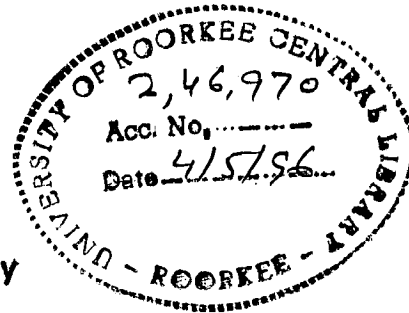


# **CRITICAL ANALYSIS OF THE FUNCTIONAL ASPECTS OF PUBLIC SECTOR HOUSING**

## **A DISSERTATION**

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



By

**VAJRAKUMAR B. MEHTA**



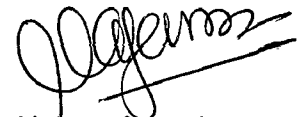
**DEPARTMENT OF ARCHITECTURE AND PLANNING  
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ROORKEE-247 667 (INDIA)**

**JANUARY, 1995**

CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in the thesis entitled "CRITICAL ANALYSIS OF THE FUNCTIONAL ASPECTS OF PUBLIC SECTOR HOUSING" in partial fulfilment of the requirement for the award of the Degree of MASTER OF ARCHITECTURE submitted in the Department of ARCHITECTURE AND PLANNING of the University is an authentic record of my own work carried out during a period from 1st Aug. 1994 to 31st Dec. 1994 under the supervision of SRI PRABHUBHAI K. PATEL.

The matter embodied in this thesis has not been submitted by me for the award of any other degree.



(Candidate's Signature)

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.



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10th Dec. 1994

  
VAJRAKUMAR B. MEHTA

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# CHAPTER - 1

## INTRODUCTION

## INTRODUCTION

In India, the population is increased rapidly, which demands urgent solution to the housing problem of urban cities.

The problems of housing has already assumed alarming proportions. Housing has been recognised as a national problem and is tackled by different agencies in their respective capacities like Central and State Government Departments, State Housing Boards, Local Authorities, Improvements Boards and Public Sector Undertakings.

After the independence, with rapid growth and trend in Industrialisation in the country many big industries were set up in both the sector public and private.

The growth of it today also is an unprecedented scale. The public sector undertakings also providing accommodation to its employees and participating in sharing the responsibility of solving housing problem at national level to its level and capability.

The most formidable problem, which the public sector faces in India is acute shortage of housing (quantitative). The other problem is qualitative. To solve the problem of shortage is a impossible task for the government with her resources in a short period. The author wishes to define only qualitative aspects of housing. In India, public

agencies construct and maintain a large number of quarters known as type design houses i.e. A, B, C and D type classified as per recommended plinth areas. Previous records of the public sector show that the construction of houses take much time than private sector houses. In public housing whether in Central or State Government, there are three separate operations, each house or building is designed by the Architect, the layout of the colony is prepared by the Town Planner, design structure and execution through engineers by contract system. In the private sector all the work is done in co-ordination except the production through contractors -or the individuals themselves by employing labour. The quality of the private sector housing is considered better than public housing is also a matter requiring assessment. (\*1,4)

### 1.1 IDENTIFICATION OF PROBLEM

Design of houses represent many physical and economic problem. The physical problems are as functionally the house is not efficient, for example house wife has to live in house throughout the day and husband has to go for duty regularly so house wife has to perform many activities during day time, she is engaged in some sort of house work i.e., cleaning, cooking and looking after the children. For all these activities, she always prefer easy access and easy space for movement. During holidays and night time the family come together and separates for different activities

i.e. formal and informal meals and entertaining friends etc. They also want to relax and rest. All these activities have impact on the space requirements, standards etc. All these aspects are related with each other. The occupant feels that his house is not properly designed after deeply considering the functional demand, so this is a matter or study for efficient designing.

A criterion of good design house is that it must provide inhabitants a proper environment for healthy growth, both from spiritual and physical point of view.

To provide inhabitants a proper environment for health growth is influenced by several factors, i.e. efficient design of sufficient size to meet the daily requirements of the households/families. These spaces are fixed in the public sector on the basis of their income range, perhaps without considering their social needs. Secondly, the rooms sizes are not based on the fundamental demands. Sometime the designer provides them two rooms and sometime three room etc.(\*8)

It is fact that more rooms are good, keeping privacy in view, but on the other hand, it creates a problem of furniture layout and instead of providing healthy environment it becomes untidy. For healthful housing good lighting and ventilation is desired and for thermal comfort orientation of houses require proper attention. All these

problems are related with physical requirements of human beings. 'Man is a social animal', he is always influenced by the external environment. Therefore, he always need open spaces around the house for sitting and for social gathering etc. May be parks and play ground etc. i.e. front and rear courtyards for sitting, sleeping in summer and drying clothes etc. In multistoreyed housing these amenities are provided in the shape of balcony, terrace etc. (\*2)

But still all these problems are not solved to the extent. Therefore, it is also a matter of concern. Another problem is of densities. It is said that the more dense areas create problems of overcrowding. It is also believed that 'high densities' are inherently evil and that of 'low densities' are inherently good.

The people, who live in certain areas or colonies wanted to live safely and always prefer easy approach to the market, school and offices etc. Sometime it is felt that due to heavy vehicular traffic is linking their houses and causes accidents or these facilities are quite away from their residences. So these types of problems also exist in housing areas, is a matter of examination for solving future problems.

Need for rational and scientific approach to planning/ design is most essential today. This objectivity in planning is particularly important in design of house which is one of the basic necessities of man. The Architect as a designer

needs to formulate his objectives based on functional requirements as given by user.

Now efforts are being made to meet the housing requirements, but the approach seems to be fragmented and not properly co-ordinated.

The genuine needs of the actual user are largely taken for granted (to be of stereo-type). Most often it appears that the Architect or the planner seems to be far away from the actual details of the aspect in concern. In fact, one should foresee the problems, one in the capacity of the concerned and design accordingly.

## 1.2 OBJECTIVE OF THE STUDY

Housing problems are numerous in type design housing as indentified in brief, which occupy a place of importance in the present setup of the public organisations. Keeping this in view and to fulfil objective, the study is oriented to critically analyse the undermentioned aspects, which if given due consideration, might be useful for the concerned organisation.

- To analyse type design houses (internal) to suggest suitable improvements in accommodation for healthy living.
- To analyse the functional aspects of various spaces of existing types of houses based on the user's view point.



- To bridge the communication gap between the designer and user.
- To suggest suitable and useful data in compiled form for use of future planning and designing.

### 1.3 SCOPE AND PROCEDURE OF THE STUDY

The study proposes to throw light on the possible reorientation of the present process of planning. The existing houses in public sector are evaluated with respect to functional services from the users point of view. This is done through a questionnaire which is suitable prepared to extract the necessary information from the present residents. [Appendix 2.1]

The questionnaire survey is done for the following two public sector housings :

- (1) B.H.E.L. Township Haridwar
- (2) Mathura Refinery Township

The analysis of the findings is done in the form of a information analysis table for each category [Appendix 2.2]. Then a study inference table summarising all the information analysis table is also prepared to give an overall picture [Appendix 2.3]. The same procedure is repeated for the second case study.

A summary of the general remarks of the residents is also projected. Based on the results of the analysis certain recommendations are made.

# CHAPTER - II

## PUBLIC SECTOR HOUSING

## PUBLIC SECTOR HOUSING

Public housing is implies to the dwelling that are owned by the Central, State and Local Government agencies or a public body. In common usage, the distinction between public and private housing has been defined in terms of dwelling, whose capital cost is financed by a Government agency or by a public body.

### 2.1 SOCIAL AND ECONOMIC OBLIGATIONS OF PUBLIC SECTOR

The public sector undertakings are no doubt enjoined to observe business on commercial principles but it is obvious that the profit motive can not be such on over-riding factor in their cases as it is in the private enterprises. It is also expected that the Government undertakings as a model employer should provide working and living conditions for their employees which may set an example to the private sector enterprises. The social infrastructure therefore created in the different undertakings had this objective in view.\*

Central Government projects play an important role in achieving the national objectives of economic and social development by balanced regional growth. They contribute substantially to the economy of the states in which they are

---

\* Editorial Lokodyog, August 1986.

located by creating employment opportunities, developing infra-structural facilities like roads, railways and power and setting up social amenities like hospitals, schools and recreational centres etc. Further, although investment decisions are primarily taken on technoeconomic considerations, the government has aimed at reducing regional imbalances to the extent feasible by a judicious location of projects. Over the five years plans, the government has deliberately directed new investments towards backward regions. Studying the availability of labour both skilled and unskilled, raw material, natural resources etc.

In constraints like above many of the projects have been started at new places or they are located at out of the way places. Therefore, as a part of the setting up of these projects considerable expenditure has been incurred by the concerned undertakings on the construction of system of townships including housing accommodation for employees with allied facilities like schools, hospitals, shopping centres, recreation (community) centres etc.

No doubt, investment on construction of townships to accommodate the employees of the public undertakings being very high adversely affects profitability of undertakings. The Bureau of Public Enterprises created in 1965 is the authority which is set with a view of achieve utmost economy in this regard.

## 2.2 STAFF STRENGTH AND HOUSING PROVISION

The total number of public undertakings upto 31st March 1986 is 176 and the total staff strength serving the public undertaking is estimated to be about 30 lacs. Various undertakings they have constructed townships for their employees. The total number of houses is about 4.75 lacs. It means the housing provision for the employees under public sector is only 15.83%. As such considering 55% housing provision for its employees the present housing stock should be 16.5 lacs. So in present situation the housing backlog for the employees of public sector is around 11 lacs houses. The following statement shows some of the enterprises with their staff strength and the present housing stock for their staff under different groups.

The study of townships constructed by the various public sector undertakings has revealed that they vary in size from small colonies with less than 100 houses to large townships having more than 15,000 houses. The distribution of townships according to sizes is as follows :

S.No.	No. of Houses	Population	To. of Township	Percentage to total
1.	Less than 1000	Less than 5000	152	77.5%
2.	1000 to 3000	5000 to 15000	27	13.8%
3.	3000 to 12000	15000 to 60000	10	5.1%
4.	12000 and above	60000 and above	7	3.6%

Source : Journal of the National Building Organisation and UN Regional Housing Centre ESCAP Vol. XXI, No. 1, April 1984.

**STAFF STRENGTH AND HOUSING PROVISION**

S.No.	Name of Enterprise	Total No. of employees as on 31.3.1987	Total No. of houses as on 31.3.1987	%
1.	Steel Authority of India Ltd.	170928	103273	60.41
2.	Hindustan Copper Ltd.	23664	9379	39.63
3.	Manganese Ore India Ltd.	12636	4773	37.80
4.	Western Coal Fields Ltd.	121258	16003	13.19
5.	Bharat Cooking Coal Ltd.	167090	51000	0.52
6.	Hindustan Petroleum Corp. Ltd.	14858	664	4.46
7.	Indian Oil Corporation Ltd.	18592	5817	31.28
8.	Indian Drugs and Pharmaceuticals Ltd.	9596	3444	35.88
9.	Bharat Heavy Electricals Ltd.	62970	24856	39.47
10.	Bharat Electronics Ltd.	16644	1428	8.57
11.	Hindustan Machine Tools Ltd.	23237	4018	17.29
12.	Bharat Earth Moves Ltd.	11306	1400	12.29
13.	Minerals and Metals Trading Corp. of India Ltd.	2554	541	18.31
14.	Indian Airlines	16039	1411	8.79
15.	Hindustan Prefab Ltd.	1873	115	6.13

\* Source : Government of India, Public Enterprises Survey, 1986-87  
Vol. I, Ministry of Finance  
New Delhi

# Figures include number of houses under construction also.

There are various agencies to construct type design houses. Following are few of them.

### **2.3 CENTRAL PUBLIC WORKS DEPARTMENT, NEW DELHI (C.P.W.D.)**

The Central Public Works Department is the agency of Central Government operating throughout the country for construction maintenance and repairs of all works and buildings financed from civil works budget, including sending and purchase of buildings.

#### **2.3.1 Functions**

Apart from other works, this department also undertakes construction of type design houses for the employees of Central Government, i.e. various ministries and their subordinate organisation. Maintenance of such houses is also done by the C.P.W.D.

### **2.4 LOCAL DEVELOPMENT AUTHORITY**

Development authority is constituted of members with Chairman and other members like Councillors of Municipal Corporation, and engineer members, one finance and accounts memebrrs an office on special duty and one administrative officer.

#### **2.4.1 Functions**

- Preparation of Master Plan and Zonal Development Plans.
- Development and disposal of land, houses, including control on other building operations in area declared as developed areas.
- Screening of proposed plans of houses.

# CHAPTER - III

## HOUSING STANDARDS



## HOUSING STANDARDS

The Government of India and other similar agencies provides housing accommodation to its employees in view of the scarcity in private sector of proper houses within the rent paying capacity of the employees. Considering this Government accomodation is allotted to the employees on the basis of duration of service and pay of the employees. There are various standards prevailing in public agencies, which is a matter of concern and for good living conditions. minimum standard may fulfil the housing situation, but not socially acceptable. Following are some of the Government Agencies who laydown standards for public sector housing.

### 3.1 BUREAU OF PUBLIC ENTERPRISES (\*10)

In race of industrialisation many new projects came up in both public and private sector during post independence period. The growth and magnitude of public sector in sense of investment is on townships and construction of houses and amenities in advance commented upon by parliamentary committee on public undertakings.

While agreeing that the public enterprises as model employer should provide adequate housing and other community facilities for their employees, particularly in cases of projects located in out of the way places, the committee felt that much available expenditure had been incurred and desired that government should laydown norms and guidelines

in this regard. So the Bureau of public enterprises was setup by Government of India in April 1965 under the Ministry of Finance to act as a service, co-ordination and evaluation agency for the public sector undertakings. One of the main functions assigned to Bureau of Public Enterprises is to cross examine the question of construction of costs which in many cases account for quite a substantial portion of the total capital cost of public sector undertaking.

It has since taken several measures and issued necessary norms and guidelines to effect uniformity in standards and ensure at most economy in the cost of townships of undertakings. The norms and standards are issued different aspects like provision of housing, types and scales of accommodation, space and density standards etc.

### 3.1.1 Building Standards for Residential Buildings and Scales for Built-in Amenities

S. No.	Item	Standard				Remarks
		Type A	Type B	Type C	Type D	
1.	2.	3.	4.	5.	6.	7.
1.	Plinth area per unit (excluding staircase)	36 sqm	56 sqm	84 sqm	139 sqm +19 sqm servants +18 sqm garage	1. Normal ceiling height may be kept at 2.75 m as per provisions of National Building Code

1.	2.	3.	4.	5.	6.	7.
----	----	----	----	----	----	----

2. These plinth areas correspond to a standard brick size of 9"x4½"x3" (nominal), where the brick size is large (10") or where thicker walls are adopted additional plinth area as below may be provided.

	Type A&B	Type C&D
10" thick wall	4%	2%
13½" thick wall	9%	5%

2. External circulation area (staircase and landings) for two or more storeyed construction	5 sqm	5 sqm	5 sqm	6 sqm
---	-------	-------	-------	-------

3. Maximum permissible additional area for sleeping out balconies	5.6sqm	5.6sqm	7.8sqm	9.9sqm
---	--------	--------	--------	--------

1. Sleeping out balconies to be provided only in higher than two storeyed quarter at such places where due to climatic conditions people sleep outside in summer

2. Where sleeping out balconies are provided, staircase need not be taken upto roof, a trap door in the roof slab and a steel ladder may be provided.

1.	2.	3.	4.	5.	6.	7.
4.	Maximum permissible additional area for sitting out balconies	2.8 sqm	2.8 sqm	3.9sqm	4.45sqm	Sitting out balconies to be provided only in those building which have two or more storeys and which do not have sleeping out balconies.
5.	(a) Scooter shed (b) Cycle sheds	-	4.2 sqm	4.2sqm	-	Scooter/cycle sheds to be provided only in buildings which have three or more storeys. They are not to be provided at Bombay and Calcutta.

B. Scales for built in amenities

1.	Built-in-cup boards with shutters in bedroom (one in each bedroom)	1	2	2	3	Open shelves for storage to be provided in living rooms and kitchens & a loft for additional storage may also be provided at suitable location.
----	--	---	---	---	---	---

C. Sanitary fittings

1.	Indian Type W.C.	1	1	1	1+1	(Servant's)
2.	European Type W.C.	-	-	-	1	
3.	Wash hand basin with mirror, glass shelf and towel rail	-	1	1	2	

1.	2.	3.	4.	5.	6.	7.
4.	Sink with draining board	1	1	1	1	
5.	Taps in kitchen bath and W.C.	3	3	4	5+2	(In servant quarter)
6.	Shower	1	1	1	2	
D Electrical Installations						
1.	Fans	2	3	4	5	Surface wiring to be provided Electrical Insalaltion
2.	Light points	6	8	10	18	
3.	Light power plugs	3	4	7	10	

Source : B.P.E. Vol. II, Published by Ministry of Industry.

### 3.2 CENTRAL PUBLIC WORKS DEPARTMENT (C.P.W.D.) (\*12)

The Government of India and other similar agencies such as C.P.W.D. and N.B.O. provides housing accommodation to its employees in view of the scarcity in private sector of proper houses within the rent paying capacity of the employees. Considering this Government accommodation is allotted to the employees on the basis of duration of service and pay of the employees. Following are the norms and guidelines layed by C.P.W.D. for public sector housing.

### 3.2.1 Classification of Residential Accommodation (Typewise)

Type	Area		Staricase		Sleeping Bal.		Cycleshed/ Scootershed		Remarks
	Sqm	Sft.	Sqm	Sft	Sqm	Sft	Sqm	Sft	
I	34.00	365	5.0	54	7.5	80	2.50	27.00	Cycle shed 100
II	45.00	484	5.0	54	7.45	80	2.50	27.00	-do-
III	55.75	600	5.0	54	7.45	80	4.20	45.00	Scooter shed
IV	83.60	900	5.5	59	7.80	84	4.20	45.00	-do- 100%
V	139.35	1500	6.0	65	9.85	106	18.00	194.00	75% Garrage

Note : These area standards shall be applicable to the construction of residential accommodation in all places in India.

### 3.2.2 Space Accommodation and Amenities

Broadly accommodation in every sector is normally similar. N.D.M.C. has not built any composite type construction and has not stipulated any demarcation for fixed plinth area. However, the accommodations provided by C.P.W.D. are laid for general information and reference. These buildings are :

Double storeyed, four storeyed and composite type constructed in Type II, III and IV accommodation and facilities in these flats differ according to the design and type of flat.

Irrespective of the type of flat and design of building, each flat has essential facilities like kitchen, bath, W.C. and water tap in bath, kitchen and W.C. etc. and electric fittings in rooms, fans and electric points.

Accommodation provided in flat is given below :

Type I :

- |      |                               |   |  |
|------|-------------------------------|---|--|
| I.   | Single storeyed<br>(old type) | - | Two rooms, a verandah and courtyard etc.   |
| II.  | Double storeyed               | - | A room, a kitchen, with separate W.C. and bath and common bath and W.C. for two allottees. |
| III. | Four storeyed                 | - | Two rooms, a balcony with services.  |

Type II :

- |      |                 |   |  |
|------|-----------------|---|--|
| I.   | Double storeyed | - | Two rooms, a verandah, a balcony.                    |
| II.  | Four storeyed.  | - | Two rooms (bed), a living room, a projected balcony. |
| III. | Composite type  | - | Two rooms, a verandah, a small terrace.              |

Type III :

- |     |                 |   |   |
|-----|-----------------|---|---|
| I.  | Double storeyed | - | Two rooms, 3 small store room, a verandah, a balcony. |
| II. | Four storeyed   | - | Two bed rooms, a living                               |

- room, a looby (generally used as dining), a projected balcony, a small box room.
- III. Composite type - Two rooms, a verandah, a big terrace.

Type IV :

- I. Double storeyed - Three rooms, a store, a verandah, a balcony.
- II. Four storeyed - (a) Three bed rooms, a living room, a dining room, a projected balcony.
- (b) Three bed rooms, a living room, a store room, a lobby (generally used as dining room), a projected balcony.

---

Source : CPWD Manual Vol. I & II, (192 Edition).

Composite types : Type IV on ground floor, type III on first floor, type II on second and third floor.

### 3.2.3 Housing Standards

A house is defined as inhabited space, including all the installation necessary from technical and social point of view. As the problem of housing concerns low-income sector of population minimum requirements in relation with local conditions should be defined in terms of economy and



liability. However, there should a balanced line below which the standards must not be allowed to lowered and should also fulfil the basic needs of the household at all levels of housing from qualitative as well quantitative point of view.

There are various standards prevailing in public agencies, which is a matter of concern and for good living condition minimum standard may fulfil the housing situation, but not socially acceptable.

#### **3.2.4 Recommendations of Expert Committee**

The summary of the recommendations of the expert committee on low-cost housing appointed by Government of India is as follows :

- Two living rooms
- Kitchen with store
- Bath
- W.C.
- Verandah
- Courtyard (single storeyed)

#### **3.2.5 Minimum Standards**

- I. One room of area not less than 12 sqm.
- II. Another room or an enclosed verandah of an area of 8 to 10 sqm.
- III. A sperate kitchen with built in cupboard and shelves of area not less than 6 sqm.
- IV. A bath room of area not less than 2 sqm.

# CHAPTER - IV

## FUNCTIONAL SPACE ANALYSIS

## FUNCTIONAL SPACES ANALYSIS

Efficient design of home and layouts is related with analysis of activities. Activities are those generally performed in house and functional design fulfils maximum satisfaction.

### 4.1 ACTIVITIES AND SPACE ANALYSIS(\*5,6)

The nature of domestic activities vary from region to region and country to country. These are guided by the living habits, social customs, cultural values and technological advancement and economic advancement of the occupants. Although a reasonable diversity is noticeable in this country too, in the patterns of these activities, a good deal of accord prevails in this basic range. Only mode of performance varies according to heritage. The low and average income group families with conservative attitude, where as in the families of higher economic status raised platform is used for cooking and dining table for eating. In India, both the extremes exist. Therefore, in this study, there is a wide spectrum for possible variations.

#### 4.1.1 Living Activities

The living activities have been covered under the following groups.

- \* Personal care - Use of W.C., wash basin, bath and informal dressing.

- \* Food cooking - Pre-cooking, cooking and cleaning.
- \* Eating - Sewing, eating activity formal and informal.
- \* Leisure & living - Chitchatting, playing cards, light reading, children playing and entertaining visitors etc.
- \* Resting & sleeping - Relaxing, sleeping, conjugal life.

Apart from this, various miscellaneous types of activities are sewing ironing, exercising etc. All these activities whether in rooms or kitchen are also related with sequence of performances. Space requirements related to anthropometric dimensions for effective planning.

For this anthropometric dimensions are given as recommended by C.B.R.I. in plates for the judgement, when and where tight spots show up in the course of working up a plan.

#### 4.1.2 Space Requirements

In order to work out the space requirements, the grouping of activities is essential. Each activity is performed by certain persons wherein some equipment and furniture is also associated. The space requirements based on the functional needs once arrive at can form basis of

further studies. Cooking and eating spaces can also be combined with alternative system of cooking and eating.

The analysis of activities is related with furniture sizes and types of dimensions.

1. Furniture
2. Dimensions between furniture layout in relation to family members.

For assessing any plan, the requirements of furniture required in a house is a matter of judgement.

The furniture requirement is worked out in the plates roomwise for assessing the functional space, requirements and further analysis housing plans in relation to furniture sizes as per anthropometric dimensions.

The furniture sizes are shown in the plate are based on the data provided for spaces in home, published by the Department of Environment, London.

#### **4.1.3 Analysis of Plans**

To determine whether plans are satisfactory they need to be analysed in details. It is usually basic allocation of spaces which determines, whether youngster can do his home work in peace, whether small children at work can be kept under observation, or whether looking after someone, who is ill in bed is difficult or reasonably easy.

In a house with larger area it is easier for the Architect to satisfy the householder's needs in terms of performances with less overlapping in uses of space, but in lesser area as in type design, it is difficult to satisfy the people.

The broad lines of analysis are given below :

- (1) The extent the space accommodate the required furniture in a sensible arrangement, leaving sufficient space of movement, open doors and windows efficiently and economically.
- (2) The efficient of circulation space, i.e., approaching from bed rooms to bath rooms, W.C. without going through other rooms, least use of leaving room as passage. Relationship of house wife with living area (4.3).
- (3) The extent to which activities need privacy and quiet.
- (4) The convenience of entering and leaving in relation to callers, i.e., sufficient room at the entrance to receive visitors, etc.

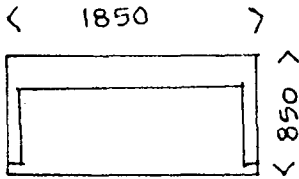
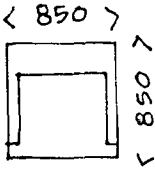
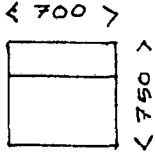
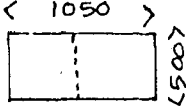
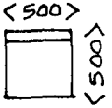
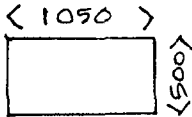

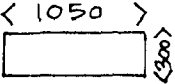
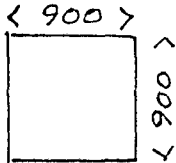
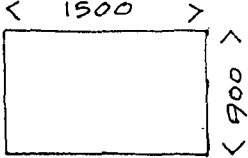

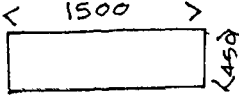
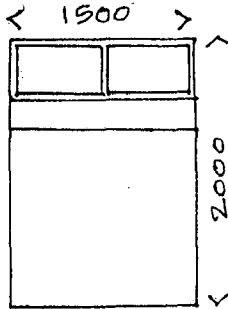
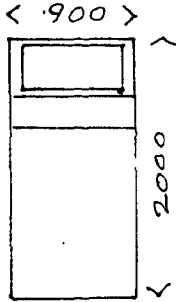
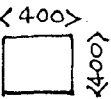
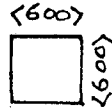
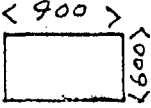
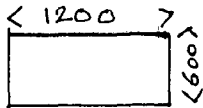
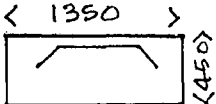
**SCHEDULE OF FURNITURE ASSUMED FOR ASSESSING PLANS**

1.	<b>KITCHEN</b>	A small cooking table unless one is built in sink or washing place	5.	<b>STUDY BED ROOMS</b>	Plus Desk Chair Book Case
2.	<b>DINING SPACE</b>	Dining table and chairs	6.	<b>MAIN BED ROOMS</b>	Double or two single beds beside tables chest of drawers double wardrobe dressing table
3.	<b>LIVING SPACE</b>	A settee 2 or 3 easy chairs small table, a TV set	7.	<b>CABIN SINGLE</b>	Bed or divan clothes storage chair small working surface
		Reasonable space for sewing			
		Book case etc.			
4.	<b>BED ROOM SINGLE</b>	Bed or divan beside table clothes storage			
		* Built in wardrobe			
		* Chest of drawers			
		* Storage for personal possessions			

Homes for today and tomorrow points out that in order to ensure that a room is efficient and enjoyable to live in, the furniture must not only fit into the in a sensible way. But must leave sufficient space to make the convenient and comfortable to use it is possible that living space may need additional items such as extra chairs, side boards etc.

SOURCE : BASED ON RECOMMENDATION MADE IN SPACES IN HOME, PUBLISHED BY DEPARTMENT OF ENVIRONMENT, LONDON.

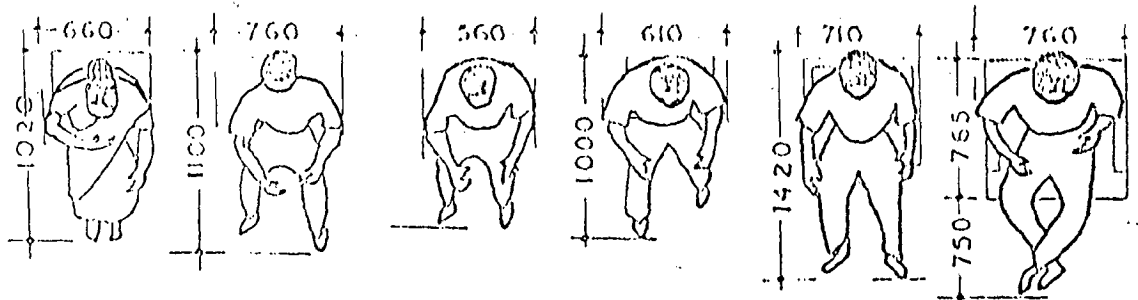
FURNITURE SIZES

1.	3-SEATER SETTEE		
2.	ARMCHAIR		
	EASY CHAIR		
	DESK		
	DESK CHAIR		
4.	RECT. COFFEE TABLE		
	ROUND C. TABLE		
8.	BOOK CASE		
9.	DINING TABLE FOR 4		
10.	DINING TABLE FOR 6		
11.	DINING CHAIR		
12.	SIDEBOARD		
13.	DOUBLE BED		
14.	SINGLE BED		
15.	BEDSIDE TABLE		
16.	WARDROBE - 600 M.M.		
17.	WARDROBE - 900 M.M.		
18.	WARDROBE - 1200 M.M.		
19.	DRESSING TABLE		

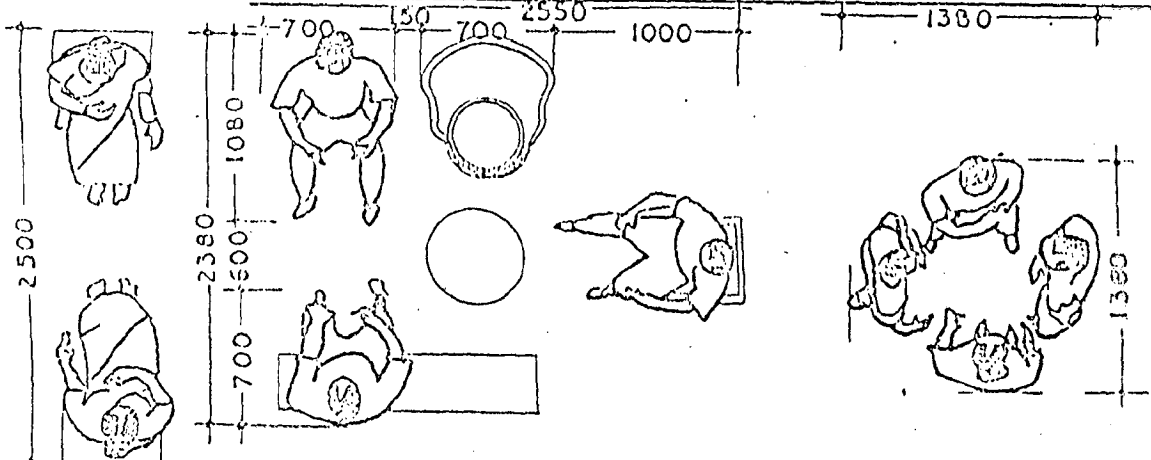
SOURCE : SPACES IN HOME DEPARTMENT OF ENVIRONMENT LONDON



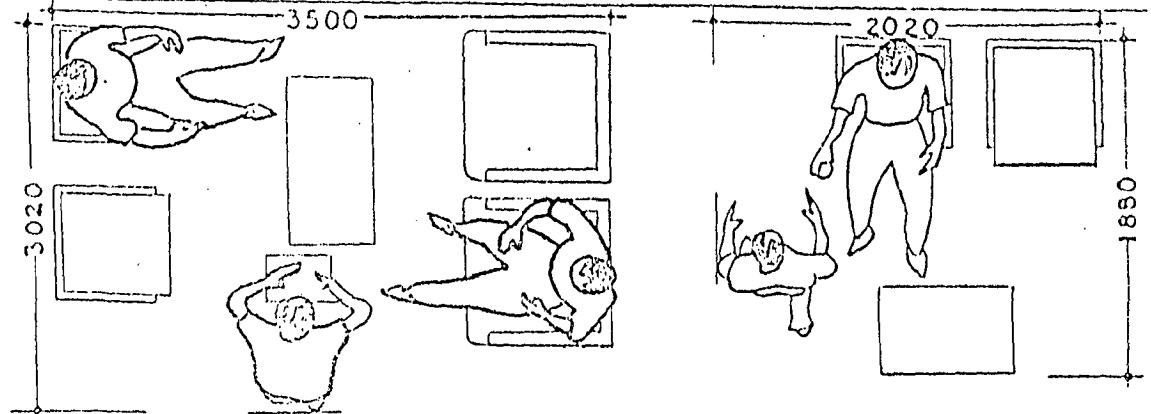
# ANTHROPOMETRIC STUDIES LEISURE & LIVING



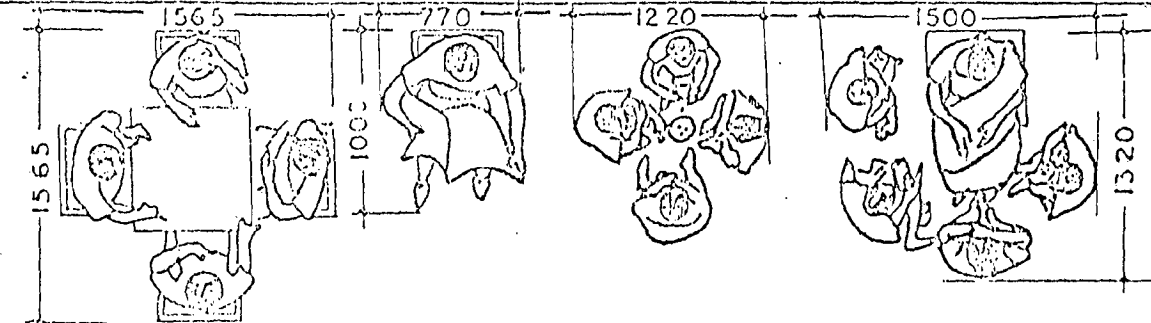
SITTING ON - PIRHI 1. -MURRAH 2. -PUFF 3. -OFFICE CHAIR 4.-CHAIR 5. -SOFA CHAIR 6.



OPPOSITE 7. INFORMAL 8. 9. CHIT-CHATTING SO.



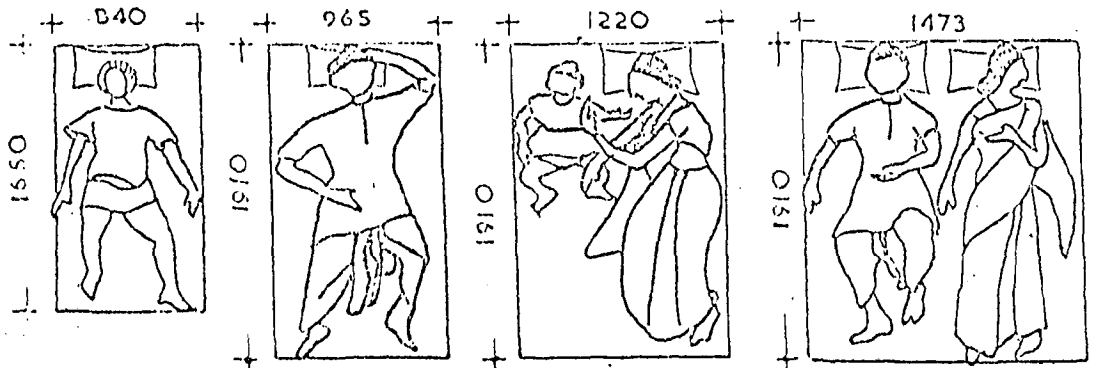
FORMAL 10. II. INFORMAL



12. PLAYING CARDS 13. LIGHT READING. 14. CHILDREN-PLAYING 15. STORY TELLING

Source : C.B.R.I. - Housing & Planning Section.

# ANTHROPOMETRIC STUDIES RESTING & SLEEPING



1. GROWN UP

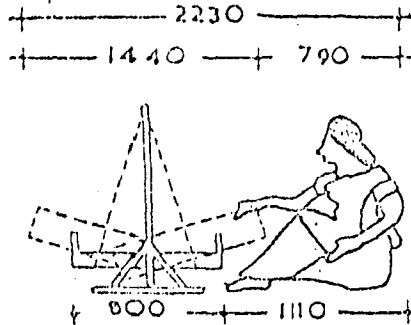
2. ADULT

3. CHILD & ADULT

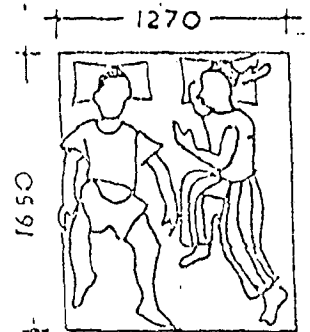
4. TWO ADULTS



5. INFANT



6. INFANT IN CRADLE



7. GROWN UPS

560 + 915

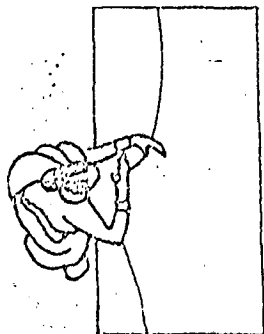
+ 915

+ 915

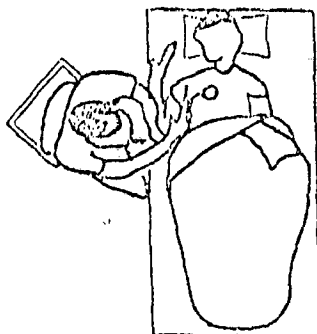
+ 560 + 915

+ 610 + 510

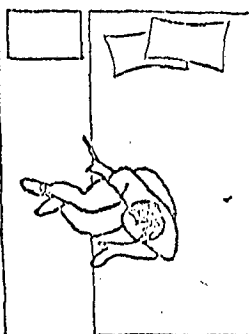
+



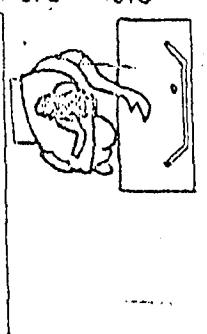
8. MAKING BED



9. DOCTOR-ATTENDING



10. LEAVING BED



11. DRESSING

560 +

1525

+ 610

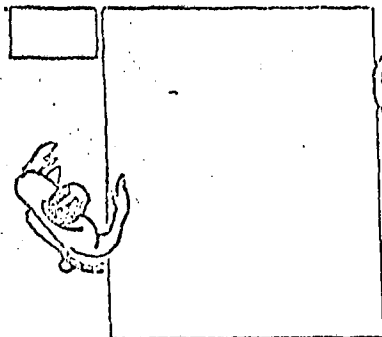
+ 560

+ 915

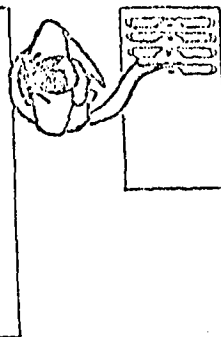
+ 610

+ 650

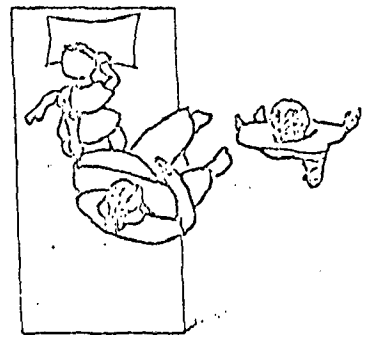
+



12. APPROACHING BED

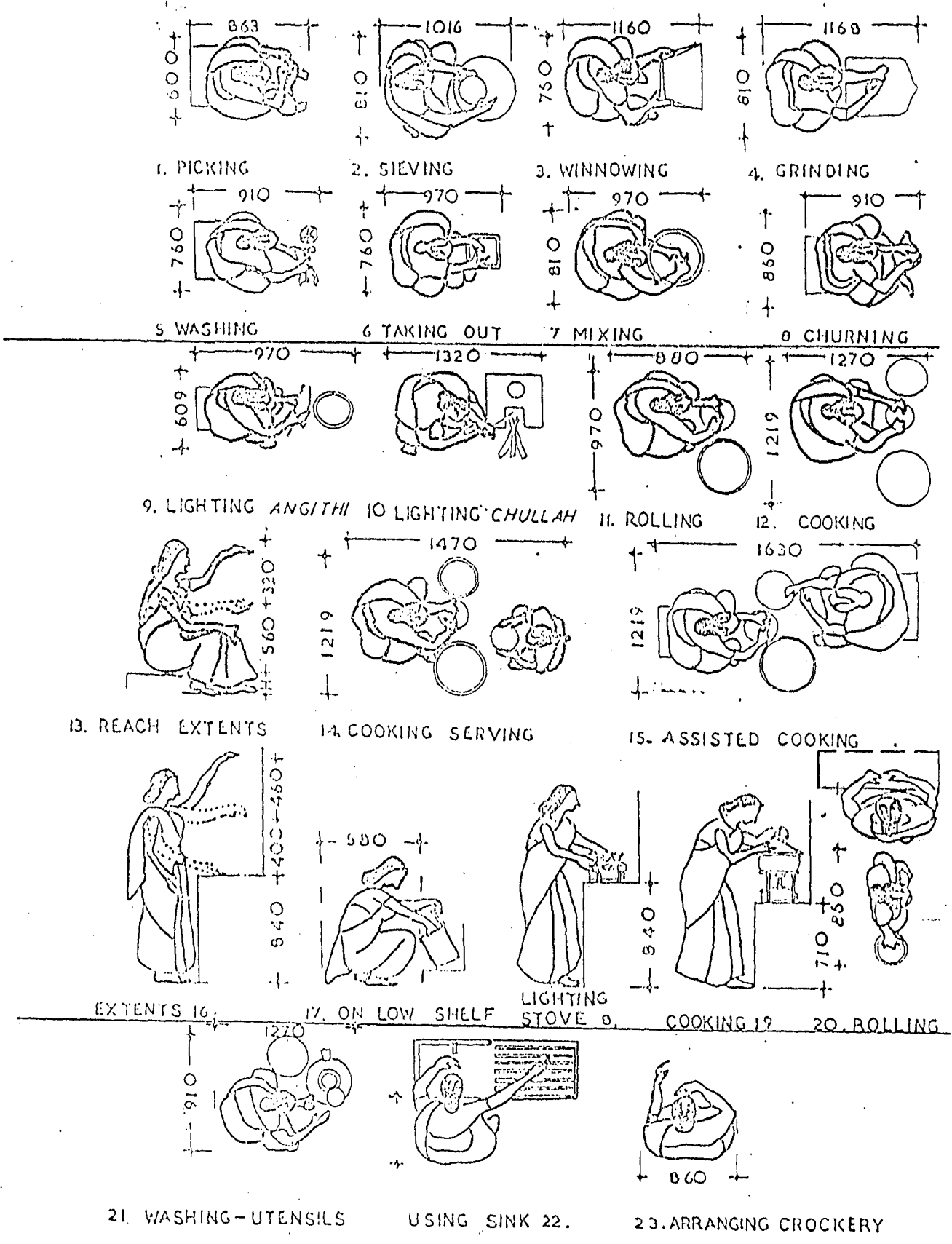


13. USING -CUPBOARD

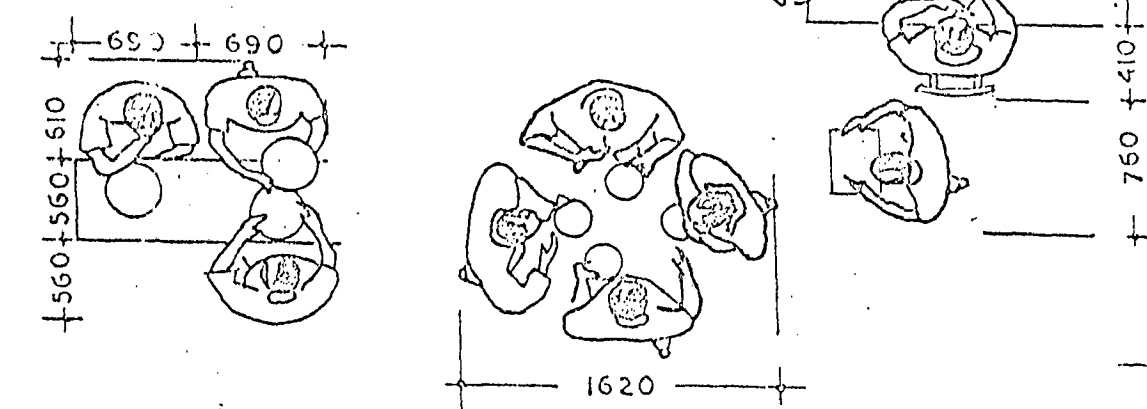
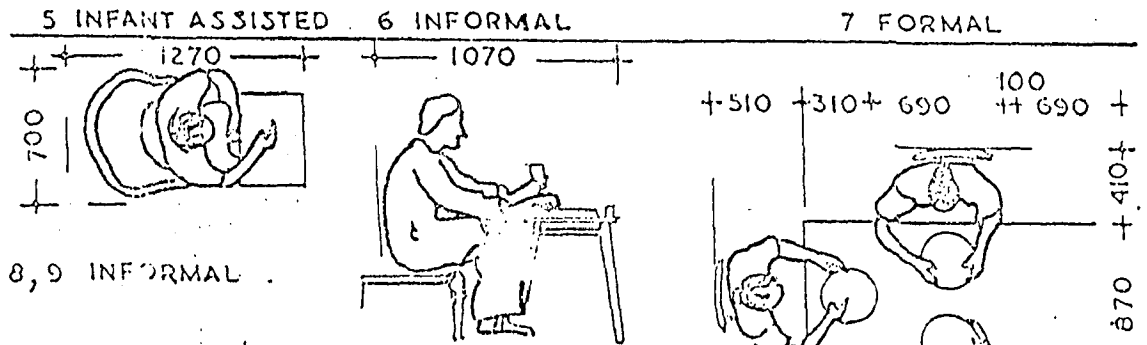
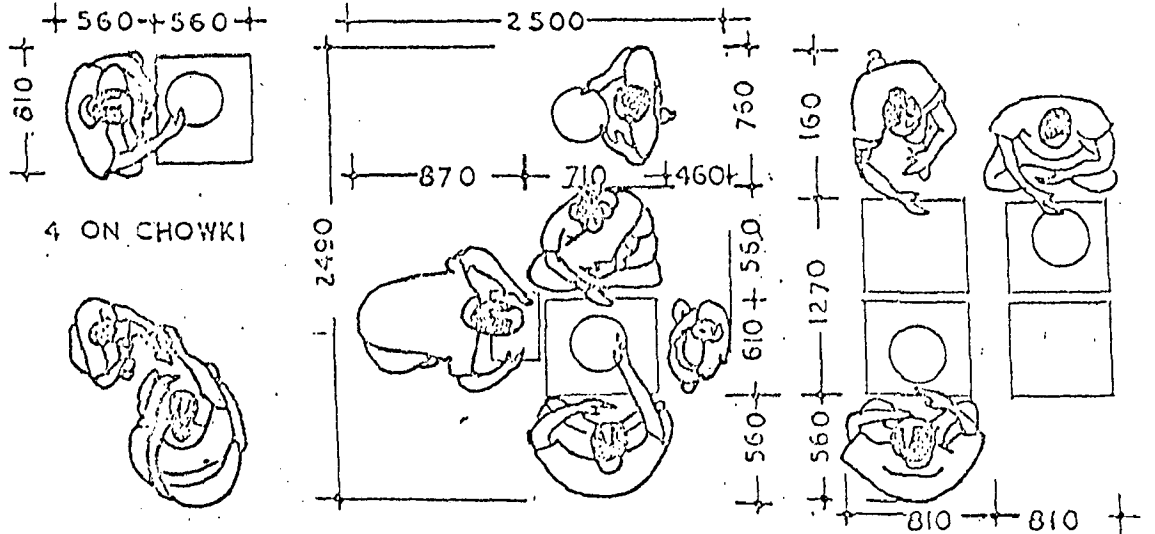
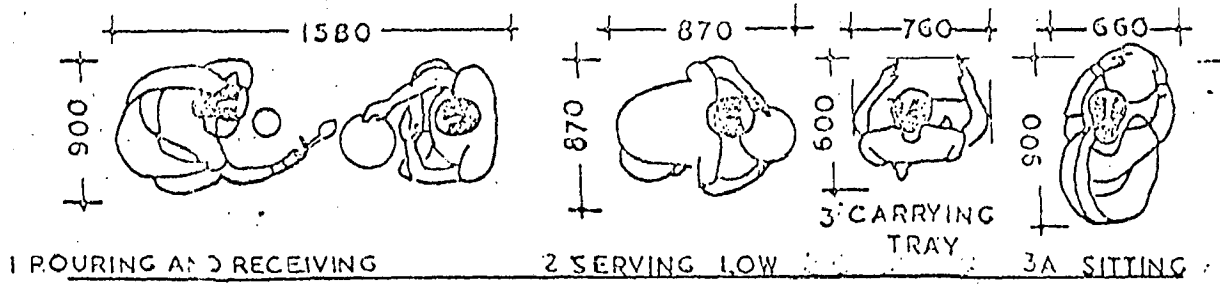


14. COMFORTING CHILD

# ANTHROPOMETRIC STUDIES FOOD PREPARATION



# ANTHROPOMETRIC STUDIES SERVING AND EATING

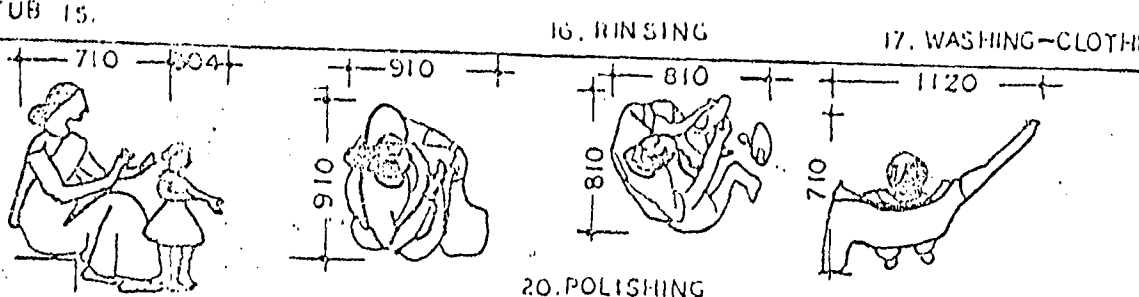
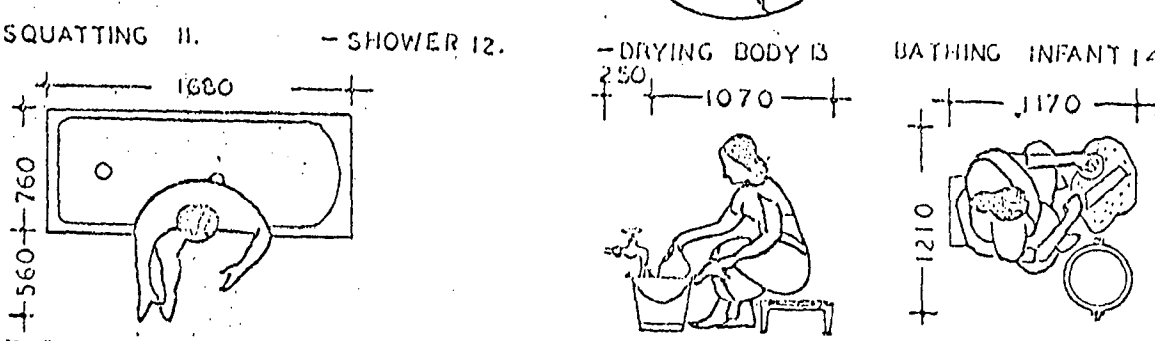
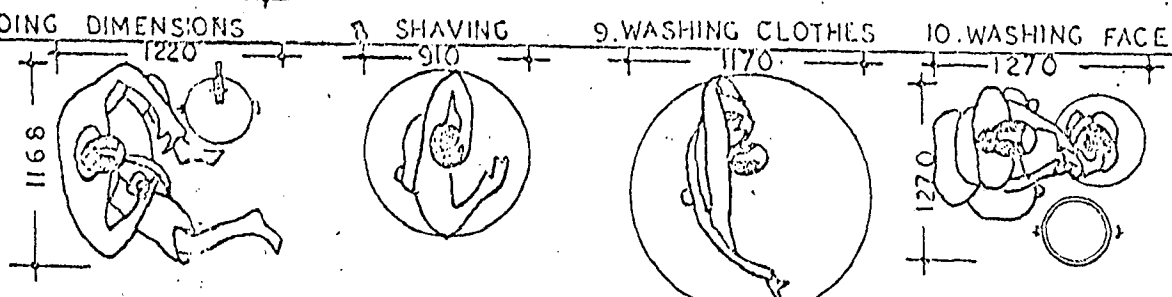
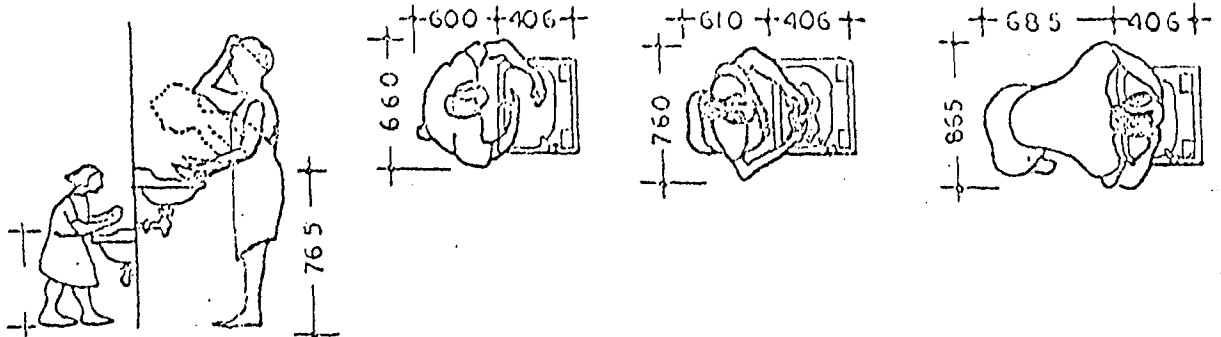
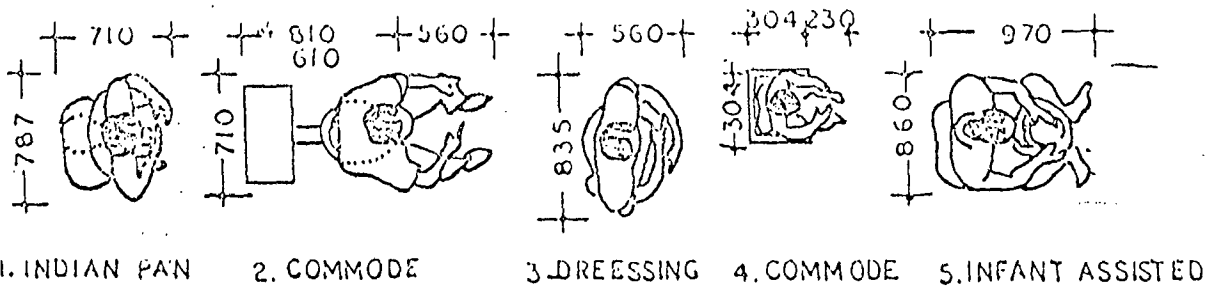


10 INFORMAL

11 BUFFET  
30

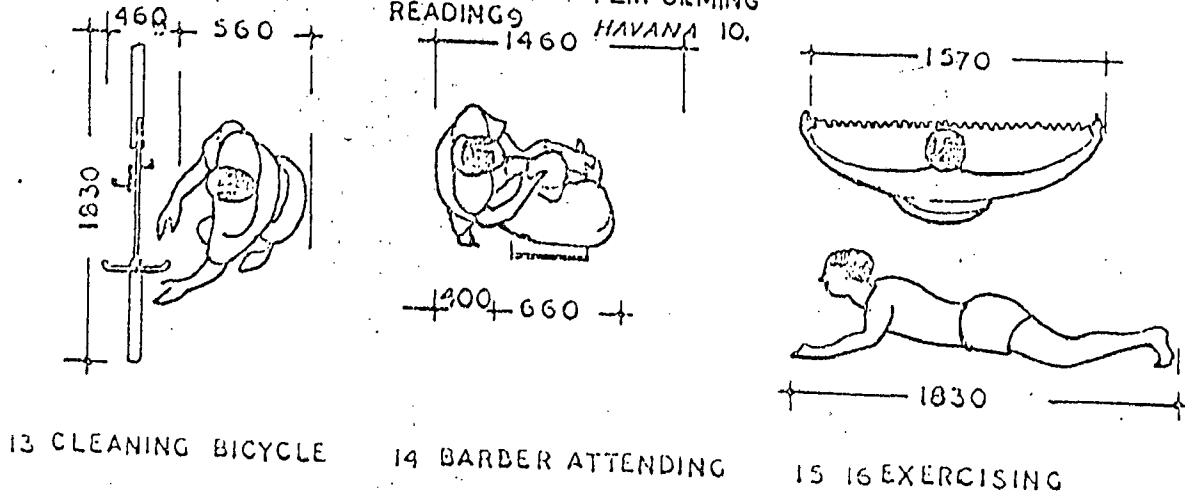
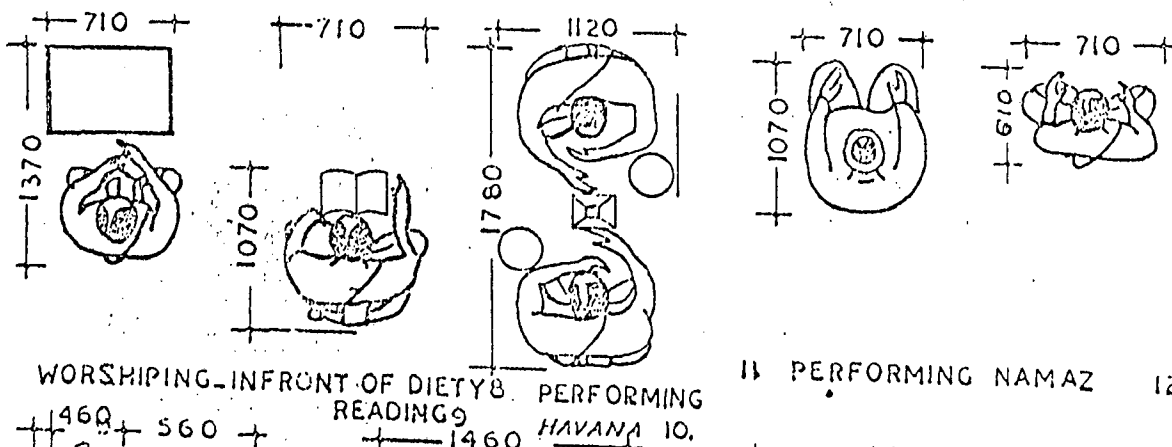
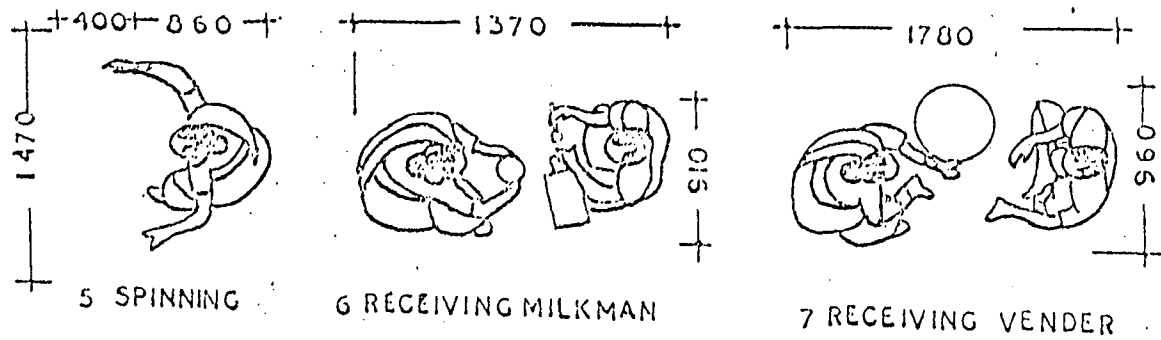
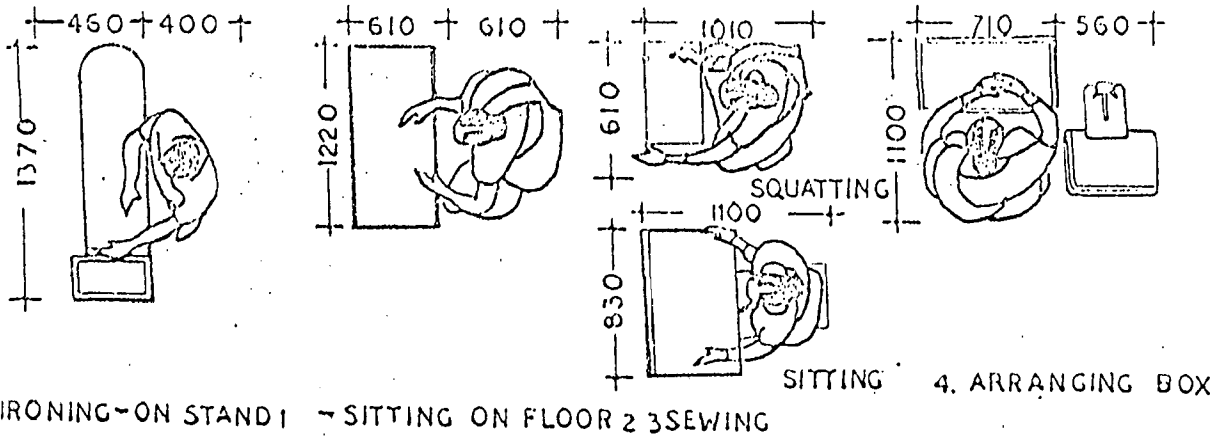
12 FORMAL

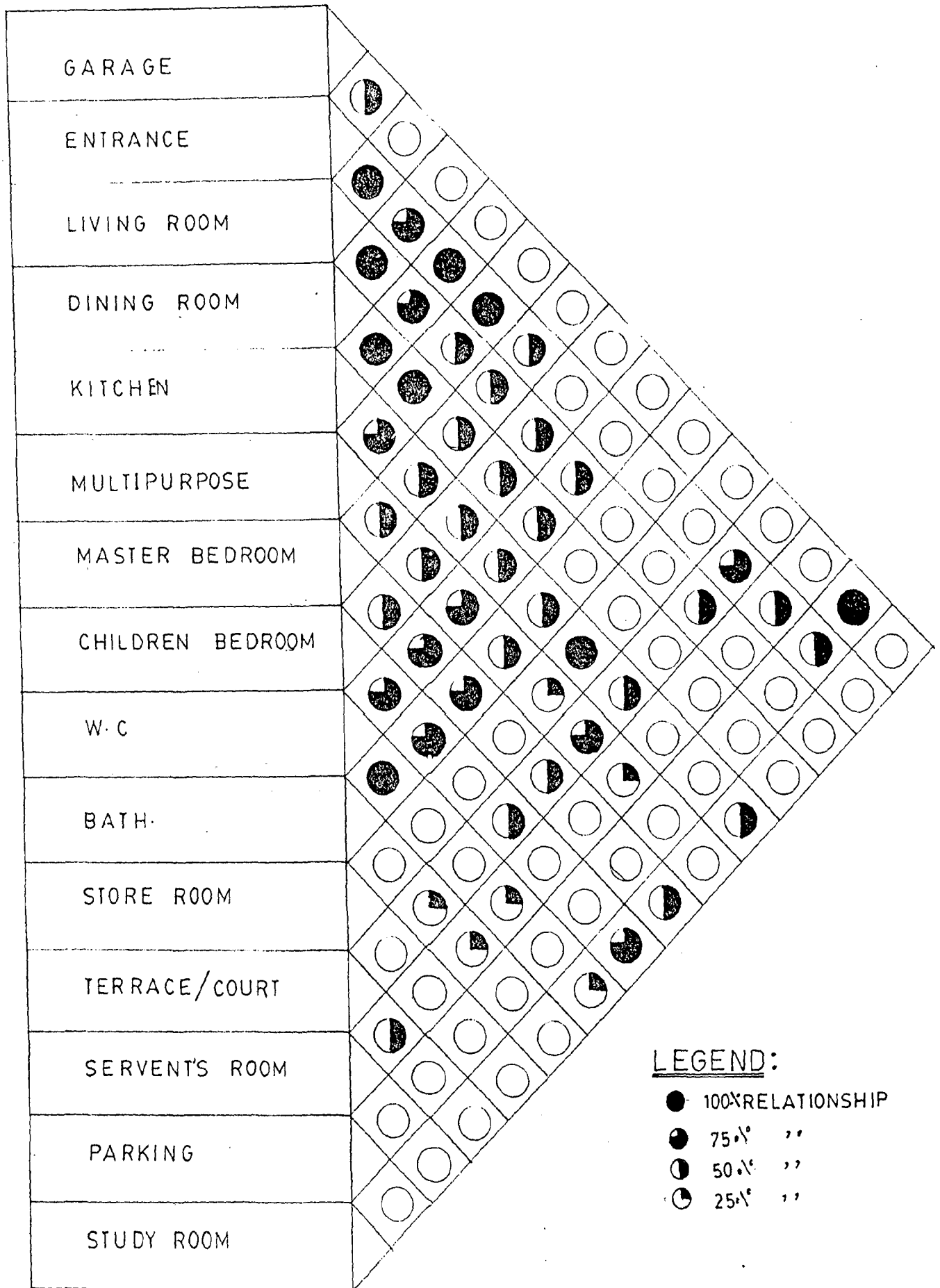
# ANTHROPOMETRIC STUDIES PERSONAL CARE



18. DRESSING - BABY      19. PUTTING ON - SARI      20. POLISHING      21. PUTTING - COAT

ANTHROPOMETRIC STUDIES AUXILIARY & MISCELLANY





4.2 INTER-RELATIONSHIP DIAGRAM OF SPACES

	HUSBAND	WIFE	CHILDREN	GUESTS	SERVANT	DRIVER	WASHER WOMAN	SWEEPER	NEW'S PAPER WALA	MILK WALA	POSTMAN	GAS WALA	DHOBI	GARDNER	MAINTAINENCE MAN	SUPERVISOR	MANAGER	CHOWKIDAR	BARTAN WALI	
GARAGE	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
ENTRANCE	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
LIVING ROOM	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
DINING ROOM	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
KITCHEN	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
MULTYPURPOSE	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
MASTER BEDROOM	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
CHILDREN BED-R.	○	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
W. C	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
BATH	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
STORE ROOM	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
TERRACE/ COURT	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
SERVANT'S ROOM	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
PARKING	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
STUDY ROOM	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

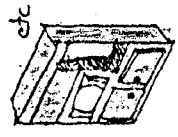


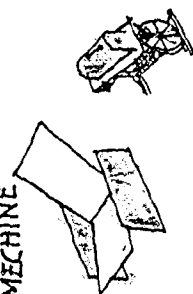
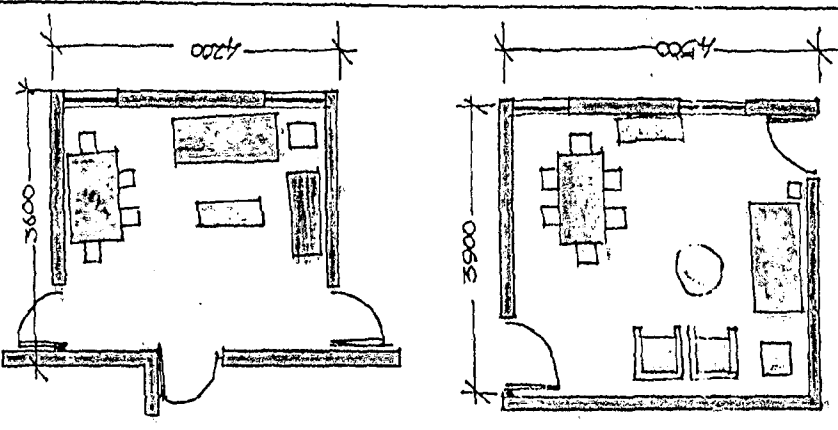
4.3 SPACE - USERS RELATION DIAGRAM

LEGEND:

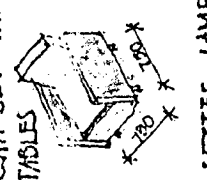
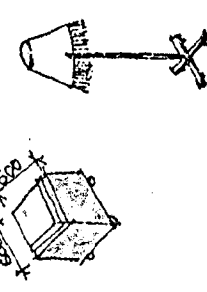
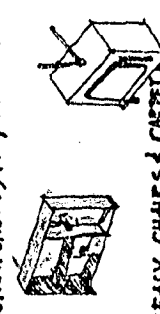
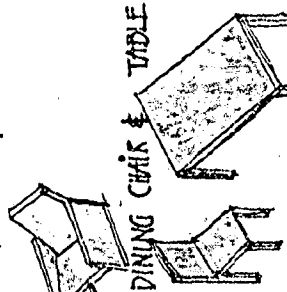
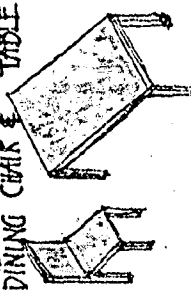
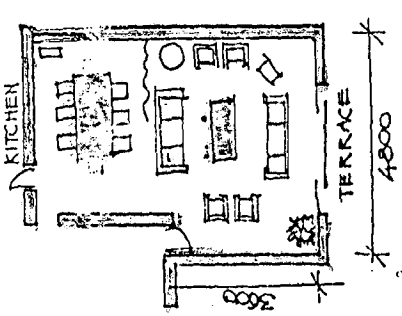
- 100% RELATIONSHIP
- ◐ 75%
- ◑ 50%
- 25%



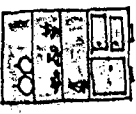
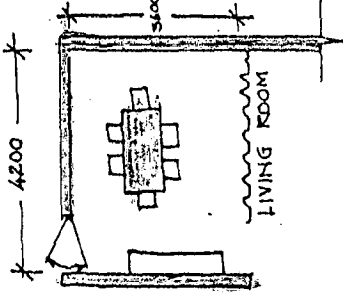
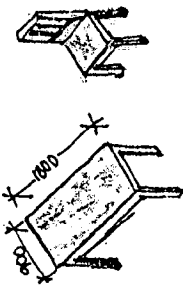
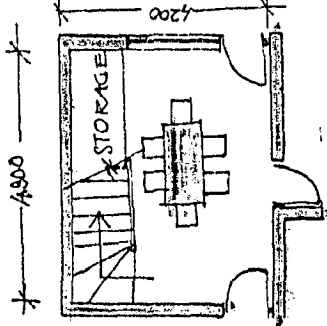
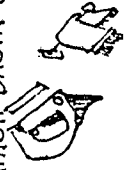



ACTIVITIES	ACCESSORIES	LAYOUT POSSIBILITIES	AREA	ENTRANCE KIT. FORMAL LIVING INFORMAL LIVING DIP ROOM TOI. TERRACE.
<p>1. FAMILY LIVING, RELAXING, SLEEPING, WATCHING TV, FAMILY MEALS/ SNACKS.</p> <p>2. HOBBIES, SEWING, KNITTING, IRONING CLOTHES DRYING, CLOTHES ON RAINY DAYS.</p> <p>3. CUTTING OF FRESH VEGETABLES, CLEANING OF DAL'S, RICE,</p> <p>4. INDOOR GAMES- CARDS, CHESS, WORD-BUILDING, RUBIK'S CUBE LISTENING TO MUSIC.</p> <p>5. CARE OF INFANT FEEDING etc.</p> <p>6. CIRCULATION.</p>	<p>1. SIDE BOARD/CABINET FOR TV, MUSIC SYSTEM, BOOKS, GAMES, etc.</p>  <p>2. TABLE, CHAIRS, MORA, CHATTAI, etc.</p>  <p>3. REFRIGERATOR, COOLER.</p>  <p>4. EASY CHAIRS, SEWING MACHINE</p> 		<p>15.00 M<sup>2</sup></p>	

INFORMAL LIVING SPACE ANALYSIS.

ACTIVITIES	ACCESSORIES	LAYOUT POSSIBILITIES	AREA	ENTRANCE	KIT	DINING	FORMAL LIVING	BED ROOM	TOILET	TERRACE
1. GREETING EACH OTHER, RECEIVING GUESTS, VISITING & CONVERSATION.	1. SOFA SET WITH SIDE & FRONT TABLES  2. SETTEE, LAMP SHADE  3. SHOWCASES, TV, MUSIC SYSTEM  4. EASY CHAIRS & COFFEE TABLE  5. DINING CHAIR & TABLE 		15.0m <sup>2</sup>							
2. OFFERING DRINKS & LIGHT REFRESHMENTS.										
3. DISPLAY OF POTTED PLANTS, PAINTINGS, HANDICRAFTS, SOUVENIERS, BOOKS, etc.										
4. RECREATION & ENTERTAINMENT OF GAMES - VIDEO GAMES, PHOTOGRAPHS, RECITING OF POEMS BY YOUNG ONES.										
5. FORMAL PARTIES, MEETINGS, GATHERINGS RELIGIOUS FUNCTIONS 'MUNDAN', SAGAI, GREH- PRAVESH, etc.										
6. FORMAL MEALS.										


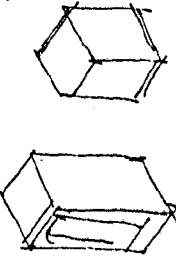

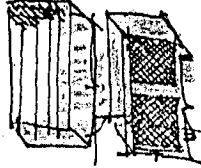
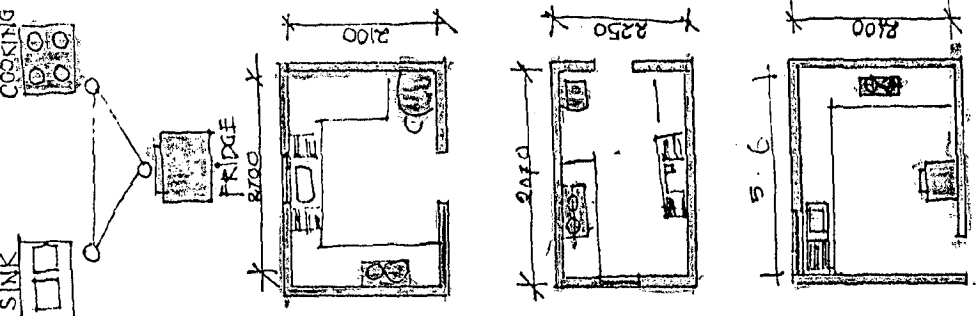
FORMAL LIVING SPACE ANALYSIS.

ACTIVITIES	ACCESSORIES.	LAYOUT POSSIBILITIES	AREA.	ENTRANCE	BED ROOM	TOI.	TERRACE.	KITCHEN	DINING	LIVING
1 FORM MEALS/ INFORMAL MEALS  2 ARRANGING OF TABLE / LAYING OF TABLE, PLACING OF PLAT FOOD.	1. CUPBOARD FOR GLASSES, CROCKERY, CUTLERY, NAPKINS 									
3. TAKING MEALS/ CONVERSATION.	2. DINING TABLE, WITH CHAIRS 									
4 WASHING OF HANDS, - BEFORE & AFTER, MOUTH CLEANING.  5 USING TOWEL, TOOTH PASTE	3. WASH BASIN WITH SOAP/ TOWEL 									
6 DISPLAY OF FLOWER POTS, PAINTINGS, HANDCRAFTS, etc.  7 STORAGE FOR NAPKINS, CUTLERY, CROCKERY, etc.	4. FRIDGE, SIDE TABLE 		12.00 M <sup>2</sup>							

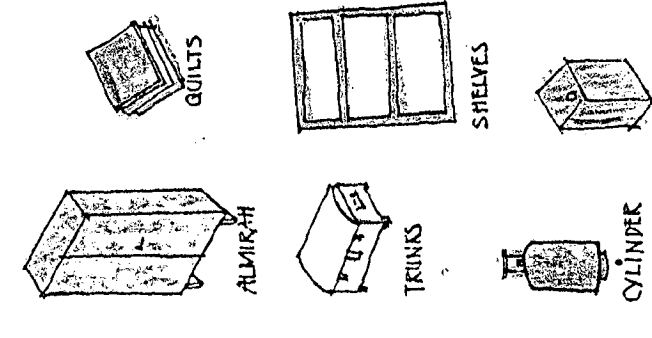
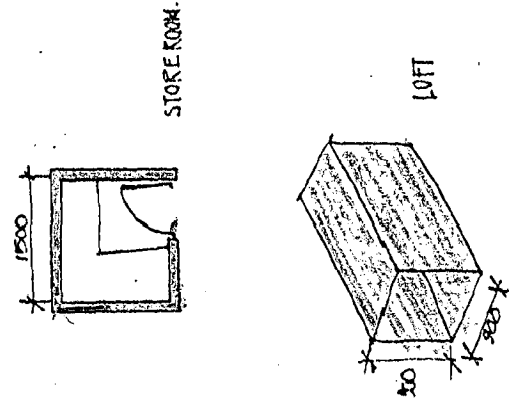
## DINING SPACE ANALYSIS.

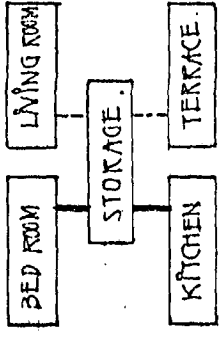
ACTIVITIES	ACCESSORIES	LAYOUT POSSIBILITIES	AREA.	ENTRANCE BED ROOM LIVING RM PRIV IN DOOR TOILET DINING RM
<ol style="list-style-type: none"> <li>1. POOJA (PRAYER)</li> <li>2. DRESSING / UNDRRESSING</li> <li>3. USE OF BATHROOM. SLIPPERS.</li> <li>4. READING / RELAXING. LISTENING TO MUSIC</li> <li>5. STUDYING / PAPER WORK</li> <li>6. HOBBIES / SEWING / STITCHING etc.</li> <li>7. STORAGE OF CLOTHES BOOKS etc.</li> <li>8. LAYING OF BED</li> <li>9. SAFETY DOOR LOCKING</li> <li>10. HANDY STORAGE FOR TOYCH, MAGAZINE DRINKING WATER, MEDICINES NEAR BED.</li> <li>11. EATING ON BED, INFORMAL MEETINGS</li> <li>12. SLEEPING TOGETHER / ALONE / WITH A GUEST</li> <li>13. CARE OF INFANT.</li> </ol>	<p>DOUBLE BED (180x200) SINGLE BED (90x200) TABLE (100x100) DRESSING TABLE (100x120) STUDY TABLE (120x150) BEDSIDE TABLE (60x60) COOLER MUGGA</p>	<p>TOILET 2000 3000 3000 2000</p>	<p>10.0M<sup>2</sup></p>	

## BED ROOM SPACE ANALYSIS.

ACTIVITIES	ACCESSORIES	LAYOUT POSSIBILITIES	AREA.	ENTRANCE SERVANT ROOM LIVING ROOM KITCHEN BED ROOM TERRACE DINING ROOM
1. STORING OF PERISHABLE & NON-PERISHABLES. 2. TAPPING OFF WATER. 3. CLEANING OF VEGETABLES MEAT, CUTTING, etc. 4. BEATING, BLENDING, GRINDING, KNEADING, MIXING. 5. COOKING, ROASTING, FRYING, GRILLING, BAKING. 6. USE OF SELECT. GADGETS - MIXES, CURD-O-MATIC, etc. 7. PRE STATION ON DISHES - SERVING. FOOD. 8. WASHING, CLEANING, DRYING OF UTENSILS. 9. GARBAGE DISPOSAL 10. BROOM STORAGE.	1. SINK  2. FRIDGE, OVEN  3. BURNER, GAS CYLINDER  4. STORAGE CUPBOARDS 		600 M <sup>2</sup> MIN. DIMENSION 1.50 M	

# KITCHEN SPACE ANALYSIS

ACTIVITIES	ACCESSORIES	LAYOUT POSSIBILITIES	AREA.
1. STORAGE OF VALUABLES IN STEEL ALMIRAH 2. STORAGE OF QUILTS, WINTER BEDDING. 3. STORAGE OF UTENSILS NOT IN USE. 4. STORAGE OF BOXES, BAGS, TRUNKS, 5. STORAGE OF OLD NEWS PAPERS, RAGS, 6. STORAGE OF PICKLES, GRAINS, etc. 7. STORAGE OF RARELY USED ITEMS. 8. STORAGE OF SHOES, BOOKS, etc. 9. STORAGE OF LESS FREQUENTLY USED ARTICLES/FURNITURE	 <p>ALMIRAH QUILTS TRUNKS SHELVES CYLINDER</p>	 <p>STORE ROOM LOFT</p>	<p>1.5 M<sup>2</sup></p>

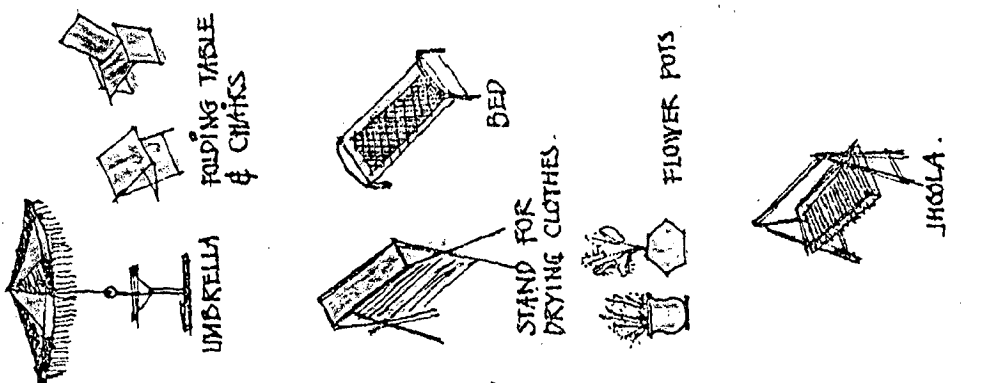
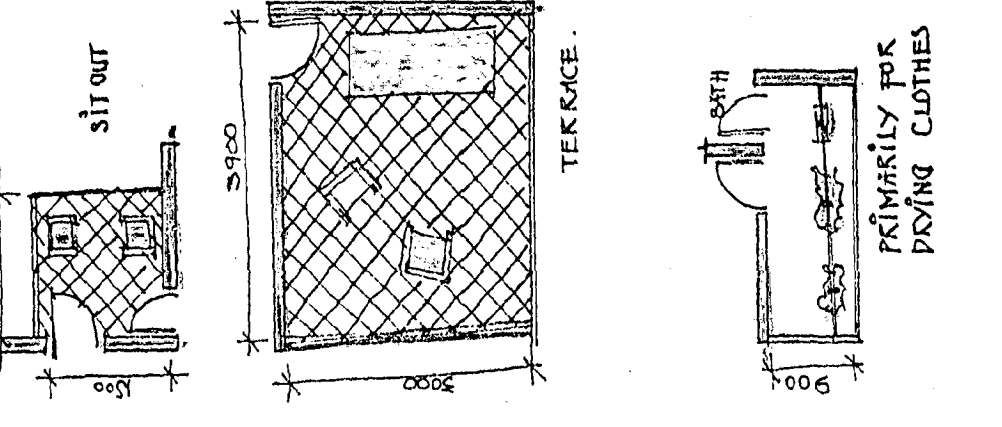


## STORAGE SPACE ANALYSIS.

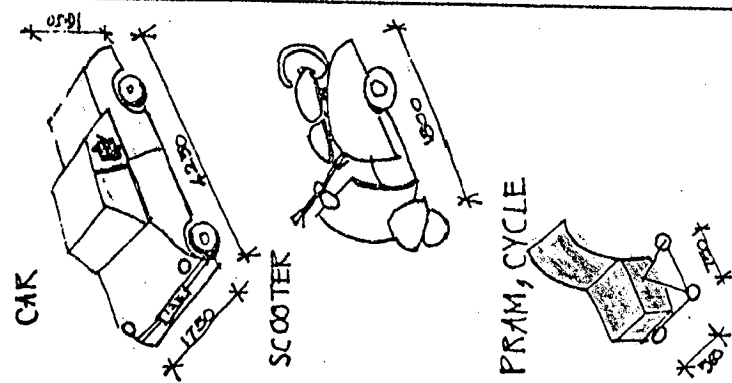
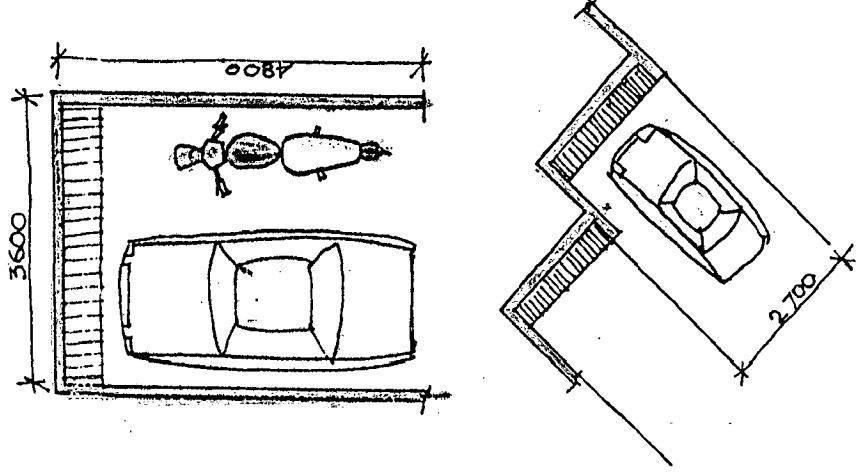
ACTIVITIES	ACCESSORIES	LAYOUT POSSIBILITIES.	AREA.	ENTRANCE BED ROOM TOILET TERRACE KITCHEN LIVING ROOM DINING ROOM
1. USING W.C., USE OF FLUSH, CLEANING. HANDS, USE OF TOILET PAPER. 2. BRUSHING, SHAVING, WASHING FACE, HANDS. 3. DRYING WITH TOWELS. 4. BATHING, SHAMPOOING. IN HOT/COLD WATER. 5. WASHING OF CLOTHES. 6. WASHING / BATHING OF BABIES, DOGS. 7. DRESSING / UNDRESSING 8. STORAGE OF TOILET ACCESSORIES. 9. USE OF DEODORANTS, POWDER - REMOVERS. 10. STORAGE OF DIRTY CLOTHES.	<p>1400 1600 1900 2800 1500 2500</p> <p>INDIAN EUROPEAN 700 800 GEYSER NRHE</p>	<p>1350 1900 2800 1250 1500 2000 2500 2500 1700</p>	<p>3.50 M<sup>2</sup></p>	

TOILET SPACE ANALYSIS.



ACTIVITIES	ACCESSORIES	LAYOUT POSSIBILITIES.	AREA.	ENTRANCE KIT. LIVING RM. BED ROOM TERRACE TOILET DINING RM.
1. ENJOYING VIEW, SUN OR/ AND BREEZE. 2. YOGA / EXERCISES / MEDITATION 3. GARDENING / CARING FOR PLANTS. 4. CONVERSATION / MEALS / SLEEPING. 5. DRYING CLOTHES, PICKLES, VEGETABLES, GRAINS, etc. 6. PLANTING OUTDOORS 7. BAR- BE- QUE. 8. SITTING AROUND FIRE, LIGHT MUSIC etc. 9. WATCHING STARS/ STAR GLAZING. 10. EXPERIENCING / FEELING ENVIRONMENT ON A MOONRY	 <p>UMBRELLA FOLDING TABLE &amp; CHAIRS BED STAND FOR DRYING CLOTHES. FLOWER POTS JHOOLA.</p>	 <p>sit out 5900 3000 TERRACE. BATH PRIMARILY FOR DRYING CLOTHES</p>	<p>10.00M<sup>2</sup></p>	

TERRACE SPACE ANALYSIS.

ACTIVITIES	ACCESSORIES	LAYOUT POSSIBILITIES	AREA.	ACCESS TO SITE ACCESS TO UNIT TOILET CARPORT
1. PARKING OF CARS 2. PARKING OF SCOOTERS, PRAMS, CYCLES. 3. PROTECTION FROM CLIMATE & ANTI-SOIL ELEMENTS. 4. STORAGE OF CAR ACCESSORIES, TYRE, CARRIER, OIL, WATER 5. STORAGE OF CRATES, etc. 6. USE AS A WORKSHED BY CARPENTERS FOR MINOR REPAIRS. 7. WASHING, CLEANING OF CAR, SCOOTER CYCLE, PRAM. 8. POLISHING OF CAR, SCOOTER. 9. MINOR REPAIRS IN CAR, SCOOTER.	 <p>CAR 1250 x 1750</p> <p>SCOOTER 1500 x 1000</p> <p>PRAM, CYCLE 1000 x 300</p>	 <p>3600 x 1800</p> <p>2700</p>	<p>16.00M<sup>2</sup></p>	<p>ACCESS TO SITE</p> <p>ACCESS TO UNIT</p> <p>TOILET</p> <p>CARPORT</p>

ACTIVITIES	ACCESSORIES	LAYOUT POSSIBILITIES	AREA.	
1. HANGING AROUND, MEETING PEOPLE, CONVERSING, 2. WALKING, JOGGING 3. PLAYING GAMES BY DIFFERENT AGE GROUPS. 4. SAND PLAY. 5. WATER PLAY 6. FORMAL GAMES - TENNIS, BADMINTON. 7. MARRIAGES, PARTIES, 'JACRANS' 8. TAKING THE BABY AROUND IN A PRAM, OR A DOG WALKING. 9. FLYING KITES. 10. CARING OF NATURE.	<p>SHADE PATHS, SUPPORT, SUPPORT.</p> <p>SAND PIT</p> <p>SLIDE</p> <p>OUTDOOR SHOWERS/POOLS</p> <p>FIRE/CAMP PITS</p> <p>FLAT FORM</p>	<p>TENNIS</p> <p>BADMINTON.</p>		

OUT DOOR COMMUNITY SPACE

# CHAPTER - V

## CASE STUDIES

## CASE STUDIES

### 5.1 DESCRIPTION OF CASE STUDIES

#### 5.1.1 Case Study - I : B.H.E.L. Hardwar

The location of the plant at Ranipur about 6 kms from the famous town of Hardwar. The entire township covers an area of 6700 acres. The township was established in 1963.

The township today has 5132 regular quarters. In addition there are 1,122 non regular type of units including hostel accommodation, labour tenant etc.

The break-up of regular quarters is given below :

Type	Plinth Area m <sup>2</sup>	General Entitlement	Total Nos.
A	36.3	Workers	3716
B	58.38	Supervisors	992
C	83.68	Executive	366
D	135.56	Top Executive	58
Total			5132

Source : B.H.E.L. Township Office.

#### 5.1.2 Case Study - II : Mathura Refinery Township

The location of the plant is 4.5 km from Mathura towards Agra. The entire township covers an area of 200 acres. The township was established in 1982.

The township today has 3000 quarters. The break-up of quarters is given below :

Type	Plinth Area, m <sup>2</sup>	General Entitlement	Total Nos.
A	36.00	Workers	1800
B	64.36	Supervisors	540
C	90.685	Executive	420
D	150.416	Top Executive	240
Total			3000

Source : Mathura Refinery Township Office.

## 5.2 PHYSICAL ANALYSIS OF TYPE DESIGN HOUSES

Physical analysis of type design houses is done under the following heads :

- \* Area statement
- \* Accommodation provided
- \* Space analysis

### 5.2.1 Case Study - I : B.H.E.L. Hardwar

#### AREA STATEMENT :

The plinth areas permissible and provided as per drawings are as given under :

Residential Types	Plinth Area Permissible (Sq.Mts)	Actual Plinth Area provided (Sq.Mts)
A	36.00	36.30
B	56.00	58.38
C	84.00	83.68
D	139.00	135.56

ACCOMMODATION PROVIDED :

Type A : A living room, one bedroom, kitchen closed varandah/dining, bath, W.C. In addition to it upper floors are provided with balcony, while ground floor quarter have open varandah.

Type B : A living room, dining, two bed rooms, kitchen, bath and W.C. In addition to it upper floors are provided with balcony, while ground floor quarter have open varandah.

Type C : A living room, dining/varandah, one bed, one bed with attached toilet, kitchen, bath and W.C. In addition to it upper floors are provided with balcony while ground floor quarter have open varandah.

Type D : A drawing/dining, one bedroom, one master bedroom with box and toilet, study room, kitchen, stone, bath, W.C., open courtyard and covered Ent. verandah.

SPACE ANALYSIS :

Type A :

	Area	%
Living Space (DRG + DN + BED + VER)	20.85 m <sup>2</sup>	57.6%
Service Space (KT + BATH + W.C.)	6.58 m <sup>2</sup>	18.1%
Space Under Walls	8.83 m <sup>3</sup>	24.3%
	<b>Total 36.13 m<sup>2</sup></b>	<b>100%</b>

Type B :

	Area	%
Living Space (DRG + DIN + BED + VAR)	38.15 m <sup>2</sup>	64.68%
Service Space (KIT + W.C. + BATH)	7.85 m <sup>2</sup>	13.30%
Circulation Space	1.52 m <sup>2</sup>	2.57%
Space under walls	11.46 m <sup>2</sup>	19.45
	<b>Total 58.38 m<sup>2</sup></b>	<b>100%</b>



Type C :

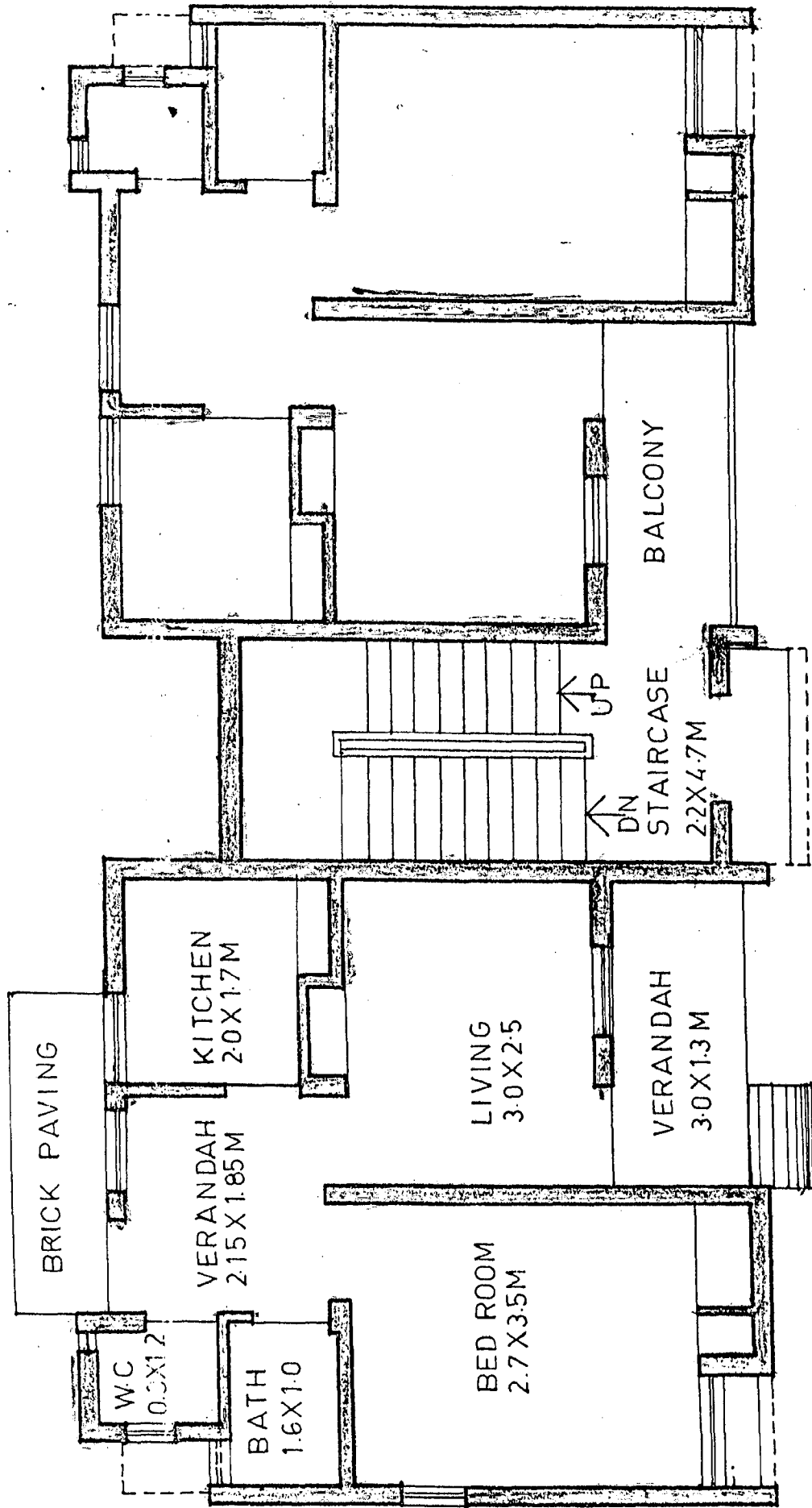
	Area	%
Living Space (DRG + DIN + BED + VAR)	51.98 m <sup>2</sup>	62.18
Service Space (KIT + BATH + W.C. + TOI)	11.15 m <sup>2</sup>	13.32
Circulation Space	0.00 m <sup>2</sup>	0.00
Space Under Walls	20.33 m <sup>2</sup>	24.56
	<b>Total 83.68 m<sup>3</sup></b>	<b>100%</b>

Type D :

	Area	%
Living Space (DRG + DIN + STUDY + BED + VAR)	82.02 m <sup>2</sup>	57.12
Service Space (KIT + BATH + W.C. + STORE + TOI)	19.25 m <sup>2</sup>	13.40
Circulation Space (Passage)	13.44 m <sup>2</sup>	9.35
Space Under Walls	28.87 m <sup>2</sup>	20.10
	<b>Total 143.59 m<sup>2</sup></b>	<b>100%</b>

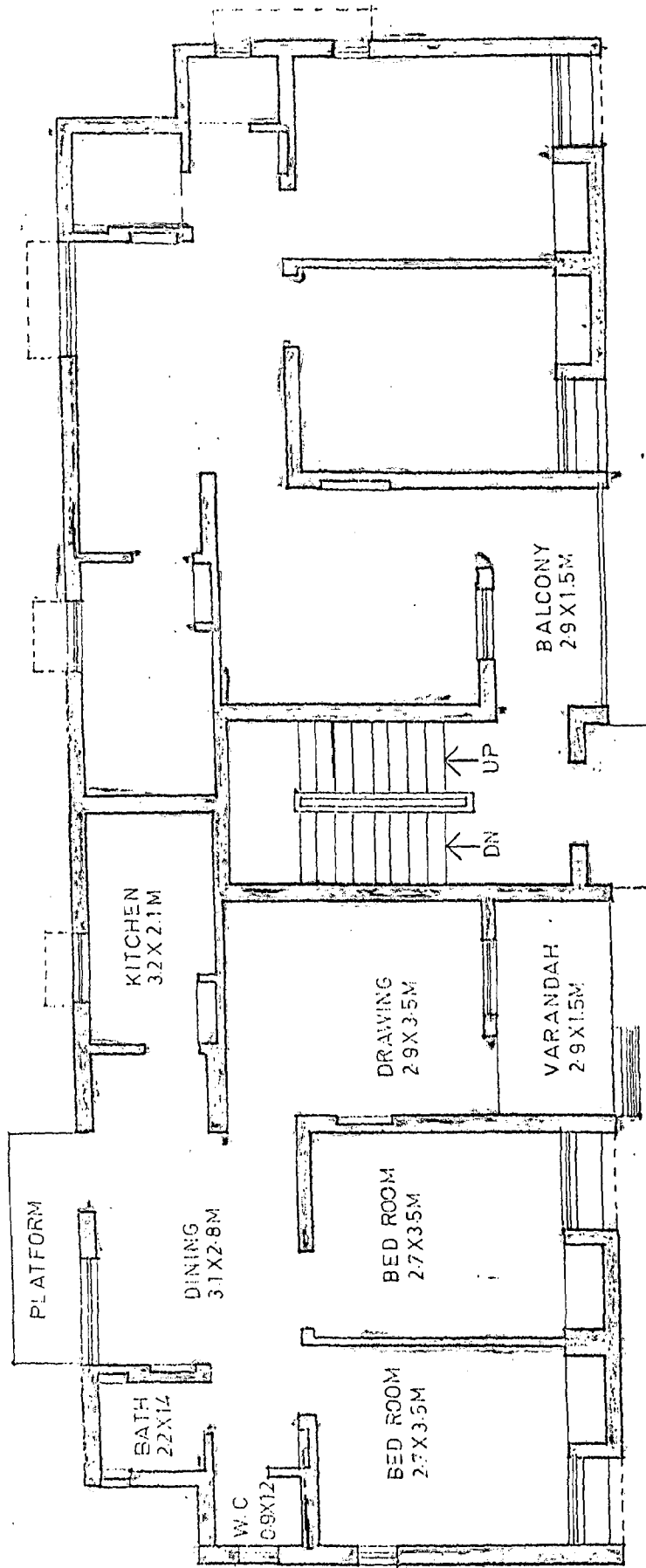
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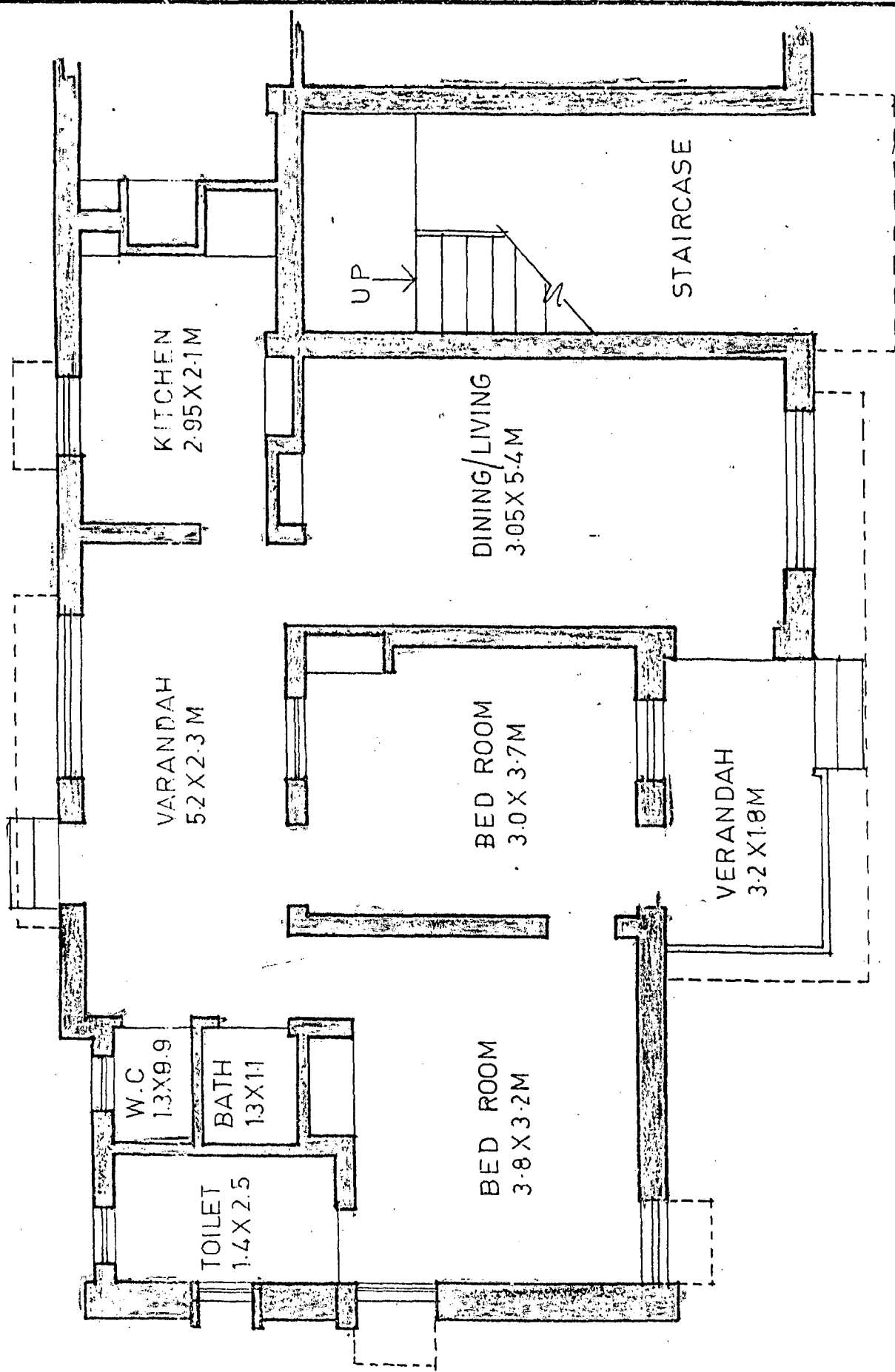
FIRST FLOOR PLAN

GROUND PLAN OF TYPE 'A' B.H.E.L HARDWAR

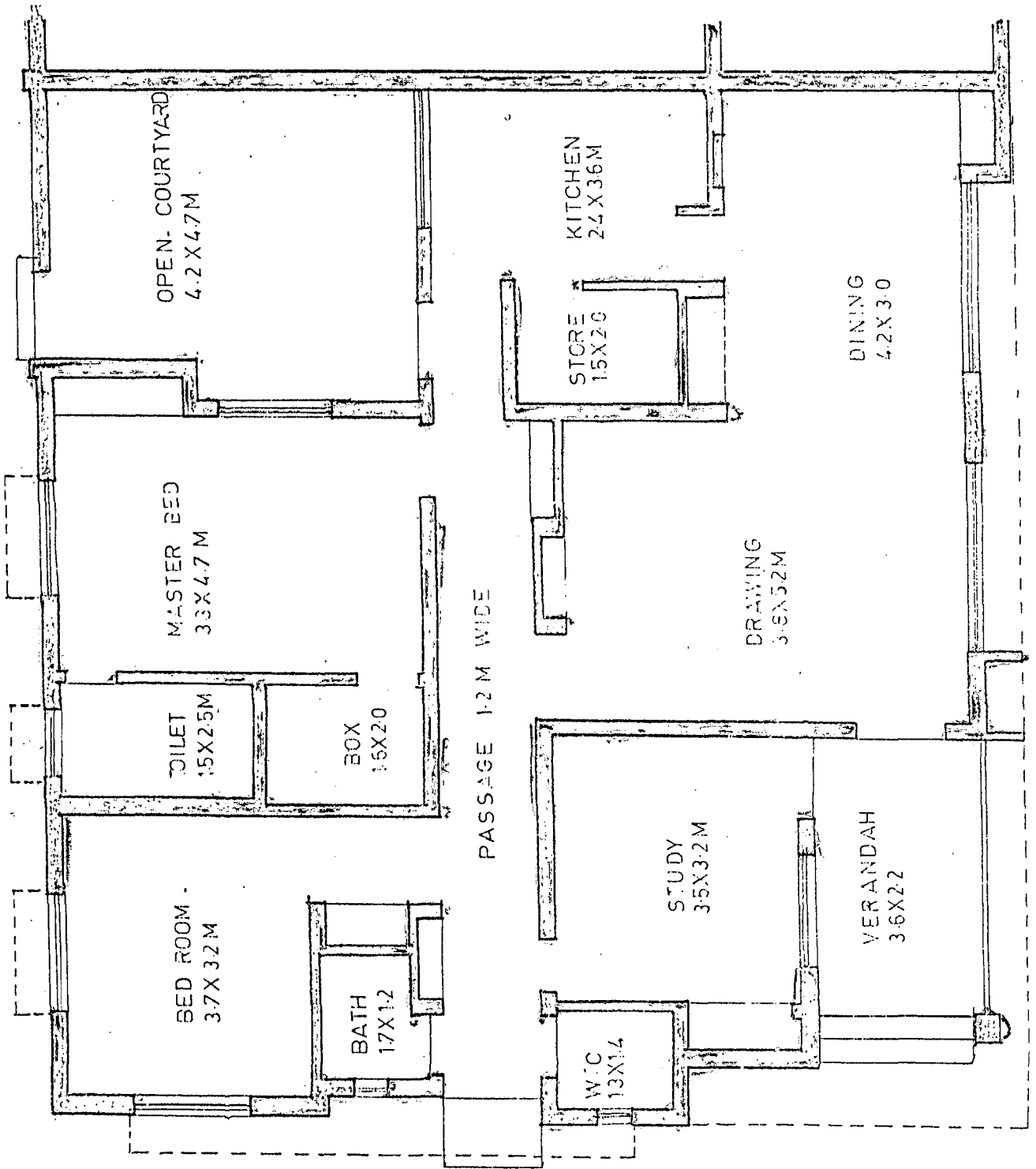


FIRST FLOOR PLAN

GROUND PLAN OF TYPE 'B' BHEL HARDWAR



TYPICAL TYPE 'C' B.H.E.L. HARDWAR:



TYPICAL TYPE 'D' B.H.E.L. HARDWAR.

### 5.2.2 Case Study - II : Mathura Refinery Township

#### AREA STATEMENT :

The plinth areas permissible and provided as per ; drawings are given under :

Residential Types	Plinth Area Permissible (Sq.Mts)	Actual Plinth Area Provided (Sq.Mts)
A	36.00	36.00
B	56.00	64.36
C	84.00	90.685
D	139.00	150.416

#### ACCOMMODATION PROVIDED :

Type A : A living room, dining room, one bedroom, kitchen, cycle shed, Bath and W.C. In addition to it upper floors are provided with balcony, while ground floor quarter have open varandah.

Type B : A living room, dining room, two bed rooms, kitchen, scooter shed, Bath and W.C. In addition to it upper floors are provided with balcony, while ground floor quarter have open varandah.

Type C : A living room, dining, bedroom, one bed with attached toilet, kitchen, store, scooter shed, Bath and W.C. In addition to it upper floors are

provided with balcony, while ground floor quarter have open ent. varandah.

Type D : A living room, dining, guest room, study room, children room, master bed, lounge, kitchen, two toilets. In addition to it have servant quarter and car garage.

SPACE ANALYSIS :

Type A :

	Area	%
Living Space (LIV + DIN + BED)	21.41 m <sup>2</sup>	59.47%
Service Space (KIT + BATH + W.C. + VAR)	8.98 m <sup>2</sup>	24.94%
Circulation Space	1.20 m <sup>2</sup>	3.33%
Space Under Walls	4.41 m <sup>2</sup>	12.25%
Total	36.00 m <sup>2</sup>	100%

Type B :

	Area	%
Living Space (LIV + DIN + BED)	34.81 m <sup>2</sup>	54.09%
Service Space (KIT + W.C. + BATH + VER)	10.52 m <sup>2</sup>	16.35%
Circulation Space	3.42 m <sup>2</sup>	5.33%
Space Under Walls	15.59 m <sup>2</sup>	24.33%
Total	64.36 m <sup>2</sup>	100%

Type C :

	Area	%
Living Space (LIV + DIN + BED)	50.44 m <sup>2</sup>	55.62%
Service Space (KIT + BATH + W.C. + STORE + TOI)	15.63 m <sup>2</sup>	17.23%
Circulation Space	4.62 m <sup>2</sup>	5.10%
Space Under Walls	20.00 m <sup>2</sup>	22.05%
Total	90.68 m <sup>2</sup>	100%

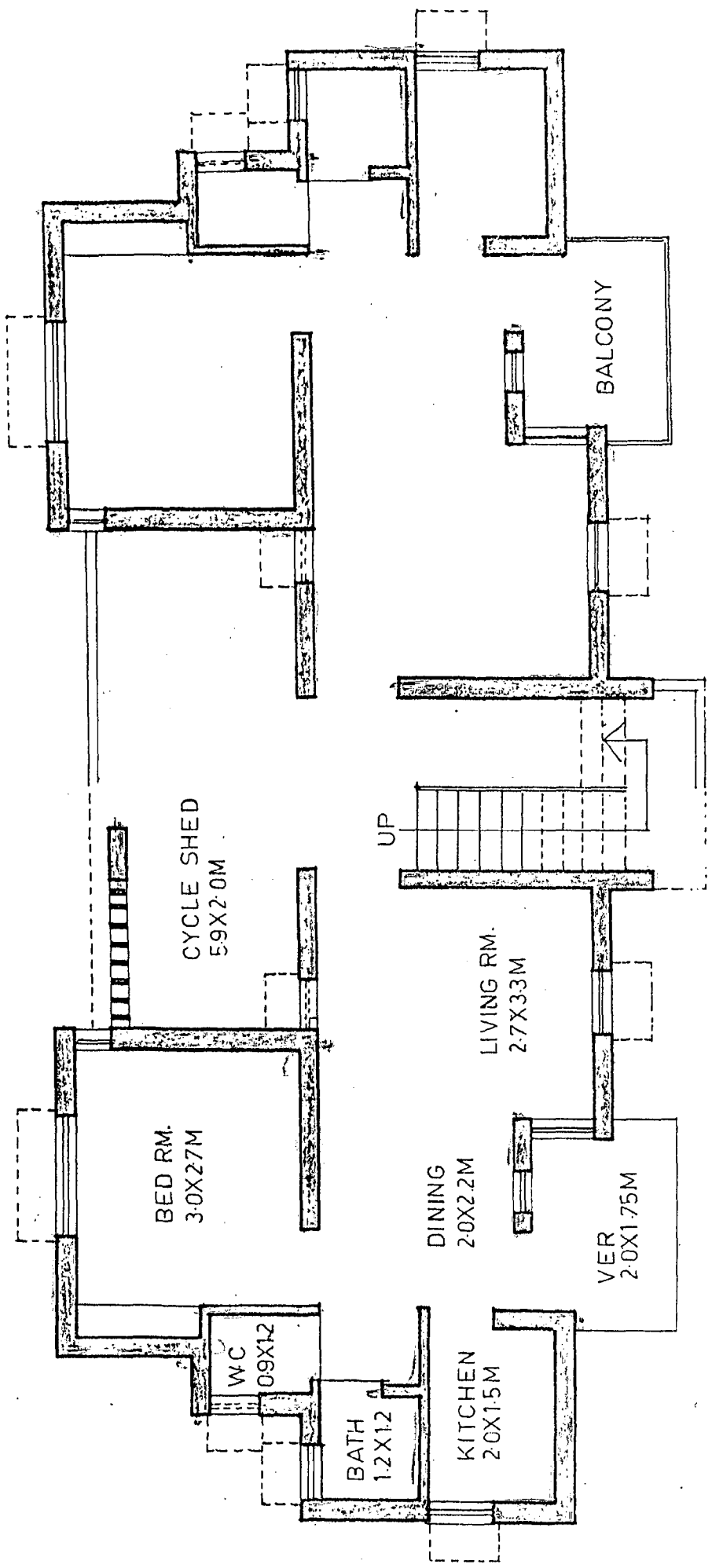


Type D :

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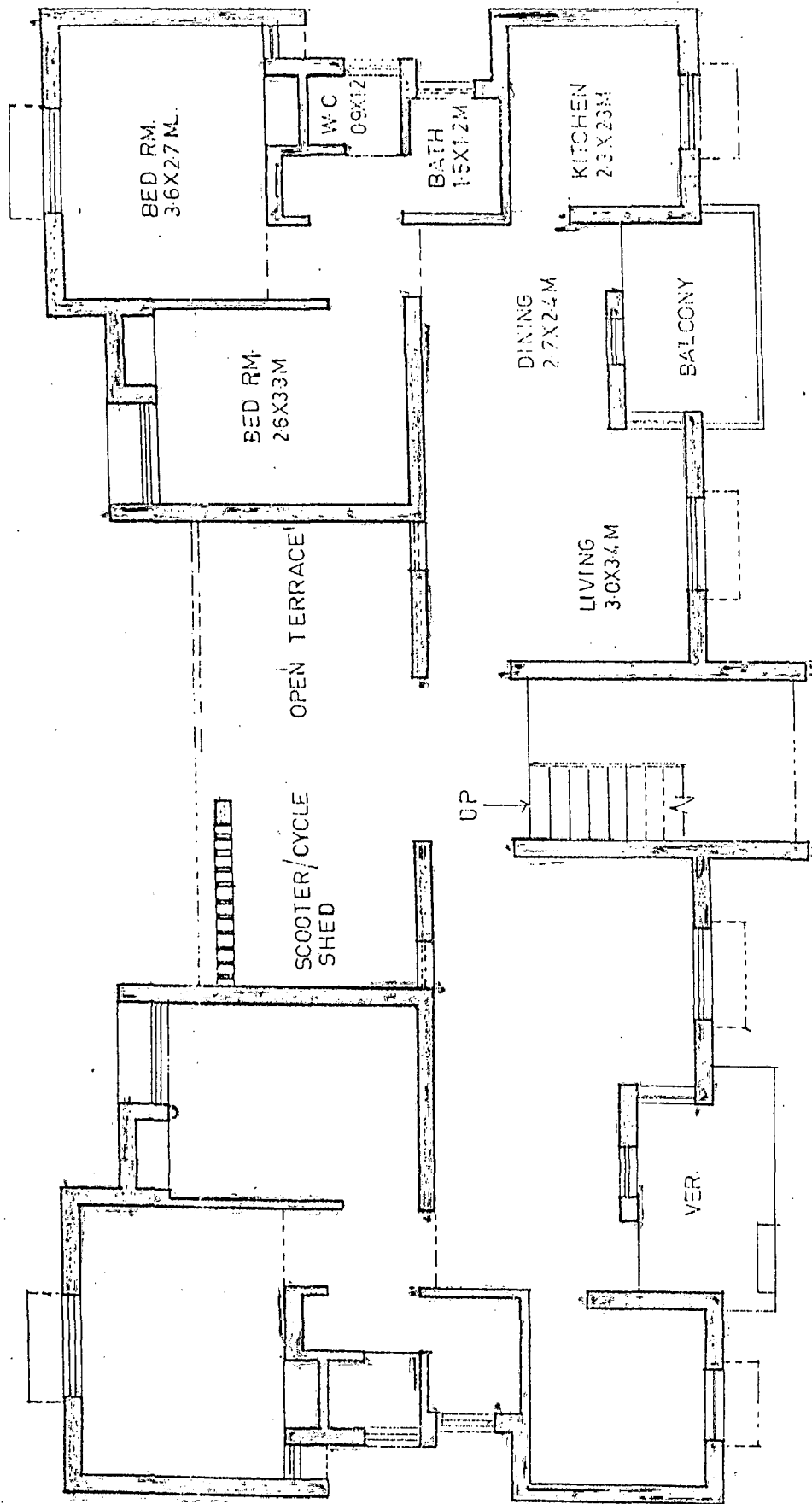
	Area	%
Living Space (LIV + BED + DIN + STUDY + LOUNGE)	95.73 m <sup>2</sup>	63.6%
Service Space (KIT + TOI + BAL)	19.2 m <sup>2</sup>	12.76%
Circulation Space	9.25 m <sup>2</sup>	6.14%
Space Under Walls	26.23 m <sup>2</sup>	17.44%
Total	150.416 m <sup>2</sup>	100%

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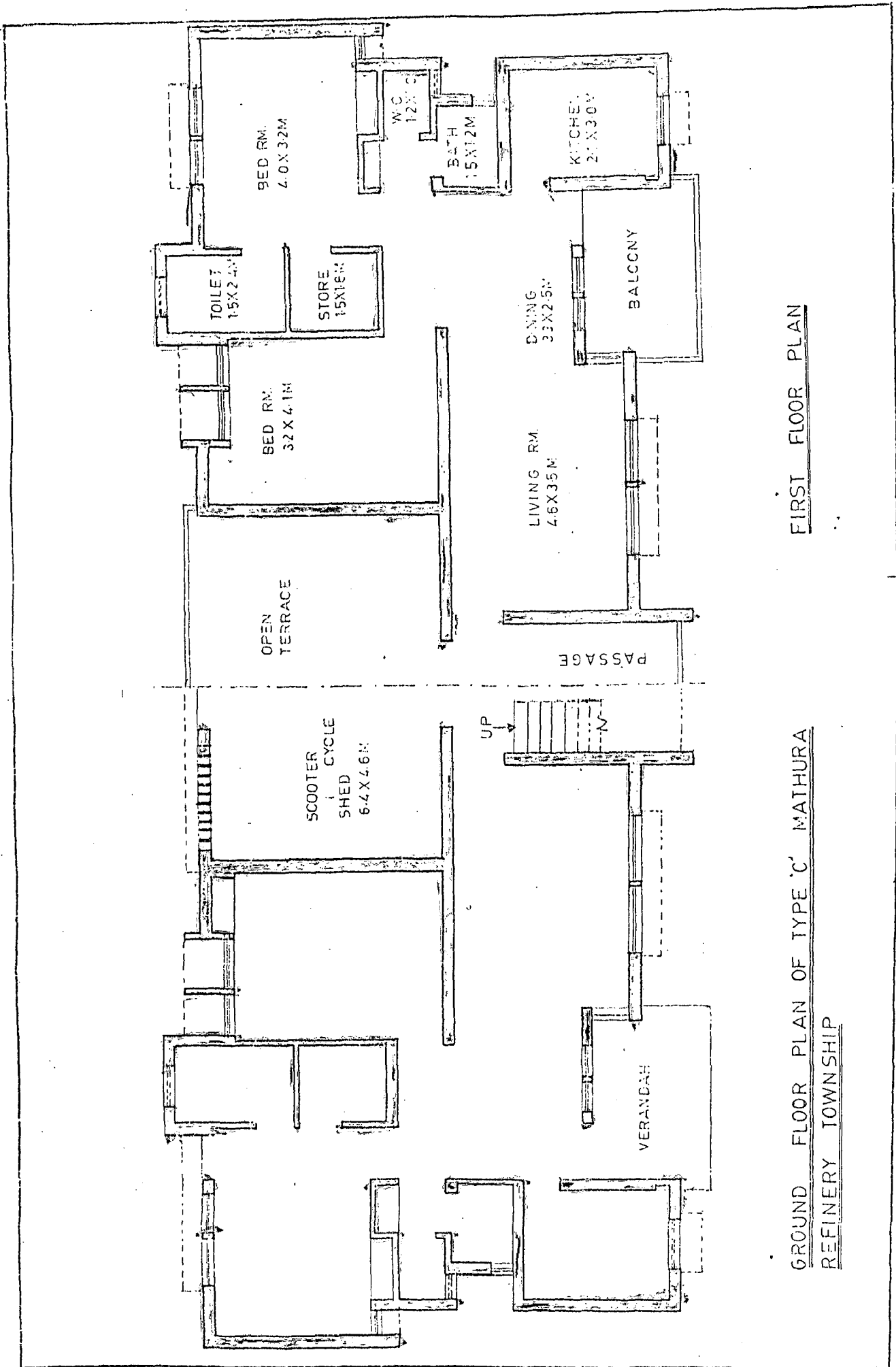
FIRST FLOOR PLAN

GROUND FLOOR PLAN OF TYPE 'A'  
MATHURA REFINERY TOWNSHIP



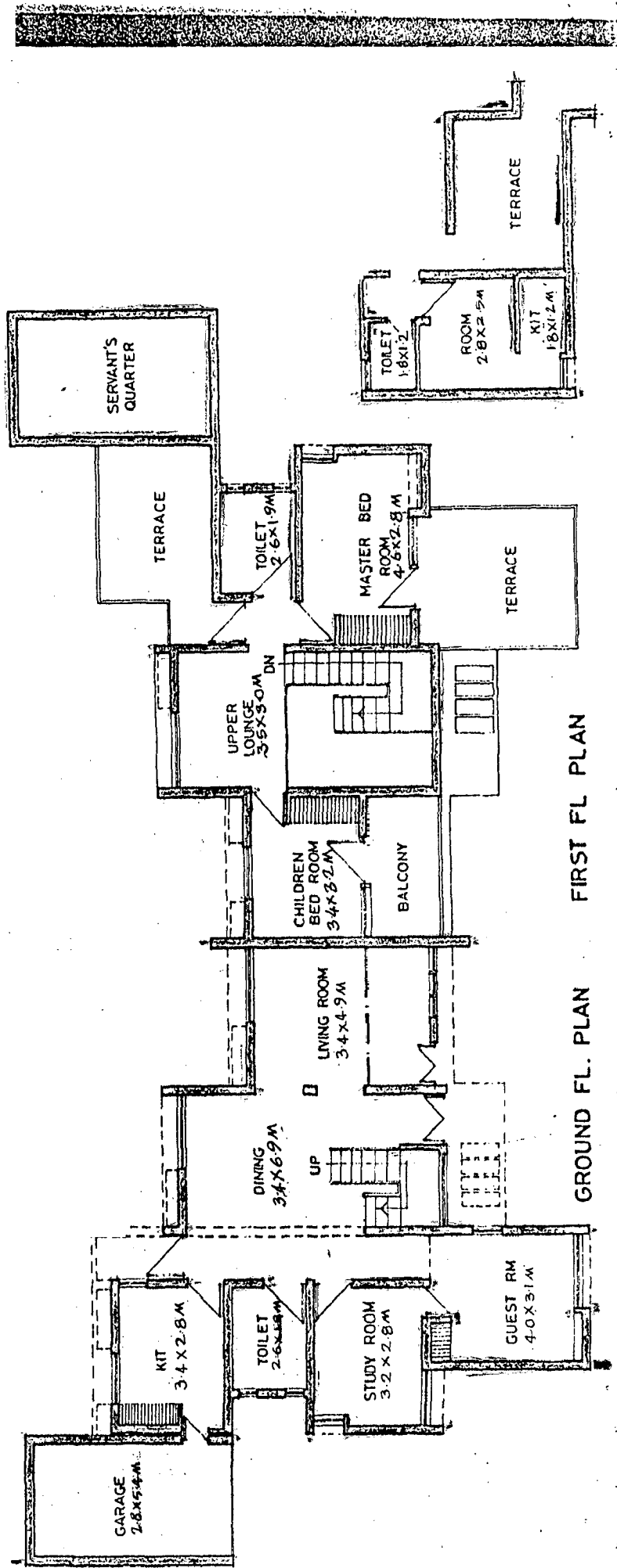
FIRST FLOOR PLAN

GROUND FLOOR PLAN OF TYPE 'B'  
MATHURA REFINERY TOWNSHIP



FIRST FLOOR PLAN

GROUND FLOOR PLAN OF TYPE 'C' MATHURA  
REFINERY TOWNSHIP



GROUND FL. PLAN      FIRST FL. PLAN

TYPE D MATHURA REFINERY TOWNSHIP

### 5.3 COMPARATIVE ANALYSIS OF TYPE DESIGN HOUSES UNDER CASE STUDIES

#### CASE STUDY - I : B.H.E.L. HARDWAR

Type of Residences	Living Space %	Service Space %	Circulation Space %	Space Under Walls %	Remarks
A	57.6	18.1	0.0	24.3	
B	64.68	13.30	2.57	19.45	
C	62.18	13.32	0.0	24.56	
D	57.12	13.40	9.35	20.10	

#### CASE STUDY - II : MATHURA REFINERY TOWNSHIP

A	59.47	24.94	3.33	12.25	
B	54.09	16.35	5.33	24.23	
C	55.62	17.23	5.10	22.05	
D	63.60	12.76	6.14	17.44	

# CHAPTER - VI

## CONCLUSION & RECOMMENDATIONS

## 6.1 CONCLUSIONS

There is no end of the problem of housing and it is not possible to accede to all the aspects in type design housing. However, the effort has been made to analyse and conclude the observations in details in chapters itself. The conclusions of all the studies are given below :

- (1) The comparative analysis has revealed that the walls and circulation area is more. For greater efficiency in design, it could be possible reduced.
- (2) The quality of the houses is not found upto the standard, because of the contract system. The contractor always tries to use substandard type of material and to make best use of the lackness of supervisory staff. Secondly, the technical setup is also responsible to a great extent, because of the reason that concerned technical cells are not working in close co-ordination among the Architects, Planners and Structural Engineer and Site Engineer which also dealy the construction for the want of decisions and to bring solution and implementation of the same. The study has also revealed that users reactions have not been incorporated in the designing.
- (3) The space areas of the type designs are reducing perhaps due to the reason to keep balance between the overall cost of the building and minimum space



requirements which had also resulted into untidy spots and does not fulfil the socio-economic demand of the family.

- (4) The more number of rooms may be good for privacy, but due to their being lesser in size create the problems of furniture layout, the position of the cupboards, shelves and almirah are not properly chalked out, which creates difficulty in movement spaces, often furniture dimensions, and the anthropometric dimensions, the rooms have been found untidy as observed in residential space analysis plates in the Chapter - IV.
- (5) Certain shortcomings are also observed in the room sizes and kitchen sizes. The spaces are not related to the size of furniture layout and anthropometric dimensions, which resulted into inadequate space for performing household activities, in living rooms and taking meals in kitchen, as no provision of separate dining space is possible in the limited standards of lower type residences.
- (6) In addition to it, considering consumers demands and family space requirements the balcony provided on upper floor is quite less in width to accommodate cots etc. for sleeping during summer and further no provision of wash basin is made.

- (7) Due to shortage of accommodation and lack of facilities and space for day to day need people prefer to live on ground floor. So if accommodation with facilities like multipurpose terrace, balcony and sufficient storage space provided, residents are ready to occupy upper floors.
- (8) In general the houses are compact with no serious problems of light and ventilation only it is less due to some unavoidable circumstances.
- (9) It seems that public sector is not giving proper attention to reduce the cost by using techniques in design and replacing materials. The design pattern is same as adopted quite back with only certain modification. No new construction and economy in design techniques are followed to reduce overall cost by this sector.

## 6.2 RECOMMENDATIONS

- (1) Within the given government accommodation for type ; design quarters, tremendous amount of qualitative improvement greatly dependent upon the designing organisation and its responsibility for implementation of proposals, obviously two separate functions, i.e. designing with Architectural section and execution with civil engineering section of the government organisation needs to be merged together for effective co-ordination and responsible execution. A total re-organisation of administrative set-up is hence recommended.
- (2) It is observed and felt the need to alter the present space allocation for various types of accommodation. The following areas thus can be well recommended against present standards given by B.P.E.

Type	Existing Standards	Recommended Standards
A	36 m <sup>2</sup>	40 m <sup>2</sup>
B	56 m <sup>2</sup>	58 m <sup>2</sup>
C	84 m <sup>2</sup>	80 m <sup>2</sup>
D	139 m <sup>2</sup>	120 m <sup>2</sup>

The above recommended standards are based on the space analysis and the opinion of the residents.

However, the standards can be reviewed and revised time to time as the rent paying capacity and the income of the occupants progresses in the course of time.

(3) Following are the recommendations made after the analysis of users survey.

(a) GENERAL

- \* The house should be more compact so that it is conveniently maintained.
- \* There should be at least one plain wall in every room.
- \* Adequate number of water tanks at a higher elevation should be constructed to avoid inconvenience often felt due to power failures and generally in the case of upper floors.
- \* To overcome the problem of white-ants necessary precautionary measure should be taken.
- \* Plinth should be high enough to prevent floor dampness due to water logging.
- \* Sufficient roof overhang should be given to prevent wall dampness.
- \* The planning should ensure free movement within the house without being interrupted by the visitors.
- \* Suitable detailing to be made for preventing entry of reptiles through pipes etc.

- \* Scooter/cycle parking space required especially in two/three storied residences.
- \* Positioning of electrical installations should be need based.
- \* Service entry should be provided besides the main entry.
- \* Window and ventilation should be of fully openable and easily operated type.
- \* Plug points for T.V. Antena and Radio Aerial should be provided at appropriate place in the residence.

(b) LOCATION

While selecting residential sites, factors creating noise, pollution and affecting privacy, safety and recreation especially for children and convenience for a healthy social life should be considered.

(c) ACCOMMODATION

- \* A separate study/guest room should be provided for higher category of houses. Verandah should be sufficiently big.
- \* Stair-case width should be minimum 1 mt clear.
- \* The balcony area for upper quarters need to be sufficiently big for facilitating outdoor sleeping and drying of clothes.

(d) COMFORT

- \* Orientation of a particular design of residences should be kept identical, satisfying the philosophy of orientation.
- \* Each dwelling unit should have spaces in two stories to make the occupants comfortable in all seasons.
- \* Where a staircase is provided inside the residence brick/concrete "Jalli" should be avoided.
- \* Projections should be provided on all opening.
- \* There should be sufficient level difference between stair-case landing and terrace to prevent rain water from entering the stairs.
- \* SE-NW larger axis orientations is desirable.

(e) SECURITY/SAFETY

- \* Cluster of houses is preferred.
- \* Spacing of bars in railing should not be made more than 12 cm.
- \* Protection grill for windows/ventilations should be stronger.

(f) DRAWING/DINING

- \* As far as possible combination of Drawing and Dining should be avoided.

- \* If not, provision for curtain rod between drawing/dining should be provided.
- \* Built in storage space for crockery should be provided in dining area.
- \* Kitchen should be close to dining space.
- \* A wash-basin should be provided near dining area besides the one in bathroom.

(g) BED ROOM

- \* Balcony of sufficient size should be provided for facilitating outdoor sleeping.
- \* Sufficient storage/wardrobe should be provided to accommodate the clothes and bedding materials.

(h) KITCHEN

- \* Cooking platform should be better finish.
- \* Storage shelf should be mosaic/cement finished.
- \* Sufficient storage space for variety of purposes should be provided.
- \* Design of kitchen should be flexible to accommodate different modes of cooking.
- \* Light point should be above working platform, and not behind.
- \* Sufficient ventilation should be provided. At least one window should open outside.

(i) TOILET

- \* Small built-in-shelf should be provided in toilet.
- \* One of the bath rooms should be attached to the master bed room.

Embedding drain pipes in walls should be avoided to facilitate future maintenance.

- \* Toilet walls should be tiled/mosaic finished upto lintel height in bath area and upto window sill height in W.C. area.
- \* Where only one set of bath and W.C. is provided, they should be provided in separate enclosures for simultaneous use.

The anthropometric dimensions recommended by C.B.R.I. may be utilised for formulating length, breadth and height relationship of various spaces.



# APPENDICES

## APPENDIX - 1

### N.B.O. SOCIO-ECONOMIC SURVEY REPORT(\*7)

This information based on the socio-economic survey was conducted by N.B.O. by interviewing. The residents of A, B, C & D type in New Delhi.

#### \* STATE OF ORIGIN

The employees occupying these flats belong to different State of India. But 72% of them came from neighbouring States of U.P., Punjab, Haryana and Himachal Pradesh.

#### \* PERIOD OF STAY

The average stay of an allottee in Delhi and in Government quarters worked out to 199 months, 84 months, 42 months and 20 months respectively (i.e. A, B, C & D).

#### \* AGE COMPOSITION

58% of the allottees of type 'A' are in the age group of 36-45, but 52% of allottees of type 'B', 77% of allottees of type 'C' are in age group of 40-50, and nearly 60% of the allottees of type 'D' are worked out to the age of 40-55. Overall average is 43 years.

#### \* CONVEYANCE OWNERSHIP

42.1% of allottees were keeping cycles. 22.1% of scooters, 10.0 were having four wheeler and 25.8 were having no conveyance of their own.

\* COOKING AND DINING-

It depends upon the income level and taste of the occupants to use those fuels which are non-smoking and want some energy for cooking. 15.2% use electrical energy, 54.4% use gas, 15.1% use kerosen oil and 15.3% use soft coke.

\* SLEEPING DURING SUMMER

Nearly 30% of allottees were sleeping inside the rooms in summer in four storeyed residents, because the balcony is insufficient to accommodate all members of the household. In double storeyed where the employees have choice to sleep in lawns and terrace, 21% of allottees were estimated sleeping inside the rooms due to change of the living habits of the people.

\* OCCUPANTS DEMAND

- There is a demand for bigger or additional balcony from allottees irrespective of their household size.
- Bigger kitchen even at the cost of reduction in some areas, mostly the passage space has been suggested. Allottees of type 'D' multistoreyed buildings preferred bigger kitchen by reducing the dining space near the kitchen.
- A number of allottees were prepared to pay more rent if they were provided with extra space.
- A wash basin in every type of residence appears to be a must.

- 69% of allottees were satisfied with the arrangement of sun light during winter and were happy with the protection provided against heat. No serious complaint was made about day light.
- Problems of waste disposal and cleanliness of common spaces causing some concern in four storeyed buildings.
- Some other important suggestions related to -
  - (a) Readjustment and distribution of spaces in different types of residences and kitchen should not open directly in leaving room.
  - (b) Provision of separate entrance for sweeper is desired by providing a verandah on the backside, which could help in getting sun in winter.
  - (c) Provision of more shelves/racks in room and bath rooms etc.

[Source : N.B.O. Publication - Consumers preferences and reactions.]



## APPENDIX - 2

### SURVEY REPORT

#### IMPORTANCE OF USERS SURVEY

In any housing development programme, no doubt there is available, the basic information, inputs and the design is based on such inputs. Further the design of houses is based on such inputs and within the framework of standards and bye-laws, laid by the controlling authority. In public sector undertakings the planning of the type design houses becomes of prime responsibility. As the typification of houses which is designed will cater for different type of people, with different linkings, preferences and life styles.

Anything to be designed always has an infinite number of alternative solutions, but typification helps to select one or two which can cater to the satisfaction of majority of the prospective users and can be mass produced for meeting their need in acceptable limits.

People are active and consequently they modify their environment in order to change the way it affects them. This interaction goes on constantly and it means that it is incomplete to consider an environment without an activity taking place within it or vice-versa.

Environmental problems arise because there is a gap between the current or expected attainment of an individual

family and group and their general goals and aims. Their goals and aims will be based on their current or expected needs, values and preferences.

A criterion of good house is that it must provide inhabitants a proper environment for healthy growth both for spiritual and physical point of views. To provide inhabitants a proper physical environment for healthy growth is influenced by several factors i.e. efficient design of sufficient size to meet the daily requirements of the household/families.

Now as the buildings are designed constructed and people they do occupy it. Here the user (in masses) for whom this is designed as a type design or a standard design occupies it and starts experiencing it for years together. So here the question of knowing the validity or correctness of the design from the users point of view comes in handy.

In order to know the need the reactions and preferences of the users and to study the present activity pattern and space utilization a comprehensive stratified sample survey of about 80 houses of type A, B, C, & D was conducted in the townships of B.H.E.L., Hardwar and Mathura Refinery Township, Mathura.

From the point of view to know the users present reactions and preferences the survey was conducted through visiting their places and a questionnaire (see appendix 2.1)

The survey has brought out some of the starting facts shattering the basic assumption and standards on which the housing policies and designs are based. The inferences drawn from the survey would form the basis for evolving revised space standards and area allocations.

#### **HOUSEHOLD CHARACTERS AND OTHER PARTICULARS**

The survey finding from the proforma and authors reactions are broadly categorised under different heads.

##### **Period of Stay**

It is found in the survey that the people who have occupied the quarters under (A) type entitlement are residing in the same accommodation from last 10 to 12 years.

Whereas under (B) category people are found residing in the houses for the period of last 6 to 8 years, and under (C) and (D) category people are continuing to stay in quarters from the last 1 to 4 years. The major reason for continuing to stay in the same accommodation is due to shortage of housing stock.

##### **Waiting time to get accommodation allotted**

The survey revealed that the workers under entitlement for (A) category got their accommodation allotted after a long waiting of 3 to 6 years. Whereas workers under (B) and (C) type entitlement got their accommodation allotted after their entitlement within a period of 1 to 2 years. And in

officers rank entitled for type D quarters they had to wait for only a period of 3 months to 1 years. 'As there was a great rush and waiting list for the provision of housing accommodation at the time of allotment. No choice was left to the occupants for the accommodation of their choice preference and also location.

#### **Occupation of one category lower accommodation**

The survey showed that about 30% families are living in one category lower type accommodation as per their eligibility norms. The persons occupying and allotted the one category lower quarters are more in number in 'B' type category. Next in the list are in 'A' type category and very few are in 'C' type category.

The people they are staying in one category lower type accommodation for the span of more than 2 to 8 years after getting entitled for the higher type accommodation. The main reason for this is shortage of housing stock at the disposal of the undertakings.

#### **Family composition**

Amongst the most of the families interviewed during survey it is joined that the average family comprises of 6 members residing in A and B type quarters. Where as in C and D type the average family composition is of 5 members. Very few families have dependents normally staying with them.



### **Number of guests**

The frequency and number of guests coming to stay with the families is in the range of 20 to 80 guests per annum. The average number of guests visiting is 55 persons per year.

### **Alteration and additional construction**

In lower type of accommodation it is found that in many cases allottees they have converted their verandah into room by adding 3 to 5 sqm of space of semi permanent type construction on ground floor whereas people on first floor constructed an additional room of 8 to 10 sqm area on terrace by the side of staircase tower. In some of the 'B' type quarters a room of 8 to 10 sqm is seen added to the house in the rear. Most of which are of semi permanent nature. No case of additional construction was found in C and D type quarters. The most cases where additional construction is done are entitled for higher type of accommodation and are on waiting list for the last 8 years.

No major alteration are done in the quarters allotted except an addition of door where openings in wall are provided. In about 80% of houses in type A and B category, people they have added shelvings and lofts for the purpose of storage.

### **Belongings and need of space**

The survey revealed that around 65% of people they do

belong a scooter and a cycle whereas there is no provision of space for such parking facility.

Similarly around 55 to 60% people they have belongings like T.V., fridge, steel almirah (which are space occuring) and there is no adequate space in the house to accommodate this alongwith the furniture like Sofa, Dining Table and Beds.

#### **Alternative use of space :**

##### **LIVING ROOM :**

It is found in study that all the people in 'A' category make alternative use of living rooms as for sleeping in night and study. In 'B' and 'C' type category people use their living rooms as guest rooms occassionally. Where as in 'D' type quarters people do not take advantage of all the rooms. It is found that the space allotted to them is excess.

##### **DINING ROOM :**

Dining rooms in type 'A' there is no provision of dining space as such also kitchen is very small so the living rooms are utilised for the purpose of dining. In type 'B' and 'C' verandah or lobby is used for dining.

##### **KITCHEN :**

The space allocation in planning of kitchens in 'A' type of quarters is very less. Study showed that most of

the house wives are unhappy with the kitchen provisions. In type 'B' and 'C' people were happy with the kitchen provisions except for the shelve which is not provided.

#### **BED ROOM :**

The bed room which is the only room for lower type accommodation is very small to even accommodate beds and a study table. In type 'B' no doubt provision of 2 beds is there but beds room are very small in size. People are most happy with the provision of beds with 'D' type accommodation.

#### **OUTDOOR SPACE :**

People they reacted that there is no sufficient semi covered space for the activities like washing utensils and clothes, for such activities a balcony is required at upper floors.

#### **SOCIAL ASPECTS**

##### **Dependency**

People they have to depend on Hawkers for daily needs like milk/vegetable, bread, newspaper etc. To get the things people have to go to shopping centres or main city which are also at quite a distance due to sprawled development.

##### **Relationship with neighbours**

People are found living most happily on the township.

They have good relations with neighbours. Most of the occupant are happy with their neighbours, or have no contact with neighbours. Very few are found unhappy with the neighbours.

### **Security**

Almost 65% people replied in favour of 'NO' to security on townships. Occupants responded that there is no security during night time and also during day time. Many cases of robbery take place every month. Similarly cases road burglary also occurred on the township. The main reason they quoted is due to very open planning of township.

APPENDIX - 2.1

QUESTIONNAIRE

(Information collected through this Questionnaire is confidential and will be used exclusively for Academic/study purposes)

I. GENERAL

1. House No. :
2. Locality :
3. Name :
4. Designation :
5. No. of Occupants : Adults : Male ....  
Female ....  
Children....
6. Since how long have you been living in the present house : ..... Years .....Months
7. Are you satisfied with the locality : YES/NO  
If no, give reasons :
  - (i) Noisy Environment
  - (ii) Far away from School
  - (iii) Far away from shopping centre
  - (iv) No amenities like playground for childrens
  - (v) Improper Electric/Water supply
  - (vi) Lack of Safety/Security
  - (vii) Lack of privacy
8. Is the accommodation sufficient to maintain your status : YES/NO  
If not, state reasons :
  - (i) Living area insufficient
  - (ii) Insufficient number of rooms
  - (iii) Insufficient/no open space around the house
  - (iv) Any other reasons :  
.....  
.....

9. Is your house comfortable throughout the year ? If no, state reasons :

Uncomfortable during :

- (i) Summer
- (ii) Winter
- (iii) Monsoon

10. Security provisions : Satisfactory/  
Unsatisfactory

## II. DETAILS OF ROOMS

11. Drawing-cum-Dining :

- (a) Do you like to have the Drawing and Dining room combined : YES/Not Particular
- (b) Size of the room : Sufficient/  
Insufficient
- (c) Space for show case/Decorative pieces : Sufficient/  
Insufficient
- (d) Ventilation : Sufficient/  
Insufficient
- (e) Entry to the Drawing room : Properly placed/  
Improper
- (f) Service Window : Provided/Not provided
- (g) Other comments : Necessary/Not necessary

12. Bed Rooms :

- (a) Size : Sufficient/  
Insufficient
- (b) Wardrobe : Sufficient/  
Insufficient
- (c) Light and Ventilation : Sufficient/  
Insufficient
- (d) Orientation w.r.t. sunlight : Sufficient/  
Insufficient
- (e) Orientation w.r.t. Wind : Sufficient/  
Insufficient

- (f) Location :
  - (i) w.r.t. toilet : Satisfactory/  
Unsatisfactory
  - (ii) w.r.t. other rooms : Satisfactory/  
Unsatisfactory
- (g) Other Comments :
- 13. Kitchen :
  - (a) Size : Sufficient/  
Insufficient
  - (b) Working Platform : Provided/Not Provided
  - (c) Storage space : Provided/Not Provided
  - (d) Ventilation : Sufficient/  
Insufficient
  - (e) Other comments :
- 14. Toilet :
  - (a) Size : Proper/Improper
  - (b) Position of furniture : Proper/Improper
  - (c) Ventilation : Sufficient/  
Insufficient
  - (d) Location w.r.t. :
    - (i) Bed room : Satisfactory/  
Unsatisfactory
    - (ii) Drawing room : Satisfactory/  
Unsatisfactory
  - (e) Other comments :
- 15. Access to the Terrace : Desirable/  
Undesirable  
Provided/Not Provided
- 16. Other Rooms/Verandah/  
Open space : Specific comments
- 17. Defect and other  
inconveniences felt  
in the houses :

APPENDIX - 2.2

FORMAT FOR INFORMATION ANALYSIS

RESIDENCE TYPE -

GENERAL

Sl. No.	Particulars of Functional Aspects	QUESTIONNAIRE NO.									
		1	2	3	4	5	6	7	8	9	10

- |    |                   |                  |
|----|-------------------|------------------|
| 1. | LOCATION          | SATISFACTORY     |
|    |                   | UNSATISFACTORY   |
| 2. | PERIOD OF STAY    | LESS THAN A YEAR |
|    |                   | 1 TO 5 YEARS     |
|    |                   | ABOVE FIVE YEARS |
| 3. | FAMILY SIZE       | LESS THAN FOUR   |
|    |                   | FOUR             |
|    |                   | MORE THAN FOUR   |
| 4. | ACCOMMODATION     | SUFFICIENT       |
|    |                   | INSUFFICIENT     |
|    | (a) FLOOR AREA    | SUFFICIENT       |
|    |                   | INSUFFICIENT     |
|    | (b) NOS. OF ROOMS | SUFFICIENT       |
|    |                   | INSUFFICIENT     |
|    | (c) OPEN SPACES   | SUFFICIENT       |
|    |                   | INSUFFICIENT     |
| 5  | COMFORT           | THROUGHOUT   YES |
|    |                   | THE YEAR   NO    |



QUESTIONNAIRE NO.

Sl. Particulars of  
No. Functional  
Aspects

1 2 3 4 5 6 7 8 9 10

- |                              |                |  |  |  |  |  |  |  |  |  |
|------------------------------|----------------|--|--|--|--|--|--|--|--|--|
| 6. DISCOMFORT                | WINTER         |  |  |  |  |  |  |  |  |  |
|                              | SUMMER         |  |  |  |  |  |  |  |  |  |
|                              | MONSOON        |  |  |  |  |  |  |  |  |  |
| 7. SECURITY                  | SATISFACTORY   |  |  |  |  |  |  |  |  |  |
|                              | UNSATISFACTORY |  |  |  |  |  |  |  |  |  |
| 8. DRAWING/DINING            |                |  |  |  |  |  |  |  |  |  |
| (a) DRAWING/<br>DINING       | PREFERRED      |  |  |  |  |  |  |  |  |  |
|                              | NOT PREFERRED  |  |  |  |  |  |  |  |  |  |
| (b) SIZE                     | SUFFICIENT     |  |  |  |  |  |  |  |  |  |
|                              | INSUFFICIENT   |  |  |  |  |  |  |  |  |  |
| (c) SHELF                    | SUFFICIENT     |  |  |  |  |  |  |  |  |  |
|                              | INSUFFICIENT   |  |  |  |  |  |  |  |  |  |
| (d) LIGHT AND<br>VENTILATION | SUFFICIENT     |  |  |  |  |  |  |  |  |  |
|                              | INSUFFICIENT   |  |  |  |  |  |  |  |  |  |
| (e) ENTRY                    | PROPER         |  |  |  |  |  |  |  |  |  |
|                              | IMPROPER       |  |  |  |  |  |  |  |  |  |
| 9. ROOM                      |                |  |  |  |  |  |  |  |  |  |
| (a) SIZE                     | SUFFICIENT     |  |  |  |  |  |  |  |  |  |
|                              | INSUFFICIENT   |  |  |  |  |  |  |  |  |  |
| (b) STORAGE                  | SUFFICIENT     |  |  |  |  |  |  |  |  |  |
|                              | INSUFFICIENT   |  |  |  |  |  |  |  |  |  |
| (c) LIGHT &<br>VENTILATION   | SUFFICIENT     |  |  |  |  |  |  |  |  |  |
|                              | INSUFFICIENT   |  |  |  |  |  |  |  |  |  |
| (d) AIR<br>CIRCULATION       | SATISFACTORY   |  |  |  |  |  |  |  |  |  |
|                              | UNSATISFACTORY |  |  |  |  |  |  |  |  |  |

Sl. No.	Particulars of Functional Aspects	QUESTIONNAIRE NO.									
		1	2	3	4	5	6	7	8	9	10

**10. KITCHEN**

- (a) SIZE  
SUFFICIENT  
INSUFFICIENT
- (b) WORKING PLATFORM  
ADEQUATE  
INADEQUATE
- (c) CONVENIENCE  
YES  
NO
- (d) LIGHT & VENTILATION  
SUFFICIENT  
INSUFFICIENT
- (e) STORAGE  
SUFFICIENT  
INSUFFICIENT

**11. TOILET**

- (a) LOCATION  
SATISFACTORY  
UNSATISFACTORY
- (b) SIZE  
ADEQUATE  
INADEQUATE
- (c) LIGHT & VENTILATION  
SUFFICIENT  
INSUFFICIENT
- (d) POSITION OF FIXTURES  
PROPER  
IMPROPER

**12. ACCESS TO TERRACE**

- (a)  
PROVIDED  
NOT PROVIDED
- (b)  
DESIRABLE  
UNDESIRABLE

APPENDIX 2.3

STUDY INFERENCE TABLE (B.H.E.L. HARIDWAR)

GENERAL

Sl. No.	Particulars of Functional Aspects	Residence Type	% of Respondants				Average %	
			A	B	C	D		
1.	Location	Satisfactory	80	70	90	90	82.5	
		Unsatisfactory	20	30	10	10	17.5	
2.	Period of Stay	Less than a year	00	10	10	30	12.5	
		1 to 5 year	40	20	60	50	42.5	
		Above 5 year	60	70	30	20	45.0	
3.	Family Size	Less than four	00	40	60	20	30.0	
		Four	70	30	30	50	45.0	
		More than four	30	30	10	30	25.0	
4.	Accommodation	Sufficient	60	60	90	100	77.5	
		Insufficient	40	40	10	00	22.5	
	* Floor Area	Sufficient	50	60	90	100	75.0	
		Insufficient	50	40	10	00	25.0	
	* Nos. of Rooms	Sufficient	50	60	70	100	70.0	
		Insufficient	50	40	30	00	30.0	
	* Open Spaces	Sufficient	100	80	80	100	90.0	
		Insufficient	00	20	20	00	10.0	
5.	Comfort	Throughout the year	Yes	40	00	00	00	10.0
			No	<u>60</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>90.0</u>
6.	Discomfort	Winter	20	00	00	00	05.0	
		Summer	<u>60</u>	<u>60</u>	<u>50</u>	<u>70</u>	<u>60.0</u>	
		Monsoon	20	40	50	30	35.0	
7.	Security	Satisfactory	30	80	50	100	65.0	
		Unsatisfactory	70	20	50	00	35.0	

Contd...

Sl. No.	Particulars of Functional Aspects	Residence Type	% of Respondants				Average %
			A	B	C	D	

#### DETAILS OF ROOMS

##### 8. Drawing/Dining

* Drawing/Dining Preferred		40	50	60	30	45.0
Not Preferred		<u>60</u>	<u>50</u>	40	<u>70</u>	<u>55.0</u>
* Size	Sufficient	50	60	40	100	62.5
	Insufficient	<u>50</u>	40	<u>60</u>	00	37.5
* Shelf	Sufficient	40	70	80	100	72.5
	Insufficient	<u>60</u>	30	20	00	27.5
* Light and Ventilation	Sufficient	70	80	50	100	75.0
	Insufficient	30	20	50	00	25.0
* Entry	Proper	60	90	50	60	65.0
	Imporper	40	10	50	40	35.0

##### 9. Bed Room

* Size	Sufficient	70	60	40	80	62.5
	Insufficient	30	40	<u>60</u>	20	37.5
* Storage	Sufficient	40	20	60	80	50.0
	Insufficient	<u>60</u>	<u>80</u>	40	20	<u>50.0</u>
* Light and Ventilation	Sufficient	80	70	50	70	67.5
	Insufficient	20	30	<u>50</u>	30	32.5
* Air Circulation	Satisfactory	80	70	80	70	75.0
	Unsatisfactory	20	30	20	30	25.0

##### 10. Kitchen

* Size	Sufficient	70	50	90	100	77.5
	Insufficient	30	50	10	00	22.5
* Working Platform	Adequate	50	70	100	70	72.5
	Inadequate	<u>50</u>	30	00	30	27.5

Contd...

Sl. No.	Particulars of Functional Aspects	Residence Type	% of Respondants				Average %
			A	B	C	D	
* Convenience	Yes		80	80	60	100	80.0
	No		20	20	40	00	20.0
* Light and Ventilation	Sufficient		80	80	80	100	85.0
	Insufficient		20	20	20	00	15.0
* Storage	Sufficient		20	50	90	80	60.0
	Insufficient		<u>80</u>	<u>50</u>	10	20	40.0
11. Toilet							
* Location	Satisfactory		80	80	50	50	65.0
	Unsatisfactory		20	20	<u>50</u>	<u>50</u>	45.0
* Size	Adequate		80	60	40	80	65.0
	Inadequate		20	40	<u>60</u>	20	45.0
* Light and Ventilation	Sufficient		100	80	80	100	90.0
	Insufficient		00	20	20	00	10.0
* Position of Fixtures	Proper		70	90	40	30	57.5
	Improper		30	10	<u>60</u>	<u>70</u>	42.5
12. Access to Terrace							
* Access to Terrace	Provided		60	60	50	00	42.5
	Not provided		40	40	<u>50</u>	<u>100</u>	<u>57.5</u>
	Desirable		60	80	90	70	75.0
	Undesirable		40	20	10	30	25.0

STUDY INFERENCE TABLE (MATHURA REFINARY TOWNSHIP)

GENERAL

Sl. No.	Particulars of Functional Aspects	Residence Type	% of Respondants				Average %
			A	B	C	D	
1.	Location	Satisfactory	70	90	50	90	75.0
		Unsatisfactory	20	10	*40	*00	17.5
2.	Period of Stay	Less than a year	20	20	30	40	27.5
		1 to 5 years	20	30	50	50	37.5
		Above 5 years	60	50	20	0	35.0
3.	Family Size	Less than four	20	10	30	10	17.5
		Four	30	30	20	20	25.0
		More than four	50	60	50	70	57.5
4.	Accommodation	Sufficient	40	30	50	100	55.0
		Insufficient	<u>60</u>	<u>70</u>	50	00	45.0
	* Floor Area	Sufficient	20	30	50	100	50.0
		Insufficient	<u>80</u>	<u>70</u>	<u>50</u>	00	<u>50.0</u>
	* Nos. of Rooms	Sufficient	00	20	60	100	45.0
		Insufficient	<u>100</u>	<u>80</u>	40	00	<u>55.0</u>
	* Open Spaces	Sufficient	*30	50	100	100	70.0
		Insufficient	<u>60</u>	<u>50</u>	00	00	27.5
5.	Comfort	Throughout the year   Yes	40	00	00	20	15.0
		No	<u>60</u>	<u>100</u>	* <u>60</u>	<u>80</u>	<u>75.0</u>
6.	Discomfort	Winter	00	00	00	00	00.0
		Summer	<u>80</u>	<u>90</u>	<u>60</u>	<u>100</u>	<u>82.5</u>
		Monsoon	20	10	10	00	10.0
7.	Security	Satisfactory	90	80	80	90	85.0
		Unsatisfactory	00	20	00	00	05.0

Contd...

Sl. No.	Particulars of Functional Aspects	Residence Type	% of Respondents				Average %
			A	B	C	D	

#### DETAILS OF ROOMS

##### 8. Drawing/Dining

* Drawing/Dining Preferred		20	30	100	90	60.0
Not preferred		<u>80</u>	<u>70</u>	00	10	40.0
* Size	Sufficient	00	20	100	100	55.0
	Insufficient	<u>100</u>	<u>80</u>	00	00	45.0
* Shelf	Sufficient	00	00	00	00	00.0
	Insufficient	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100.0</u>
* Light and Ventilation	Sufficient	40	80	100	100	80.0
	Insufficient	<u>50</u>	20	00	00	17.5
* Entry	Proper	50	40	30	30	37.5
	Improper	<u>50</u>	<u>60</u>	<u>70</u>	<u>70</u>	<u>62.5</u>

##### 9. Bed Room

* Size	Sufficient	30	30	100	20	45.0
	Insufficient	<u>70</u>	<u>70</u>	00	<u>80</u>	<u>55.0</u>
* Storage	Sufficient	00	10	100	100	52.5
	Insufficient	<u>100</u>	<u>90</u>	00	00	47.5
* Light and Ventilation	Sufficient	90	90	60	100	85.0
	Insufficient	00	10	40	00	12.5
* Air Circulation	Satisfactory	100	20	20	100	60.0
	Unsatisfactory	00	<u>70</u>	<u>80</u>	00	37.5

##### 10. Kitchen

* Size	Sufficient	20	10	60	100	47.5
	Insufficient	<u>80</u>	<u>90</u>	40	00	<u>52.5</u>

Contd..

Sl No.	Particulars Functional Aspects	Residence Type	% of Respondents				Average %
			A	B	C	D	
	* Working Platform	Adequate	20	30	80	60	47.5
		Inadequate	<u>80</u>	<u>70</u>	20	20	47.5
	* Convenience	Yes	50	40	30	80	50.0
		No	<u>50</u>	<u>60</u>	<u>70</u>	00	45.0
	* Light and Ventilation	Sufficient	100	90	100	100	97.5
		<u>In</u> sufficient	<u>00</u>	<u>10</u>	<u>00</u>	<u>00</u>	<u>02.5</u>
	* Storage	Sufficient	00	00	00	40	10.0
		<u>In</u> sufficient	<u>100</u>	<u>100</u>	<u>100</u>	<u>60</u>	<u>90.0</u>
11.	Toilet						
	* Location	Satisfactory	30	20	50	20	30.0
		Unsatisfactory	<u>70</u>	<u>80</u>	<u>50</u>	<u>80</u>	<u>70.0</u>
	* Size	Adequate	100	70	60	80	77.5
		Inadequate	00	30	40	20	22.5
	* Light and Ventilation	Sufficient	100	100	100	100	100.00
		Insufficient	00	00	00	00	00.0
	* Position of Fixtures	Proper	90	80	60	20	62.5
		Improper	00	20	40	<u>80</u>	35.0
12.	Access to Terrace						
	* A	Provided	100	100	100	100	100.0
		Not provided	00	00	00	00	00.0
	* B	Desirable	100	100	100	100	100.0
		Undesirable	00	00	00	00	00.0



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