster of adjoining plots.

* The F.A.R., as far as possible, should be kept somewhere between 0.5 and 0.8. To make it possible, employment generation should be encourged around new city centre. Instead of 'frozen' master plan, open-ended planning is necessary, which can postulate series of growth options. This will also help in lowering the land costs.

* Instead of tenement density, density should be specified in persons per acre basis. Measures should be taken to solve the 'empty nest problem' by relating the area of dwelling to family size.

* Care should be taken to see that the bye-laws do not become hindrance in a good and functional design.

* The professional background of the approving authority should be reconsidered. Approving body should be inclusive of architects and planners.

* Ceiling of time for the procedure of approval should be specified. Direct meetings with architects should be encouraged to expedite the matters, instead of depending only upon correspondence. Such meetings will give the architects a chance to explain their

schemes.

* The implementation of bye-laws should be uniform in all cases except for the designs with strong architectural concept, where special permission could be granted.

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APPENDIX A:

QUESTIONNAIRE FOR ARCHITECTS :

Suvarna Varty,

F-7, Sarojini Bhawan,
University of Roorkee
Roorkee,
U.P. 247 667.

Date :

Dear Sir,

As a part of the post-graduate curriculum, a study has been undertaken by me, related to residential Building Regulations, Building Bye-laws and Development Control Rules of Greater Bombay. Your opinions on these are humbly solicited.

A questionnaire has been attached herewith for this purpose. Please fill in the required details about you as needed and indicate your opinions by making a tickmark (✓) on the word/statement aggreable to you. Your suggestions are welcome wherever necessary. The term 'Building Regulations' is used synonymously for Building Bye-laws and Development Control Rules in this questionnaire.

Your responses will be used in strict confidence for research purpose only. As the success of the research mainly depends upon your frank and genuine opinions, they are earnestly sought for.

May I hope for your kind co-operation and request for a response in the matter at your earliest.

Thanking you in anticipation,

Yours faithfully,

(Suvarna Varty)

P.S. : If you feel that the space provided for any item is inadequate for your suggestions, please utilise the provided extra sheet by making reference to the question number.

Sample No. :

Date :

Name of the Architect :

Designation/position in the firm :

Name and Address of the Office/Firm :

Overall experience in the field _____ years.

Number of years in service : _____ (Government/ Teaching / Private Firm)

Number of years in prctice _____

---

1) How far do you think the Building Regulations are helpful in controlling the residential development ?
   a) Very helpful
   b) Helpful
   c) Somewhat helpful
   d) Not of much help.
   e) Not at all helpful

2) Do you think that the present Building Regulations are:
   a) Very useful
   b) Moderately useful
   c) Neither useful nor useless
   d) Cumbersome
   e) Useless

3) Architects generally believe that there are certain advantages and disadvantages of the present Building Regulations. They are listed below in separate columns. Please make a tickmark against those with which you agree :

   Advantages :

   i) They help to achieve homogeneous development.
   ii) They control the street perspective.
   iii) They prevent builders from exploiting the situation.
   iv) They provide good outdoor spaces and opportunity for landscaping
   v) They provide better lighting and ventilation.
   vi) If any other, please specify.

   Disadvantages :

   i) They do not take into account certain physical and psychological factors.
   ii) They lead to a monotonous appearance.

iii) They suppress the individualistic approach to design.
iv) The conditions for minimum lighting and ventilation in these are inadequate.
v) If any other, please specify :

4)a) Is any change necessary in methodology of submission and approval of drawings ?
a) Yes.
b) No.

b) If yes, in which area would you like to suggest change ?
i) Format of drawings for submission.
ii) Procedure of submission and approval.
iii) Both : (i and ii).
iv) If any other, please specify.

5)a) What do you think should be the professional background of the approving authority ?
a) Political
b) Administrative
c) Legislative
d) Technical

b) If technical, who should be the approving authority ?
a) Architect
b) Town Planner
c) Engineer

c) Do you think that the approving body should be composed of persons of different branches according to which approval should be divided into different parts like plan approval, structural stability approval, development control approval, etc ?
a) Yes.
b) No.

6) In spite of a straightforward proposal, have you ever experienced any difficulty in getting you proposal sanctioned ?
a) Yes.
b) No.

7) Which of the following policies would you recommend ?
i) Implementations of Building Regulations without exceptions.
ii) Waiving aside some objections in certain cases.
iii) Giving concessions to special cases.

8) Do you think that the Builders restrict the Architects' imagination by encouraging in them a tendency to stick to the minimal requirements as stated in Building Regulations ?
a) Yes.
b) No.

9) The conditions on the minimal areas in the Building Regulations (Old and Revised) are listed below. Please tick the ones you feel are appropriate. If not, mention the changes necessary .

S.No.	Room or Space	MINIMUM AREA SPECIFIED		Minimum Area Recommended by you
		OLD	REVISED	
1.	LIVING	120 Sq.Ft.	-	
2.	KITCHEN	80 Sq.Ft.	5.5 Sq.M(59.20 Sq.Ft.)	
3.	HABITABLE ROOM	100 Sq.Ft.	9.5 Sq.M(102.25 Sq.Ft.)	
4.	BATH	16 Sq.Ft.	1.8 Sq.M(19.40 Sq.Ft.)	
5.	W.C.	12 Sq.Ft.	1.1 Sq.M(11.85 Sq.Ft.)	
6.	TOILET	28 Sq.Ft.	2.8 Sq.M(30.10 Sq.Ft.)	

10)a) Do you think that all the requirements of residents are fulfilled with the spaces indicated above ?
i) Yes.
ii) No.

b) Should there be some specific mention about dining,drying area, servant's accommodation or any other requirement ?
i) Yes.
ii) No.
If yes, please specify :

11) The conditions for the minimum widths as per Building Regulations (Old and Revised) are listed below. Tick whichever you think are appropriate. If not, suggest the changes necessary.

S.No	Room or Space	MINIMUM WIDTH SPECIFIED		Minimum Width Recommended by you
		OLD	REVISED	
1.	LIVING	9'-0''	-	
2.	KITCHEN	7'-0''	1.8 MTS(5'-11'')	
3.	HABITABLE ROOM	9'-0''	2.4 MTS(7'-10$\frac{1}{4}$ '')	
4.	BATH	3'-6''	1.2 MTS'3'-11'')	
5.	W.C.	3'-0''	1.2 MTS(3'-11$\frac{1}{2}$'')	
6.	TOILET	3'-6''	1.2 MTS(3'-11'')	
7.	CORRIDOR	3'-0''	1.0 MTS(3'-3'')	

12) The conditions laid down for minimum heights in the Building Regulations (Old and Revised) are listed below. Please tick the ones you think are appropriate. If not, suggest the necessary changes :

S.No.	Room or Space	MINIMUM HEIGHT SPECIFIED		Minimum Height Recommended by you
		OLD (Floor to Floor)	REVISED (Clear)	
1.	HABITABLE ROOM AND KITCHEN	9'-0''	2.75 MTS(9'-0'')	
2.	BATH, W.C. AND TOILET	7'-6''	2.20 MTS ($7'-2\frac{1}{2}''$)	

13. Do you think that the balconies can be effectively utilised as outdoor spaces with the present restrictions on their widths and length ?
a) Yes
b) No.
If not, what changes do you suggest in the regulations regarding balconies ?

14)a) Do you find the minimum open spaces to be left as per existing regulations are :
i) in excess. ii) ideal iii) inadequate.

b) Is there any change necessary in the total pattern of the open space to be left as per the needs of residents like parking, play area, landscape development or any other ?
i) Yes
ii) No.
If yes, please elaborate :

15) Do you think that the above regulations regarding the areas, widths, heights and open spaces influence architects' imagination adversely ?
a) Very much
b) To quite an extent.
c) Slightly
d) Not at all

15) Do you think that the decision of minimal areas, widths, heights and open spaces should be left entirely to the discretion of the architect ?
a) Yes.
b) No.

17)a) Do you think that the F.S.I. provisions should be uniform in different parts of the city ?
i) Yes.
ii) No.

b) Do you find the present uniform F.S.I. provision (1.33) is in
i) excess. ii) optimum iii) inadequate.

18) Do you think that the conditions laid down by Building Regulation for lighting and ventilation are satisfactory ?
a) Yes.
b) No.
If not, what changes are suggested ?

19) Do you think that some of the Building Regulations are difficult to adhere to ?
a) Yes.
b) No.
If yes, please mention these giving reasons :

20) Please state briefly if you have any suggestions for the improvement of the Building Regulations in general or in a specific area.

APPENDIX B:

INTERVIEW SCHEDULE FOR OCCUPANTS :

Dear Sir,/Madam,

As a part of the postgraduate course, a study has been undertaken by me regarding the household requirements of the occupants.

A questionnaire has been attached herewith for this purpose. Please fill in the required details about you as stated and indicate your opinions by making a tickmark (✓) on the word/statement aggreable to you. Wherever necessary, your suggestions are welcome.

Your responses will be used in strict confidence for research purpose only.

Hoping for your kind cooperation and requesting a prompt response in the matter.

Thanking you in anticipation,

Yours faithfully

(Suvarna Varty)

Name of the respondent :

Number of members in the family :

---

1) Please tick your opinions about the sizes of the rooms/ spaces in your flat.

ROOM OR SPACE	LARGE	PERFECT	SMALL
LIVING			
KITCHEN			
BED ROOM			
BATH			
W.C.			

2. a) How do you dine ?
   Sitting on the floor/At the dining table

   b) Where do you dine ?
   In the living room/In the kitchen/
   In a separate dining room

   c) If in living/kitchen, is the room large enough to accomodate the dining activity ?
   Yes/No

3. Where are the utensils cleaned in your house ?
In the bathroom/In the kitchen sink/
In a separate washing place.

4. What type of W.C. would you prefer ?
Indian type/European (commode) type.

5. What kind of toilet facilities would you prefer ?
Bath and W.C. combined/Separate bath and W.C.

6.(a) Where do you dry your clothes ?
In the balcony/In the passage/In one of the rooms/
In a separate drying verandah.

(b) Do you have sufficient storage space in your flat ?
Yes/No

7.(a) For what purpose do you use your balcony ?
Standing/As outdoor sitting/Sleeping/For drying
food-stuff/

(b) Do you think that the size of your balcony is Big/Perfect/
Small.
If small, in which of the dimensions would you prefer a
change ?
Length/Width/Both.

(c) Given a choice, would you like to enclose your balcony ?
Yes/No.

8. Do you think that the height of your rooms is Big/
Perfect/Small.

9. Please tick your opinion about the lighting and ventilation
in rooms and toilets of your house.

ROOM OR SPACE	WELL LIGHTED	WELL VENTILATED
LIVING		
KITCHEN		
BED ROOM		
BATH		
W.C.		

10.(a) Do you find your staircase sufficiently wide ?
Yes/No

(b) Do you find any difficulty in climbing your stiarcase ?
Yes/No

11.(a) Do you think that the open spaces around your building are Large/Ideal/Narrow ?

(b) Is there sufficient space in your compound for Children's play/Parking/Gardening ?

12. Are all of your household requirements fulfilled with the rooms/spaces provided in your flat ?
Yes/No.
If not, which other facilities are required ?

Address of the respondent :

APPENDIX- C STATEMENT OF BUILDING BYE-LAWS APPRAISED IN THE STUDY

. M.C.G.B. stands for Municipal Corporation of Greater Bombay

. D.C.Rules mean Development Control Rules

Minimum Standards for Areas of Rooms/Spaces :

M.C.G.B. BUILDING REGULATIONS AND BYE-LAWS : Clauses 5(e),34 42(d) and B.M.C. ACT : Clause 348 (h)

''Every living room shall have a clear superficial area of not less than 120 sq.ft., a habitable room not less than 100 sq.ft., and kitchen not less than 80 sq.ft... Water closet to have clear internal dimensions of not less than 4 ft. (along the length of the pan) x 3 ft (crosswise) and no Indian pattern W.C. pan shall be less than 27'' in length.... The clear internal dimensions of bath rooms shall not be less than 4'6''x 3'-6''.

BUILDING BYE-LAWS AND D.C.RULES FOR M.C.G.B.(DRAFT): Clauses 17.2.1, 17.3.1, 17.5.1, 17.8.1 and 17.9.1

''No habitable room shall have a floor area less than 9.50 sq.m.... The area of the kitchen shall not be less than 5.50 sq.m. A kitchen which is also intended for use as a dining room shall have a floor area not less than 9.50 sq.m.... The size of a bathroom shall be not less than 1.80 sq.m.... The minimum size of a water closet shall be 1.10 sq.m. If it is a combined bathroom and W.C., the minimum area shall be 2.80 sq.m.... The aggregate area of the mezzanine floor shall not exceed 33-1/3% of the built-up area of that room. The minimum size of a mezzanine floor if it is used as a living room shall not be less than 9.5 sq.m. (NOTE - Mezzanine floor area shall be counted towards F.A.R.).... The area of a store room shall not be more than 3 sq.m.

Minimum Standards for Widths of Rooms/Spaces :

M.C.G.B. BUILDING REGULATIONS AND BYE-LAWS : Clauses 5(c), 34 and 42 (d)

''No habitable room shall be less than 9' in width and kitchen less than 7' in width.... Water closet to have clear internal dimension of 3'(crosswise) and bathroom shall not be less than 3'-0'' in width.

BUILDING BYE-LAWS AND D.C.RULES FOR M.C.G.B.(DRAFT): Clauses 17.2.1, 17.3.1, 17.5.1

''The minimum width of the habitable room shall be 2.40m....

Kitchen shall be with a minimum width of 1.80 m. A kitchen which is also intended for use as a dining room shall have a minimum width of 2.40 m... The minimum width of a bathroom shall be 1.20 m and that of a water closet shall be 0.90 m. The combined bathroom shall be with minimum side 1.20 m.

Minimum Standards for Heights of Rooms/Spaces :

M.C.G.B. BUILDING REGULATIONS AND BYE-LAWS : Clause 42(a) and B.M.C. ACT : Clause 348(f)

''Every room intended to be inhabited, in any building, shall be in every part at least ten feet in height from the floor to the ceiling. This will also apply to every kitchen room.

BUILDING BYE-LAWS AND D.C.RULES FOR M.C.G.B.(DRAFT) : Clauses 17.2.2, 17.3.2, 17.5.2, 17.6, 17.8.2 and 17.10.3

''The height of all rooms for human habitation and a room height of a kitchen shall not be less than 2.75 m measured from the surface of the floor to the lowest point of the ceiling (bottom of slab).... The height of a bathroom or water closet measured from the surface of the floor to the lowest point of the ceiling (bottom of slab) shall be not less than 2.2 m.... The maximum height of a loft shall be 1.5 m.... The minimum height of a mezzanine floor shall be 2.2 m. The head room under mezzanine floor shall not be less than 2.2 m... The maximum head room in a garage and parking area shall be 2.4 m. Loft may be provided over residential kitchens, bathrooms and corridors, built up to an area 25 percent over kitchens and full space of bathrooms, water closets and corridors.

Restrictions on Balcony Dimensions/Outdoor Spaces.

DEVELOPMENT CONTROL RULES FOR G.B.: Clause 37, 33

''In case of of residential flats, galleries/balconies may be permitted to the extent of 10 percentum of the floor area of each floor except ground floor, in addition to the permissible F.S.I. and subject to the following restrictions : (a) that the length of the balcony shall be restricted to half the length of the room from which it projects, except in the case of such a flat with a plinth area of 60 sq.m. or less wherein the length of the balcony may be permitted, (b) that when the balconies are enclosed, 1/3rd of the area of their faces shall have louvers or grills on the top and the rest of the area except parapet shall have glazed shutters, (c) that no dividing wall between the balcony and the room shall be removed, (d) that the maximum projection of the balcony shall not exceed 4'-0'', except that when it faces a street a maximum

projection of 4'-6'' may be allowed.... No gallery or balcony shall be permissible which will reduce the required open space, except that facing a street, to less than 10 ft.... The terraces created by the setbacks at higher level, shall not be accessible through individual flats or rooms.

BUILDING BYE-LAWS AND D.C.RULES FOR M.C.G.B.(DRAFT): Clause 15.4.1

''In residential buildings, a balcony or balconies at roof level above ground floor (including stilt floor) of a width of 0.9 M from the building line (measured perpendicular to the building line) to the outermost line of the balcony overhanging set backs within one's own land and courtyards and this shall be subjected to a maximum of 1/3rd length of perimeter of building. However no balcony shall reduce the clear marginal open space to less than 3 M in width''.

Minimum/Maximum Standards for Staircase Dimensions :

M.C.G.B. BUILDING REGULATIONS AND BYE-LAWS :

There are no specific discussions as to the design standards but the construction aspects of a staircase have been covered under Clause 37.

BUILDING BYE-LAWS AND D.C.RULES FOR M.C.G.B.(DRAFT):Clause 19.4.3

''The minimum width of an internal staircase shall be 100 cms.... The minimum width of treads without nosing shall be 25 cm. for an internal staircase for residential buildings... The maximum height of riser shall be 19 cms. in the case of residential buildings... Handrails shall be provided with a minimum height of 90 cms. from the centre of the tread... The minimum headroom in a passage under the landing of a staircase and under the staircase shall be 2.2 m.

Minimum Standards for Lifts :

DEVELOPMENT CONTROL RULES FOR G.BOMBAY :Clause 35

''No building shall be erected or raised to a height greater than 52 ft. above the average surrounding ground level without the provision of a lift in addition to the required staircase... When a building is erected or raised to a height greater than 70 ft., at least two lifts shall be available for every dwelling except those situated on the ground and first floor without having to climb or go down more than one floor... In case

of buildings with a ground floor on stilts for parking facilities and having seven upper floors not exceeding 75'-0'' in height (measured from ground floor up to the top slab), the provision of a second lift may not be insisted upon.... The requirements for the fire prevention and five fighting shall be carried out... The lifts so provided shall be permanently maintained in good working order.... The number of respective floors in the building shall be engraved of adequate size and painted in the wall facing lift openings on the floor so as to be distinctly visible from the lift cage''.

BUILDING BYE-LAWS AND D.C.RULES FOR M.C.G.B.(DRAFT):Clauses 18 and 25.2

''Provision of lift shall be made for all buildings more than 16m. in height... The planning and design shall be in accordance with SECTION-5. Installation of Lifts and Escalators of National Building Code of India.... The lifts shall be maintained in working order.... The number of respective floors in the building shall be engraved of adequate size and painted in the wall facing staircases and lift/lifts openings on the floor so as to be distinctly visible from the lift cage''.

Minimum Standards for Open Spaces :

DEVELOPMENT CONTROL RULES FOR G.BOMBAY: Clause 11- TABLE LXVII

Required Open spaces for the Different Heights of Building

Height of building above ground level I		Required Open spaces II
	Feet	Feet
Upto	30	12
	39	15
	45	17
	51	19
	54	20
	60	22
	69	25
	78	28
	80	30
	90	30
	100	30
	110	32
	120	34
	130	36
	140	38
	150	40
	160	42

Contd...

170	44
180	46
190	48
200	50

BUILDING BYE-LAWS AND DEVELOPMENT CONTROL RULES FOR M.C.G.B. (DRAFT): Clause 15.1.4

TABLE 4 - OPEN SPACES FOR DIFFERENT HEIGHTS OF BUILDINGS FOR LIGHTING AND VENTILATION

Sl. No.	Height of Buildings in m	Open spaces to be left around building excepting front of plot in m
1	2	3
1	10	3
2	15	5
3	18	6
4	21	7
5	24	8
6	27	9
7	30	10
8	35	11
9	40	12
10	45	13
11	50	14
12	53 and above	16

Minimum Standards for Lighting and Ventilation :

M.C.G.B. BUILDING REGULATIONS AND BYE-LAWS: Clause 42(e) and B.M.C. ACT: Clause 348(i)

''Every room shall be ventilated by means of doors or windows which open directly into the external air and have an aggregate opening equal to not less than 1/4th the superficial area of the side of the room which faces an open space.... Every room shall have for the purpose of ventilation, a window or windows clear of the sash frames, opening directly, into an interior or exterior open air space, having an opening of not less than 1/10th of the floor area of the room or an aggregate opening of doors and windows of not less than 1/7 the of the floor area of the room''.

DEVELOPMENT CONTROL RULES OF G.BOMBAY: Clause 11(e)

''A room shall be considered as adequately lighted and ventilated if its depth from the side abutting the required open

space for light and ventilation does not exceed 25 ft.

BUILDING BYE-LAWS AND D.C.RULES FOR M.C.G.B.(DRAFT):Clauses 17.3.3(d), 17.4.1, 17.14.3, 17.14.4 and 17.14.5

''All habitable rooms including kitchen shall have, for the admission of light and air, one or more appertures, such as windows and fan lights, opening directly to the external air or into an open verandah, not more than 2.4 m in width.... Every room to be used as kitchen shall have a window of not less than 159 m. in area, opening directly on to an interior or exterior open space, but not into a shaft.... The minimum aggregate area of openings of habitable rooms and kitchens excluding doors, shall be not less than 1/6th of the floor area... No portion of a room shall be assumed to be lighted if it is more than 7.5 m away from the opening assumed for lighting that portion.... For ventilating the spaces for water closets and bathroom, if not opening on the front, side, rear and interior open spaces, shall open on to the ventilation shaft, the size of which shall not be less than the values given below :

Height of building in metre	Size of ventilation Shaft in sq.m.	Minimum size of Shaft in metre
Upto 12	2.8	1.2
18	4.0	1.5
24	5.4	1.8
30	8.0	2.4
Above 30	9.0	3.0

(Note - For buildings above 30 m, mechanical ventilation system shall be installed besides the provision of minimum ventilation shaft.)

Regulations for Zoning :

DEVELOPMENT CONTROL RULES FOR G.BOMBAY : Clauses 5,6,7,8, 13,18,19,27,31

''For the purpose of the Development Plan and these rules Greater Bombay has been divided into the following classes or zones :

1)(a) Residential (b) Residential with shop lines along streets
2)Commercial
3)Industrial (a) General (b) Special
4)Green or No Development Zones

.... The Zones are located and bounded as shown on the

Development Plan, on which the Commercial, Industrial and Green Zones are marked and the remaining areas shall be deemed to be in the Residential Zones... Use provisions in every zone are stated''.

BUILDING BYE-LAWS AND D.C.RULES FOR M.C.G.B.(DRAFT): Clause 14 and Appendix M.

''The various land use classifications shall be in the following zones :

i)	Residential Zone	- Purely Residential (R_1)
		- Residential with Shop Lines (R_2)
ii)	Commercial Zone	- Local Commercial Area (C_1)
		- District Commercial Area (C_2)
iii)	Industrial Zone	- Service Industries (I_1)
		- General Industries (I_2)
		- Special Industries (I_3)
iv)	Green Zone	- (No Development Zone)
v)	Special Reservations	

.... The various building uses and occupancies and premises to be permitted in the various zones are given.... The zones are located and bounded as shown on the Development plan.

Regulations for Plot Sizes :

DEVELOPMENT CONTROL RULES FOR G.BOMBAY: Clause 12

''The plots less than 50' in width/depth shall be considered as narrow plots... When the width/depth of the plot is more than 38', rules for setback lines will be the same as other plots and the side/rear open space can be reduced to 10', provided the building does not derive light and ventilation from this side... When the width/depth of the plot is less than 38', the side/rear open space can be reduced to 6' and the other side/front open space shall be minimum 10', the width/depth of the building being maximum 18' and height not exceeding 3 storeyes or 32'.... Semi-detached structures may be permitted on two adjoining plots, provided the conditions of open spaces are adhered to... In areas where majority of plots are less than 38' in width/depth, the commissioner may prescribe building lines within which row houses would be permissible.... In plots having width/depth less than 30', a ground floor structure with 5' open space alround may be permitted.

BUILDING BYE-LAWS AND D.C.RULES FOR M.C.G.B.(DRAFT): Clauses 13.4, N-1.1.5

''The plot size in residential layouts shall be as follows:

Plot areas	Development schemes
Above 50 to 125 sq.m.	Row Housing
Above 125 to 250 sq.m.	Semi-detached
Above 250 sq.m.	Detached

.... Plots are 4.5 to 8 m in width shall be developed as Row Housing Scheme which shall not have more than 8 plots in a row and the separation between blocks in a row shall be not less than 6 m.... Plots which are 8 m to 12 m in width shall be developed as Semi-detached Building Scheme.... Plots which are above 12 m in width shall be developed as Detached Building Schemes. Further no dimension of the plot shall be less than 12 m.... For special housing schemes, undertaken by Public Agencies for Low Income Group, Economically Weaker Section of Society, and slum clearance Schemes, the minimum plot size shall be 30 to 50 sq.m. with a minimum width of 3.5 m.... When the width/depth of the plot is less than 12 m, no dimensions of a building shall exceed 30 m.... When the width/depth of the plot is less than 12 m but more than 9 m, the front open space shall not be less than 3 m, the rear/one side open space may be reduced to 1.8 m, the other side open space being 3 m minimum, the width/depth of the building shall not exceed 12 m and height of building shall not exceed 3 storeyes or 10 m..... Semi-detached structures on two adjoining plots may be permitted provided the conditions of minimum open spaces mentioned above are maintained.... If the width/depth of the plot is less than 9 m, a ground floor structure with 1.5 m open space all around may be permitted provided no dimension of the building exceeds 30 m and height of building does not exceed 4 m.

Regulations for Set-back Lines :

DEVELOPMENT CONTROL RULES FOR GREATER BOMBAY: Clause 11

''There shall be a minimum open space of 10' in width between the street and the building in the Residential Zones of the city.... Fron open space of not less than 15' shall be provided along the roads mentioned in the clause.... There shall be minimum open space of 15' in width between the street and the building in the residential zones of the suburbs and the extended suburbs.... No construction work of a building shall be undertaken within 25' from the edge of the Eastern and Western Express highways and other roads 175' or more in prescribed width.... No construction work of a building shall

be undertaken within 20' from roads 70' or more in prescribed width in the suburbs and extended suburbs.

BUILDING BYE-LAWS AND D.C.RULES FOR M.C.G.B.(DRAFT): Clause N-1.1.1, N-1.1.3

''There shall be a minimum open space of 3 m in width between the street and the building in the Residential Zones of the city area.... A front open space of not less than 4.5 m shall be provided along the roads mentioned in the clause.... There shall be minimum open space of 4.5 m in width between the street and the building in the residential zones of the suburbs and the extended suburbs.... No construction work of a building shall be undertaken within 7.5 m from the edge of Eastern and Western Express Highways and other roads 52.5 m or more in prescribed with.... No construction work of a building shall be undertaken within 6 m from roads 21 m or more in prescribed width in the suburbs and extended suburbs.

Regulations for Plot Coverage, Floor Area Ratio and Density Control :

DEVELOPMENT CONTROL RULES FOR GREATER BOMBAY: Clauses: 10,39

''The Floor Space Indices and the tenements per net acre permissible in the various residential and commercial zones shall not exceed the respective figures shown in the table below:

F.S.I. Zone	Boundaries of the Zone	Floor Space Indice	Tenement per net Acre
R_1	Specified	1.33	80
R_2	''	1.33	100
R_3	''	1.33	125
R_4	''	1.66	100
R_5	''	1.66	125
R_6	''	1.66	150
R_7	''	1.66	175
R_8	''	2.45	140
R_9	''	3.50	175
R_{10}	Suburbs and extended suburbs		

..... When the land under development admeasures 3000 sq. yds. or more, 15 percent of the entire holding area shall be

reserved for a recreational space which shall be as far as practicable in one place.... No such recreational space shall admeasure less than 450 sq.yds.... The minimum dimension of such recreational space shall in no case be less than 25' ft. and if the average width of such recreational space is less than 80 ft. the length there of shall not exceed $2\frac{1}{2}$ times the average width.

BUILDING BYE-LAWS AND D.C.RULES FOR M.C.G.B.(DRAFT): Clauses: N-1.5

''The Floor Area Ratio for building of various uses (in various zone) shall be as given below :

	Uses/Zones	F.A.R.
i) ii)	Residential Commercial	As per Table 26
iii)	Service Industries (also applicable to Service Industries Class 'A' in other Zones)	0.5
iv)	General and Special Industries	0.5
v)	Educational Building	1.33 in City area 1.00 in Suburbs
vi)	Institutional Building	1.00
vii)	Cinema Theatres/ Assembly Halls/Mangal Karyalaya	1.00
viii)	Storage Building (Warehouses,godowns)	0.50 (Volume to Plot Ratio of 4 m)

TABLE 26 - F.A.R. FOR RESIDENTIAL AND COMMERCIAL USE/ZONE

F.A.R. Zones	Boundaries of the Zone	Floor Area Ratio	Per net Acre Tenement
1	2	3	4
R_1	Specified	1.33	80
R_2	''	1.33	100
R_3	''	1.33	125
R_4	''	1.33	80
R_5	''	1.33	100
R_6	''	1.33	120
R_7	''	1.33	140

Contd..

1	2	3	4
R_8	Specified	1.33	75
R_9	"	1.33	65
R_{10}	Suburbs and Extended suburbs	1.00	80

.... In any plot admeasuring 0.3 hectare or more in residential and commercial zones, 15% of the entire holding area shall be reserved, for recreational spaces which shall be as far as possible, be provided in one place.... No such recreational spaces shall admeasure less than 450 sq.m.... The minimum dimension of such recreational space shall in no case be less than 7.5 m and if the average width of such recreational space is less than 24 m, the length thereof shall not exceed $2\frac{1}{2}$ times the average width.