DESIGN CONSIDERATIONS FOR DEFENCE OFFICERS' RESIDENTIAL BUILDINGS

A DISSERTATION

Submitted in partial fulfillment of the requirements for the award of the degree of

MASTER OF ARCHITECTURE

By

AIJAZULLAH KHAN

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INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
ROORKEE - 247 667 (INDIA)

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CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in the dissertation entitled **'Design Considerations for Defence Officers' Residential Buildings'** in partial fulfillment of the requirement for the award of the degree of **MASTER OF ARCHITECTURE** submitted in the **Department of Architecture and Planning** of the Institute is an authentic record of my own work carried out during the period from Jul 2007 to Jun 2008 under the supervision of **Prof. S.Y.Kulkarni.**

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

Place: Roorkee
Dated: June 20, 2008

(AIJAZULLAH KHAN)

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

Dated: Jun , 2008

Prof. S.Y.Kulkarni
(Thesis Guide)
Deptt. Of Architecture & Planning
Indian Institute of Technology
Roorkee - 247667

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AU Khan

ABSTRACT

The important issue is to find the right kind of place for the right things to happen and the solution must be liked by majority. The "use factor" is the key to planning a more effective allocation of space in a home.

Every individual has individual styles of living that should be reflected in the design of homes. There isn't any "right" design or any formula for living. Each home must be planned uniquely.

Contemporary man no longer looks upon his house as just an abode ... rather; he views it as "home," his status symbol. The character of your home affects the quality of your life, your feelings about yourself, and other people's feelings about you. A comfortable and cared for home will improve your quality of life and promote a sense of well-being.

But there are certain masses like defence forces, due to high level of transfers can not satisfy the need of a house of their dream till their retirement, as they have to stay in residences constructed by government.

The defence forces are the symbol of India's honour and integrity. From 1947 when they came into existence till this very day they have been playing a key role in the defence of the land. Their sense of self sacrifice and-devotion to duty is really commendable.

Officers of defence forces are the most important appointment .They have to command their troop, their words motivate individuals to carry out the task which is not possible in normal circumstances.

This dissertation is an attempt to look in to the possibility of further improvement to residential buildings of defence officers of India by identifying issues which needs design consideration.

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CHAPTER -1
INTRODUCTION

1.1 INTRODUCTION

Contemporary man no longer looks upon his house as just an abode ... rather, he views it as "home," his status symbol, interpreting to himself that if and all the accompany it on his property depict to the world his position in life, indeed even his weaned.

The character of your home affects the quality of your life, your feelings about yourself, and other people's feelings about you. A comfortable and cared for home will improve your quality of life and promote a sense of well-being.

1.2 ABOUT DEFENCE OFFICERS

Defence officers are leaders on all fronts. The leader had to be.

"possessed of a sharp intellect, strong memory, and keen mind, energetic, powerful, trained in all kinds of arts, free from vice, capable of paying in the same coin by way of awarding punishments or rewards, possessed of dignity, capable of taking remedial measures against dangers, possessed of foresight, ready to avail himself of opportunities when afforded in respect of place, time and manly efforts, clever enough to discern the causes necessitating the cessation of treaty or war with an enemy, or to lie in wait keeping treaties, obligations and pledges, or to avail himself of his enemy's weak points, making jokes with no loss of dignity or secrecy, never brow-beating and casting haughty and stern looks, free from passion, anger, greed, obstinacy, fickleness, haste and backbiting habits, talking to others with a smiling face, and observance of customs as taught by aged persons".(*book" Indian army through the ages", by Lt. Col Gautam*)

The armed forces are the symbol of India's honour and integrity. From 1947 when they came into existence till this very day they have been playing a key

role in the defence of the land. Their sense of self sacrifice and-devotion to duty is really commendable

Defence officers of Indian forces i.e. army, navy and air force are selected intellectuals, which have courage to die for country, and can withstand in adverse situations.

These officers are sacrificing their comfort for our country by staying in LEH (extreme cold area), RAJASTHAN (extreme hot area)

1.3 HIERARCHY AND EQUIVALENT RANKS OF OFFICERS'

Hierarchy and equivalent ranks of officers in three services are as given in table no1.1

Table 1.1 *Equivalent ranks of defence officers*

Army	Navy	Air force
Lieutenant general	Vice admiral	Air marshal
Major general	Rear admiral	Vice air marshal
Brigadier	Commodore	Air Commodore
Colonel	Captain	Group captain
Lieutenant Colonel	commander	Wing commander
Major	Lieutenant commander	Squadron leader
Captain	Lieutenant	Flight Lieutenant
2 Lieutenant/ Lieutenant	Sub Lieutenant	Pilot officer/flying officer

Source: **scales of accommodation 1983 for defence forces**

1.4 MODERNIZATION OF DEFENCE FORCES

History of modern Indian Architecture in India is assumed to have begun with the arrival of Le Corbusier. Use of RCC changed the shape of architecture in India. A revolution that started with city planning, affected the planning of cantonments

also. After independence and formation of Pakistan the importance of army assumed new dimensions. Expansion of Indian army resulted in raising of new regiments and thus, more infrastructure for them. This infrastructure included offices, training areas, **residential areas**, etc

During 1950s major concern for Government and planners was standardization of areas depending on number of users and authorized strength of regiments. Building design and construction in post independence era were taken up by CPWD (Central Public Works Department) and MES (Military Engineers services). Both of these organizations had qualified architects to work on new designs and solutions for upcoming problems at that time. A major concern in all their work was the standardization and control of building environment. Over all concern for these designers was to adopt the international style with relevance to Indian context. Maintaining the ethos of army and still providing them with new and modern designs was a challenge for the designers of that time.

1.5 ROLE OF MES (MILITARY ENGINEERS SERVICES)

MES (Military Engineers Services) is the premier design and construction organization for Indian army. This organization has played a significant role in evolution residences from British period to the modern times. After looking into various aspects of residences and discussion at various levels MES made standard designs for residential buildings.

1.6 USER'S DISSATISFACTION

According to the statement by Hon'able Defence minister "it is very difficult, not only to attract selected intellectuals for defence forces but to keep them in forces" a statement published in Times of India. This situation aroused due to better jobs and salaries offered by multinational companies.

Despite 6^{th} pay commission, hike in salaries, rate of voluntary retirement has not come down. In such circumstances offering them better accommodation would be a step in increasing satisfaction level among the officers.

The problem at present is manifold. Where the world around has started racing with the modern culture and in persuade of glittering modern materials and comfort level the present residential buildings are lacking behind.

1.7 MAP MARRIED ACCOMMODATION (MAP)

1.7.1 INTRODUCTION

A cell specially to tackle deficiency of defence housing has been come in to force under E-in-Chief HQ New Delhi. Under this cell lot of improvement has been brought in specification of officers residences.

A detailed analysis of the requirement relating to construction of married accommodation has been carried out by the three services

This has revealed a total deficiency of 2.47 lakh dwelling units for the present.

The share of army being 1, 76,440 units while those of navy and air force wing 6,332 and 16,109 respectively.

1.8 THE NEED FOR STUDY

Officers of defence forces are the most important appointment .They have to command their troop and their words motivate individuals to carry out the task which is not possible in normal circumstances, so to create an impression on subordinate, down from the history defence head and officers where given lots of powers .these powers were given along with a big spacious house, servants, vehicles for pick up and drop from house to duty place .These facilities were given to create an impression among all concerned, and the officer should discharge his valuable services at the best .But present norms and standards for residences are missing this particular factor. This may be because of budget allotted for residences. One factor which is most important that these officers, due to high level of transfers they can not satisfy the need of a house of their dream till their retirement.

At present some of these officers' when they are commanding any unit may get independent type of bungalows as shown in PLATE – 1.

PLATE-1 ***An independent residence of commanding officer at Roorkee, shows elements to enhance status of the post***

1.8.1 PRESENT SCENARIO

Presently defence officers are being provided by residences but these residences are based on scales of accommodation 1983.design consideration for these residential buildings are not clear. This consideration could be space economy and, budget.

These residences are normally based on E- in -Chief NEW DELHI, line plans and are mostly with double storey, block of four configurations, but these plans are rigid in nature. Due to this configuration external

appearance of subordinate residences and officers residences have become more or less similar.

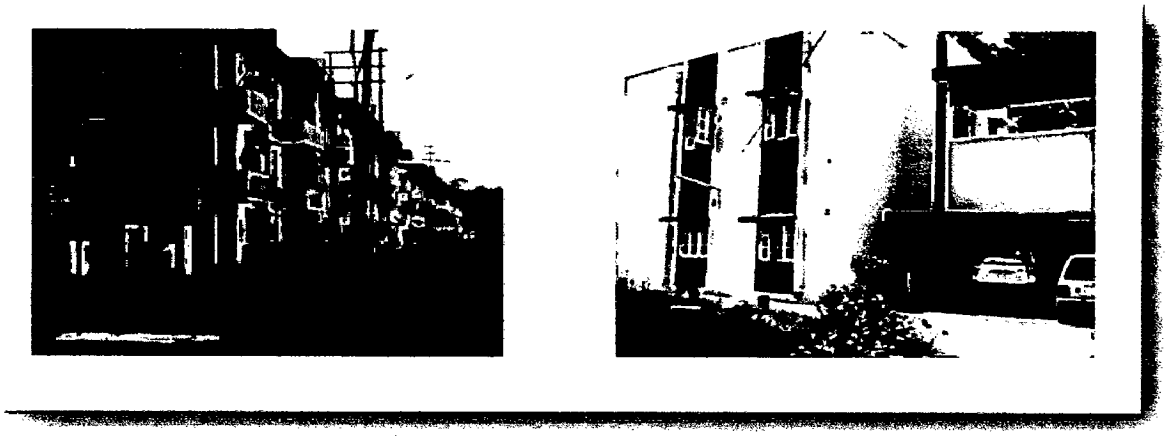


PLATE-2 ***(i) residence of subordinate, (ii) residence of officer at Roorkee, no visual difference***

1.8.2 AIM

To identify issues which need consideration for designing residential buildings of defence officers'

1.8.3 OBJECTIVES

1. Identifying needs of modern way of living
2. Understanding implication of the needs on design.
3. Case study and analysis of proto type design.
4. To suggest design and guidelines for defence officers residence as per present/ future demands/need

1.8.4 SCOPE AND LIMITATIONS

The thesis will be limited to the detailed study of existing defence officer's residences, type design of double story, block of four configurations. And to suggest design / guidelines as per present/ future demands.

1.8.5 METHODOLOGIES

Literature study, data collection from books, and other sources

Framing aim, objective and scope of study

Identification of issues need design consideration in light of literature

Case studies: analysis of existing residences in use and study of latest type designs developed for defence officers

Analysis and inferences from literature study and case studies

Recommendations and proposals

CHAPTER- 2

LITERATURE REVIEW

2.1 GENERAL

Literature review and compilation has been done in three heads

1. Development of present type design
2. various activity in a residence
3. Space requirement for activity
4. Design principle for various climate

2.2 DEVELOPMENT OF PRESENT TYPE DESIGN

2.2.1 INTRODUCTION

History of modern Indian Architecture in India is assumed to have begun with the arrival of Le Corbusier. Use of RCC changed the shape of architecture in India. A revolution that started with city planning, affected the planning of cantonments also. After independence and formation of Pakistan the importance of army assumed new dimensions. Expansion of Indian army resulted in raising of new regiments and thus, more infrastructure for them. This infrastructure included offices, training areas, **residential areas**, etc

During 1950s major concern for Government and planners was standardization of areas depending on number of users and authorized strength of regiments. Building design and construction in post independence era were taken up by CPWD (Central Public Works Department) and MES (Military Engineers services). Both of these organizations had qualified architects to work on new designs and solutions for upcoming problems at that time. A major concern in all their work was the standardization and control of building environment. Over all concern for these designers was to adopt the international style with relevance to Indian context. Maintaining the ethos of army and still providing them with new and modern designs was a challenge for the designers of that time.

2.2.2 INTRODUCTION TO SCALES OF ACCOMMODATION

One of the major advancement with the increasing demand of infrastructure was standardization and fixing of scales of accommodation in the army. These scales of accommodation there after became bible for the designers and planners in army for all of their future works.

Scales of Accommodation gives complete details of area and authorization depending on number of users for whom structure is to be designed. Not only area but Scales also provide details of extra features or furniture that are to be provided with a special type of building.

These scales of accommodation form basis for sanctioning a project by Government. Chapter-61of "Scales of Accommodation" gives out in detail scale of Officers residences for Indian Defence given below in table number 2.1

2.2.3 SCALES OF MARRIED ACCOMMODATION FOR OFFICERSRS

Table 2.1 *authorization of plinth area for various ranks in defence*

	RANK	MAIN UNIT		STAIR CASE	SERVANT QR		GARAGE	
		MD			MD		MD	
1.	2Lt/Lt/Sub/Lt/Plt	83.61		6.04	-		-	
2.	Capt/Lt/	83.61		6.04	22.30		20.90	

	Flt Lt							
3.	**Maj/Lt Comdr/Sqn Ldr**	**139.35**		**6.04**	**22.30**		**20.90**	
4.	**Lt Col/Comdr/Wg Comdr**	**139.35**		**6.04**	**22.30**		**20.90**	
5.	**Col/ Capt / Gp Capt**	**139.35**		**6.04**	**22.30**		**20.90**	
6.	**Brig/Comdr/ Air Commodore**	**139.35**		**6.04**	**22.30**		**20.90**	
7.	**Maj Gen/Rear/ Air Vice Marshal**	**139.35**		**6.04**	**22.30**		**20.90**	
8.	**Gen/ Vice Adm**	**139.35**		**6.04**	**22.30**		**20.90**	

Source: **scales of accommodation 1983, for defence services**

MES (Military Engineers Services) is the premier design and construction organization for Indian army. This organization has played a significant role in evolution residences from British period to the modern times. After looking into

various aspects of residences and discussion at various levels MES made standard designs for residential buildings.

2.2.4 Features of standard drawings by MES

These standard designs were used allover India in coming up cantonments .No changes were made in the drawings to suit the special requirements of site or users.

Various special features of residences designed by MES are given below:

a) For the first time grid system was adopted in planning of buildings.

b) RCC beam and column system was the construction system adopted for coming up buildings.

c) Flexibility in plan was not given importance so as to suit requirements of all type of users

e) Block of four ground floor plus first floor configuration is common for officers' residence.

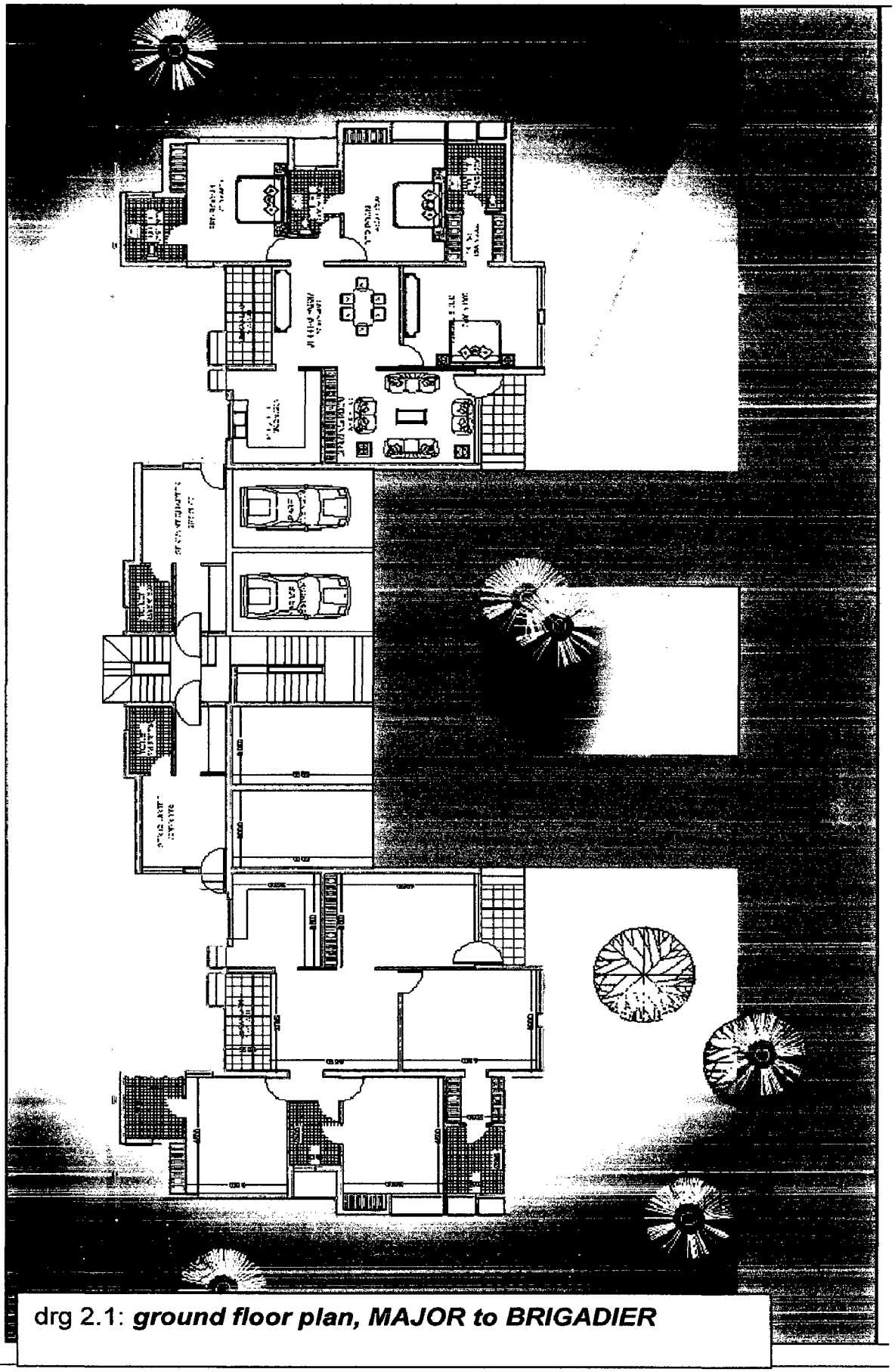
a) a big lawn to ground floor

b) a small terrace to first floor

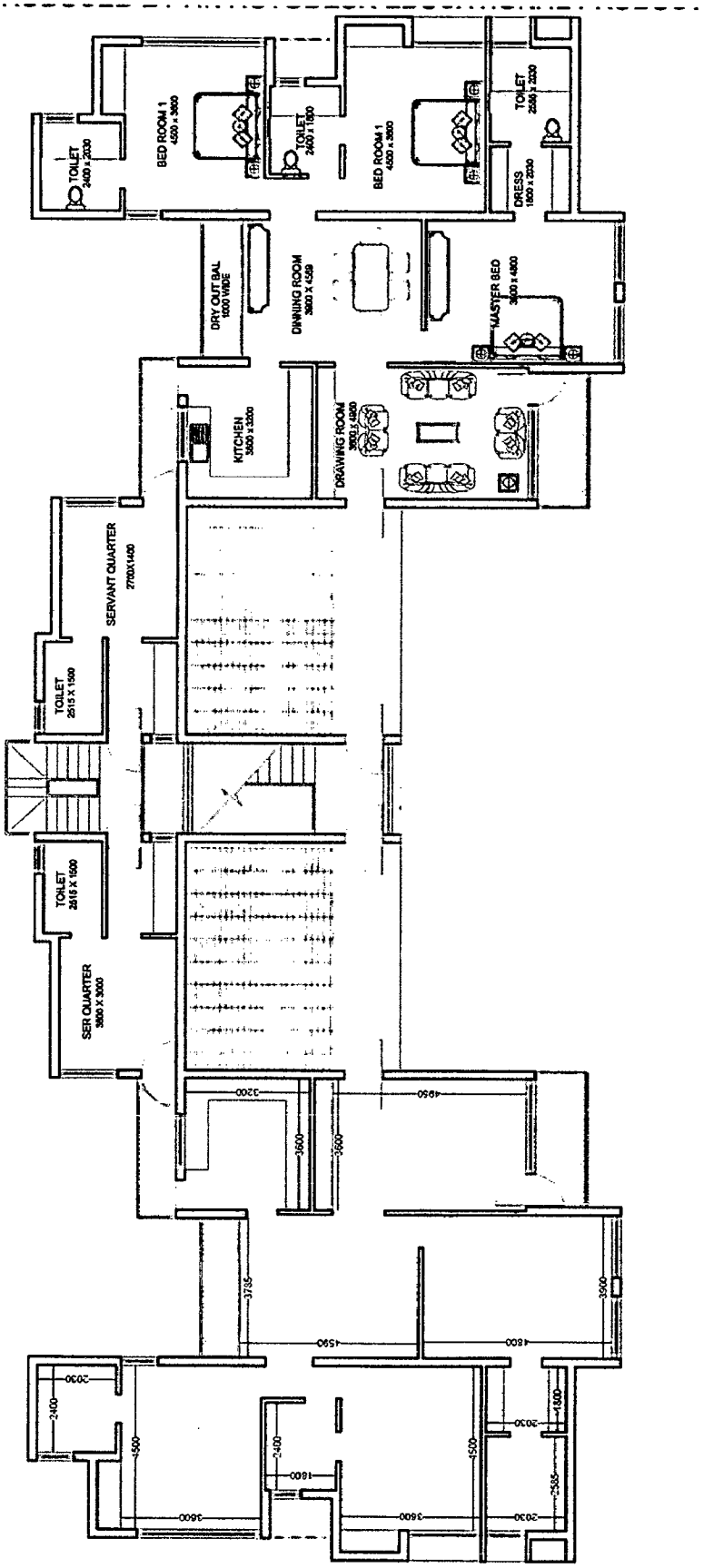
c) a common stair case serves two upper floor

d) a common gate

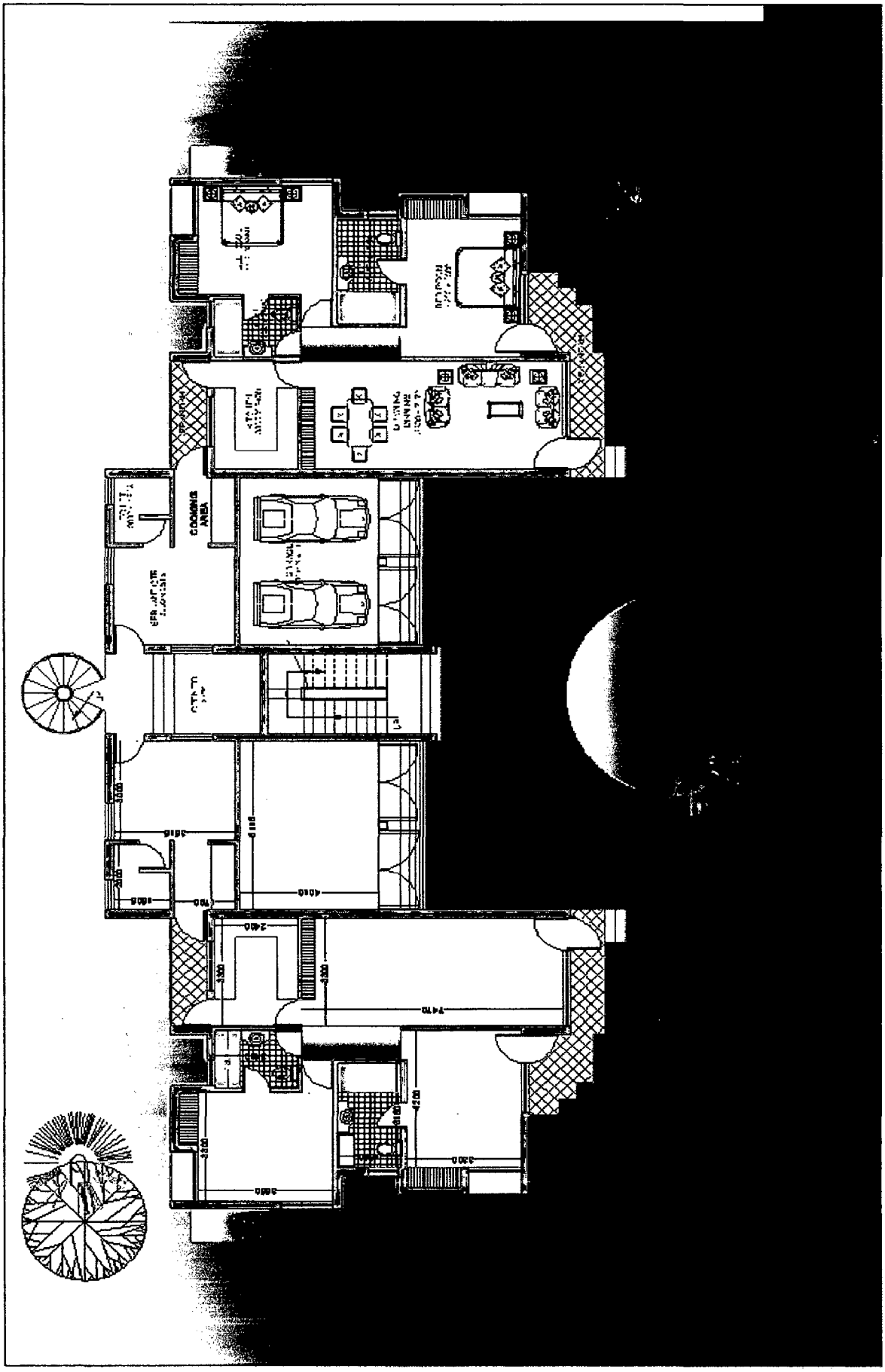
e) each unit have servant quarter



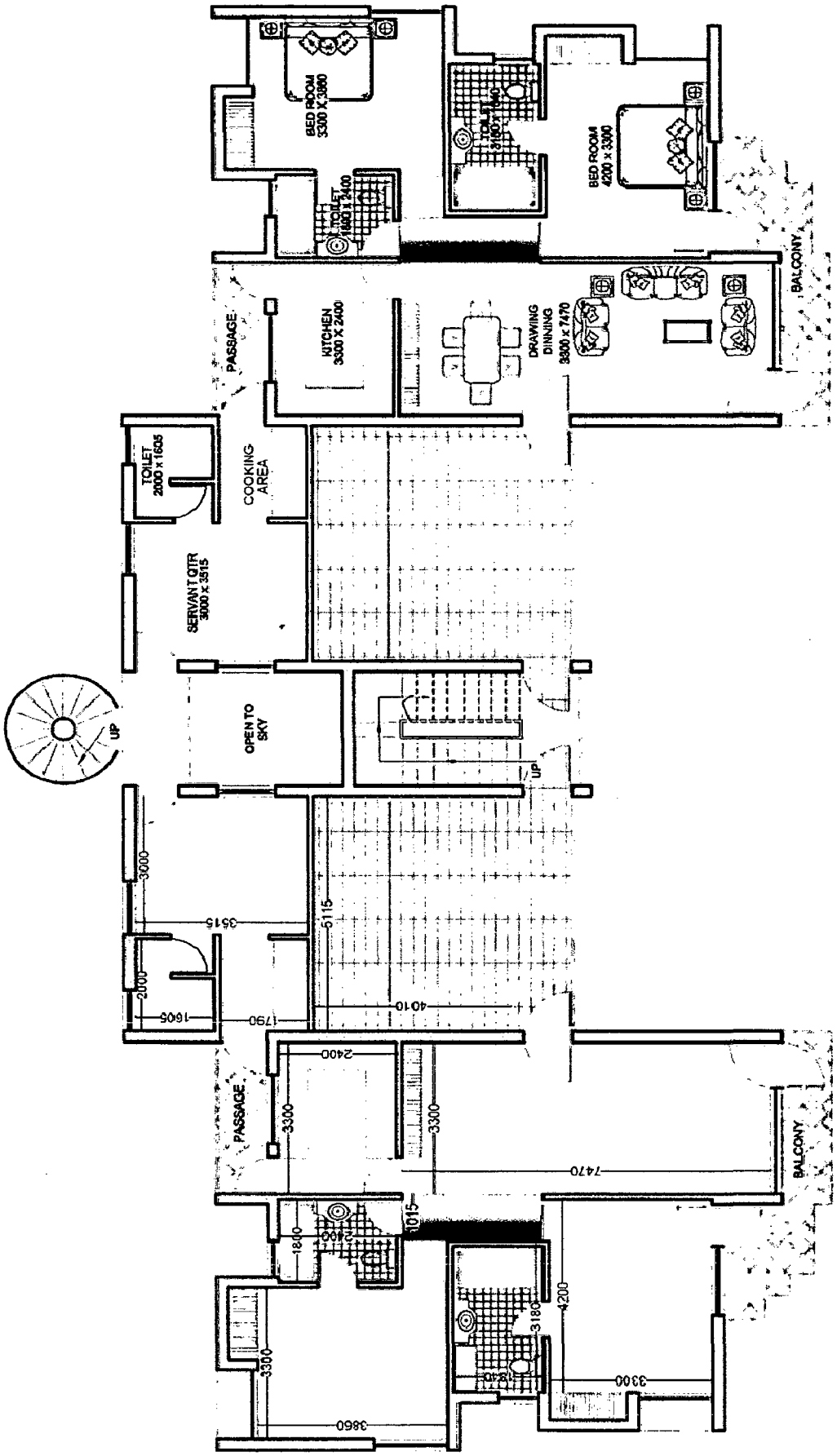
drg 2.1: ***ground floor plan, MAJOR to BRIGADIER***



Drg 2.2: ***first floor plan, MAJOR to BRIGADIER***



Drg 2.3: ***ground floor plan, CAPTAIN***



Drg 2.4: ***first floor plan. CAPTAIN***

2.3 VARIOUS ACTIVITIES IN A RESIDENCE

2.3.1 INTRODUCTION

The important issue is to find the right kind of place for the right things to happen and the solution must be liked by majority. The "use factor" is the key to planning a more effective allocation of space in a home.
"Without certain basic concepts, without being tuned into and aware of certain aspects of space and architecture, it's almost impossible to create a pleasing environment. Every individual has individual styles of living that should be reflected in the design of homes. There isn't any "right" design or any formula for living. Each home must be planned uniquely. The character of your home affects the quality of your life, your feelings about yourself, and other people's feelings about you."

For a space to be well designed and pleasing, nothing extraordinarily expensive or fine is needed. The relationship among the elements is what counts.

Study of traditional architecture of the region is necessary; you don't have to copy it, but to understand it. If certain architectural features and building materials have been used for a couple of hundred years, there may be some good reasons why.
The home has a great impact on the human being, an impact unquestionably more important than that of the any other place in the universe. The physical home provide privacy and intimacy, can encourage exploration, self determination, and creativity and can help to develop emotional harmony and love of beauty. A well designed house never a substitute for any other things, but it can provide right things to happen.

Some exciting new concepts in the field of biology, sociology, anthropology, psychology and building engineering technology can be explored. Many of these ideas remain at the theory level, but there is nevertheless an immense

amount of material to substantial each position. A scientific view of the man, the instinct the structure, the idea or the relationship through which man can integrate successfully with his environment.

The design of every house is an act of social importance. It influences the future trend of family living. By force of the environment it presses family life into one shape to another. The place to begin is not with the house itself but with needs of the persons who are occupy it.

Literature review has been done with a view to understand space requirement for different activity of residences.

The house comprises of various activities, these activities are interlinked with each other .According to an architect a " house is a machine to live in". like in machine every part has its place with reference to adjoining parts, any disturbance in one part will hamper normal functioning of machine.

In the same manner many activities take place in any residence. Space requirement and it's inter connectivity is very important for comfortable living. Both equipment and furnishing have their own requirements in terms of space when in use and when not in use, which form guidelines for dwelling design. Development of equipment and furniture which are functional in use, space-saving, and which, allow standardization and serial production are as much matters of research in housing and architecture as for the equipment and furniture industry. It is, after all, the interaction between the equipment and furnishing and the spatial dimension which is of paramount important to the designer as well as to the user.

Understanding these activities is essential before suggesting any improvement, in the light of literature. These activities can be, Leisure activities, Visiting, Preparing food, Eating, Sleeping, Storing

i. LEISURE ACTIVITIES

Resting, Talking, Visiting with guests, Reading, Lounging and smoking, keeping records, Doing needle-work, thinking, Displaying articles of interest, writing letters, Playing games.

ii. SOCIALIZATION

Conversation furniture typically includes a sofa with two end tables, coffee table, Rocker, and one or more chairs arranged in closed loop. Recommended distance between seats for comfortable conversation is 10ft.

iii. PREPARING FOOD

Planning, storing, and preparing food, washing utensils, waste disposal, preserving food.

iv. EATING

Pick-up meals, quick breakfasts, snacks, family-meals, dress-up meals, dinner parties, party refreshments, Large Luncheons, Holiday and celebrations.

v. SLEEPING

Napping, Night's rest, Caring for sick, Dressing, For ease in making the bed(s), residents prefer to place it so it is accessible from two sides and one end. A night stand is located at the head of a bed (between twin beds) upon which is usually found a table lamp, clock, medicines, and other personal items. The two bureaus along with a chair are typically clustered near the closet(S) to form a convenient dressing area.

vi. BATHING & DRESSING

Washing, cleaning and maintenance.

vii. STORING

Facilities adjacent to the place of the activities of the family for the equipment and supplies needed for these activities, as well as separate storage for the many articles not in active use

2.4 SPACE REQUIREMENT FOR ACTIVITY

Above mentioned activities need some specific space (three dimensional).
These spaces are living area, family room, kitchen, dining room, bed room, dressing, toilet, etc.

2.4.1 THE LIVING AREA

Is usually a focus for leisure activities in the home, whether you like to spend relaxing evenings in front of the television, need a play space for children, or a room for entertaining? Careful planning is required to create a space that can adapt easily to a variety of functions, and to ensure that different activities do not conflict. Think about who will use the space and how they will spend their time. Consider how you move around the room, and plan the layout so that the main door, windows, and furniture are easily accessible. Place occasional furniture where it can be fully utilized, such as next to a sofa, but avoids flow areas that need to be clear for access. A mixture of cabinets and open shelves can provide a range of storage options for books, games, CDs and other accessories, as well as for large items, such as a music system or television.

The living area is often the largest space in the house and also the most public room a reception area, where visitors can be entertained. As such, this

room has traditionally been used for formal display - a place where valuable items, such as paintings, antiques, and expensive furniture can create an impressive setting.

A home should have attractive and comfortable space for entertaining. Most effort and money goes into the living room. It's the showplace of the home, the place where people express their ambitions and sense of their own worth.

2.4.2 FAMILY ROOM

Family living areas are more than just a place for sitting down to talk or watch television. They are centers of activity used by different age groups for different things. To satisfy everyone's needs, create an environment with distinct zones, so that a range of leisure activities can be pursued unhindered. If the living area will be used by children and pets, combine function with style, and avoid furniture and furnishings that cannot be cleaned or replaced.

2.4.3 THE KITCHEN

"The kitchen is the most intensively used space in the home and the one place where we are spending more and more time. Thoughtful planning and careful design are therefore essential before you undertake any alteration or purchase any new equipment."

A well-designed kitchen will allow you to move smoothly from task to task in a logical sequence and to work comfortably, safely, and efficiently. It will also allow you to integrate a wide variety of appliances and equipment seamlessly into your living space. The key is to create a blueprint that incorporates every requirement for you and your circumstances, while allowing flexibility for future change.

A plain counter separating the kitchen and dining area is often a pleasant and convenient arrangement. The counter partially shields the view of the kitchen and is a good place for working and serving. Guests can bring over dishes

and glasses without having to squeeze through a door one by one and without getting in the way of the cook.

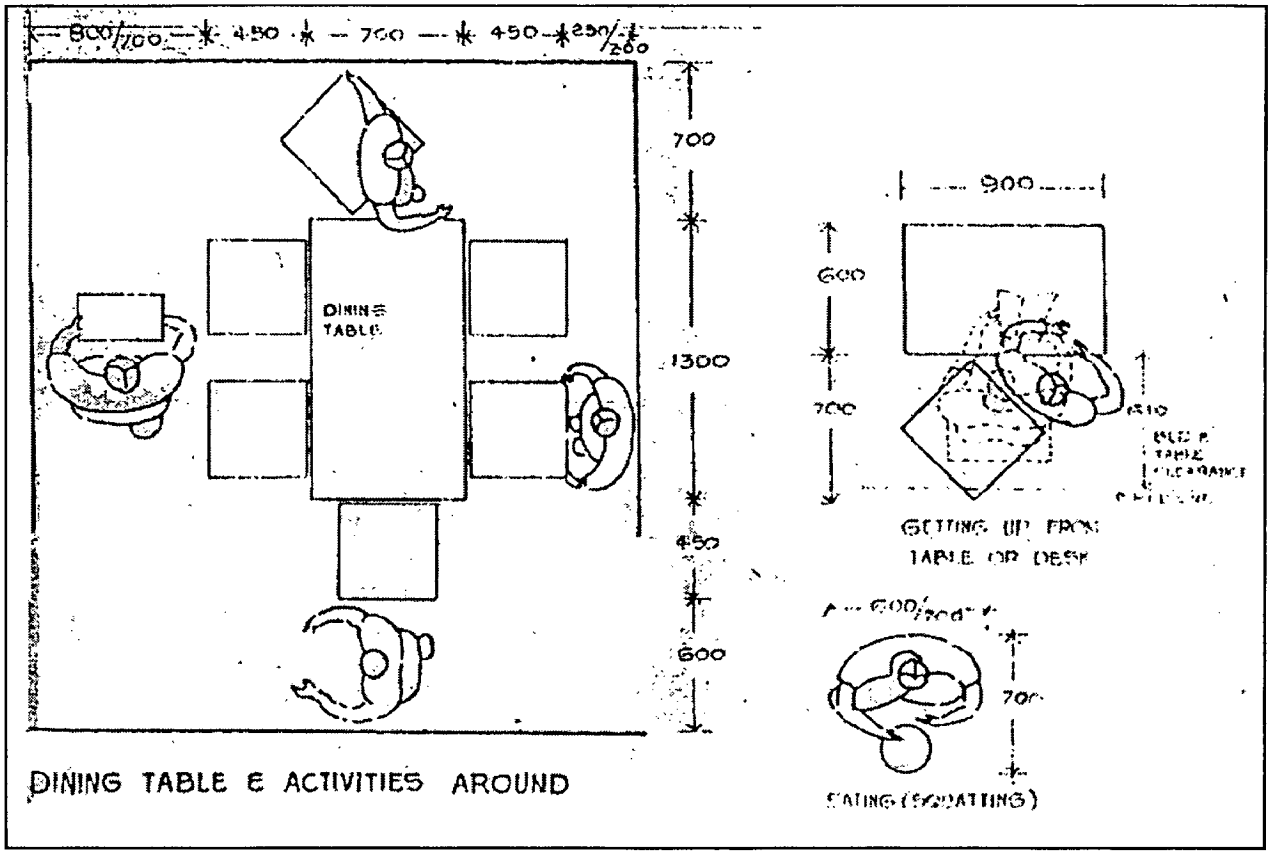


fig 2.1 : *dining table and activities around it*

2.4.4 .1 ERGONOMICS

When it comes to planning your kitchen, ergonomics is a key consideration. The most important rule here is the "work triangle," a concept worked out by ergonomic studies in the early 1950s (and based on research conducted in the 1920s to improve industrial efficiency) These studies showed that the overall distance between your sink, fridge, and stove - the three chief activity centers in the kitchen should not be too great. Since nearly all the manual labor done in the kitchen involves laps between the three, the objective is to make the distances between them comfortable. The study established carefully measured distances between these three primary

kitchen areas to optimize convenience and safety. Ideally, an imaginary line joining the sink, fridge, and stove should measure no more than 20ft in total, although the sides of the triangle can vary according to the size and shape of the room. However, the distance between each work zone should be at least 3ft. If the distances are too far, you will waste time and energy moving from one end of the kitchen to the other. If the distances are too short, working in the kitchen becomes cramped and uncomfortable.

Divide your kitchen into sectors. Start with the food storage area, which should include the fridge and ideally cabinets and a work surface for preparation. Next is the cooking area, where the oven and cook top should be flanked by counters suitable for placing hot pans on. The sink area should also include nearby storage for crockery and cutlery after washing the dishes.

The most important workspace in the kitchen lies between the sink and the stove, because that is where the most activity takes place. Situate the main food preparation area between the two - it should be the longest stretch of eye- level ovens.

2.4.5 BEDROOM

The bedroom is the first room you see in the morning and the last one you see at night so its style and atmosphere should promote a sense of wellbeing at all times. Unlike other communal areas, the bedroom is one room not on general view, where you can choose furniture and furnishings to please yourself Most of the time spent in a bedroom takes place during sleeping hours ,when you are oblivious to your surroundings. However, it is still important to create a room that ensures you enjoy every moment spent there.

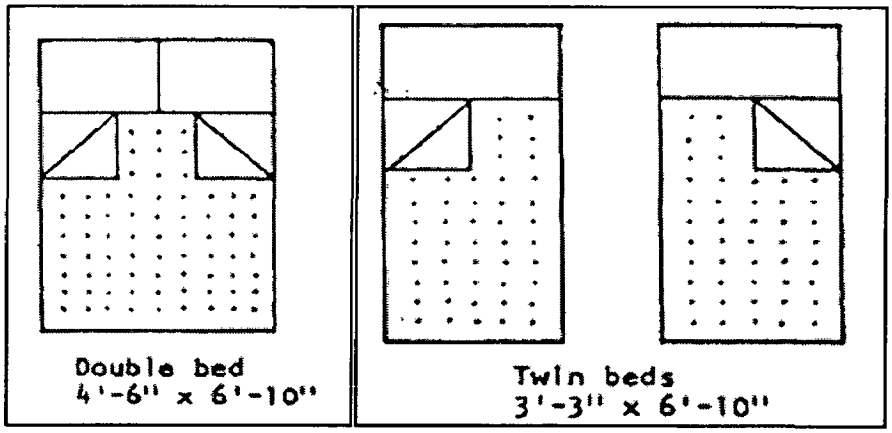


fig 2.2: *bed and sizes*

A century ago it was not uncommon for several children to share the same bed in top-to- toe fashion, or for parents to make provision in their room when the need arose. For the masses bedrooms were simply furnished and functional.

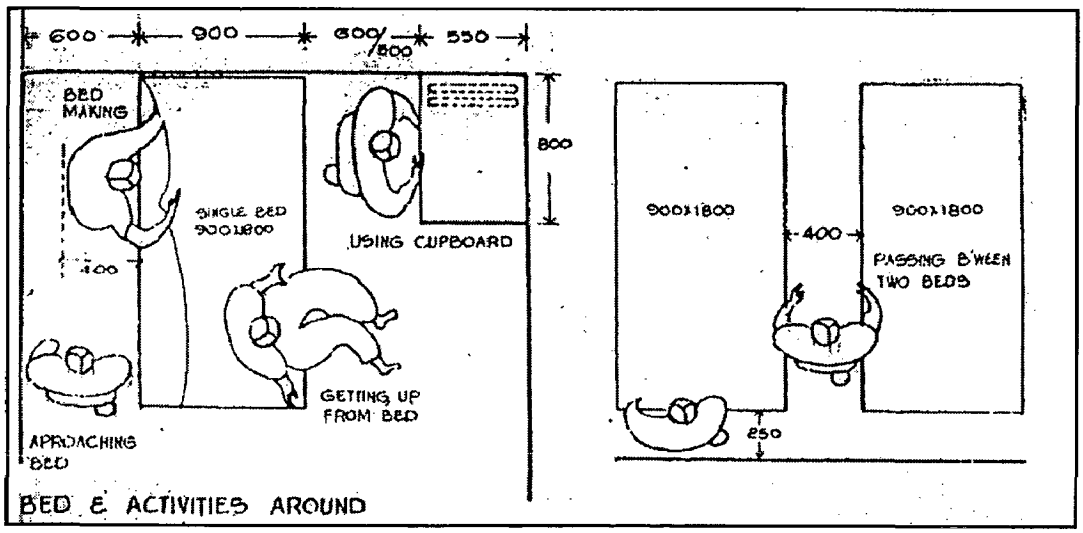
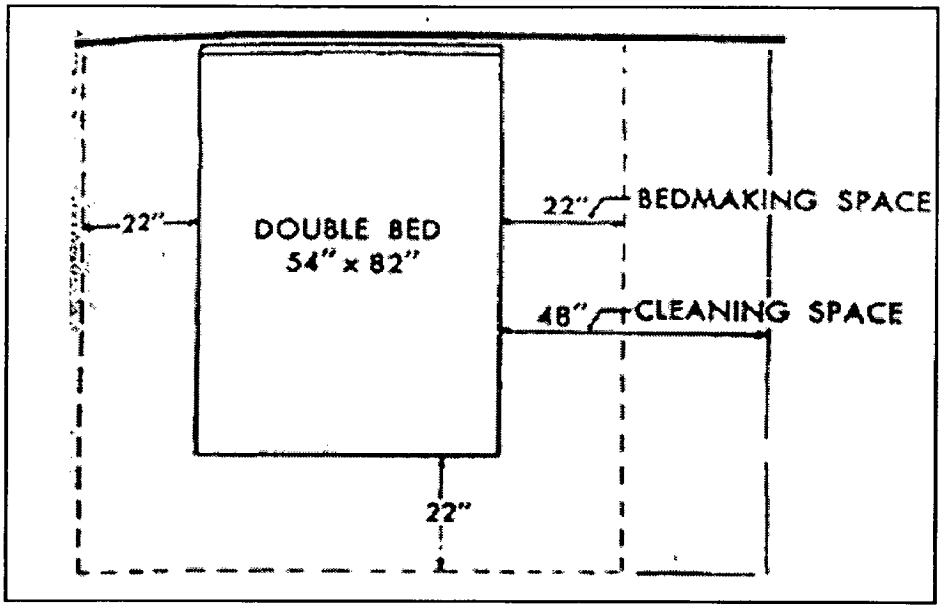


fig 2.3: *bed and activity around it*

Expectations are different now and the bedroom is considered a personal domain in which the highest standards of comfort and privacy are demanded. Space for fitted storage, en-suite bathrooms, and dressing areas are sought after in many homes.



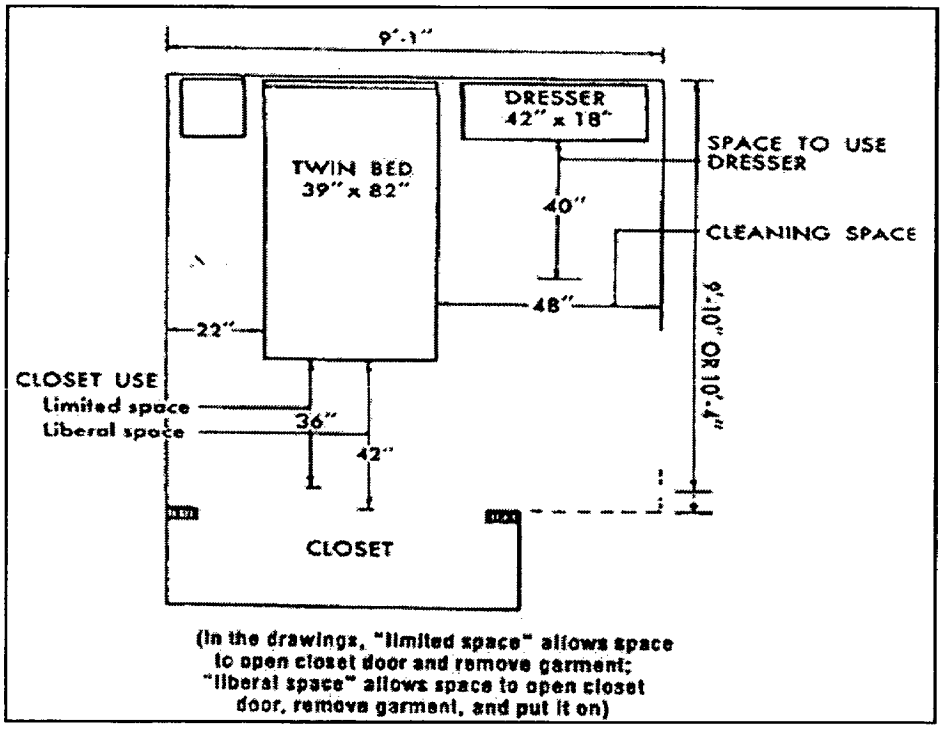


fig 2.4: *bed and space around it*

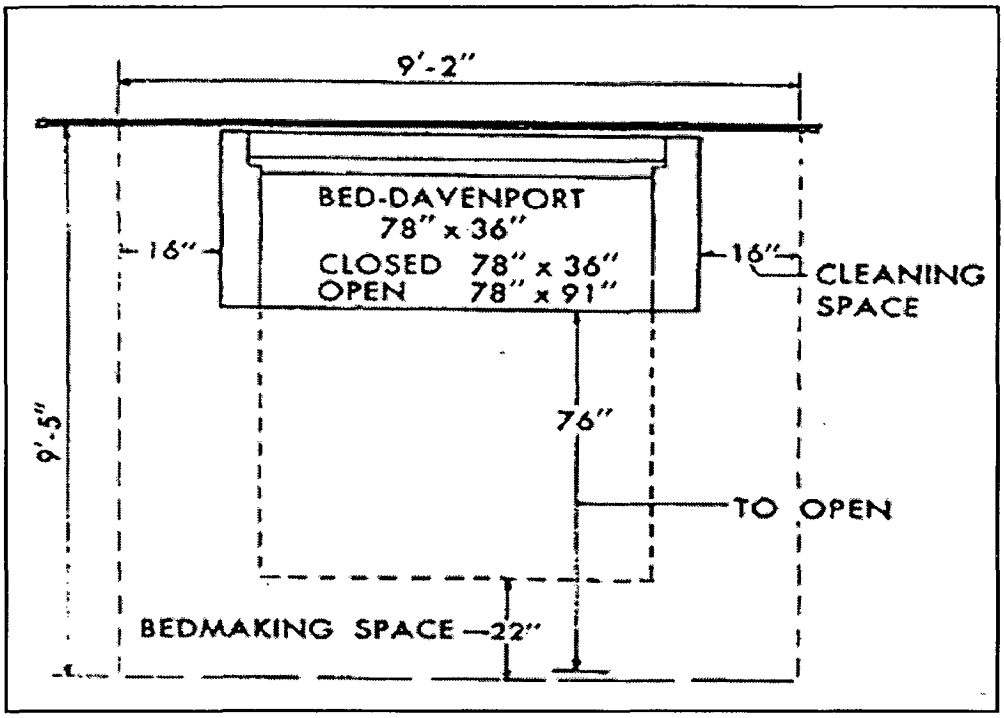


fig 2.5: *sofa cum bed and space around it*

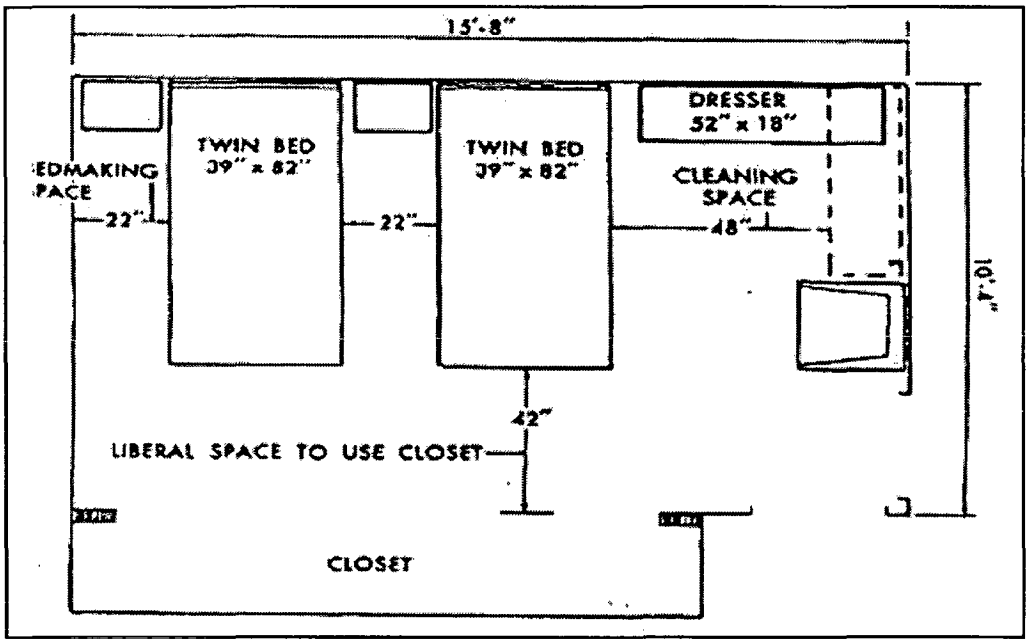


fig 2.6: *space requirement for bed room*

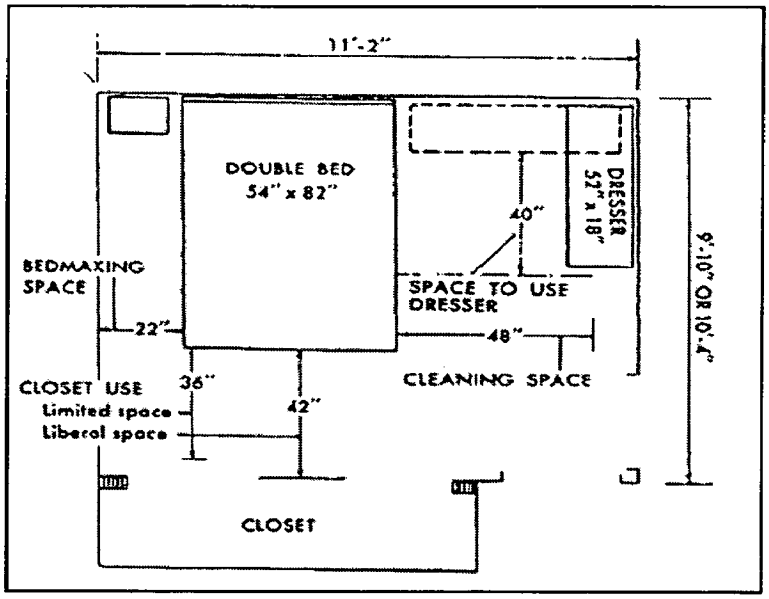


fig 2.7: *bed and space around it*

2.4.5.1 BEDROOM STORAGE

Plan storage facilities carefully and design the layout to enable easy access to the bed from either side. Clothes, shoes, cosmetics, books, and bedding will clutter up a bedroom quickly if there is insufficient storage or if the space is badly designed. Good storage enables you to keep possessions where they can be found in a hurry.

2.4.5.2 WALK-IN CLOSET

Walk-in closet set up like a small storage room with drawers, hanging rods and shelves is ideal, transparent drawers allow instant visibility for accessories, and high level shelves can be used for out of season storage. An absence of windows means less exposure to dust, but lighting must be good.

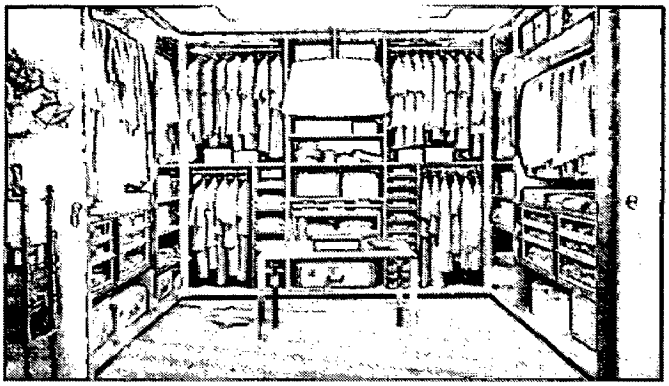


Plate 2.1: *dressing room*

2.4.6 STORAGE SPACE

Storage space needs as much thought and regular attention as the rest of the home. But it seldom gets it, probably because guests don't have to be shown the close.

Good storage is one of the best ways to improve household efficiency. Items that can be put away easily will also be quick to find. In each room, plan open shelves for everyday belongings and closed storage or cabinets for items that will clutter the room or attract dust. Make ancillary areas work for you by providing them with organized storage.

Some kinds of storage spaces aggravate the tendency of things to get lost. Chests and deep drawers are convenient only for keeping a few bulky items, such as blankets. Fill them with smaller items, like sweaters and scarves or papers and photo graphs, and unless what you want is right on top, you won't find it easily. And while you dig around, you make more of a jumble.

In most clothes closets, especially men's, there's relatively too much hanging space compared to shelf space, and even the hanging space isn't well planned. Often where there's only one rod, two will fit, one on top of the other. (Your longest garment determines the height needed for the bottom rod) The top rod can be used for out-of-season clothes. If the closet is deep, you may be able to fit one rod behind another.

2.5 LITERATURE FOR CLIMATE CONSIDERATION

2.5.1 GENERAL

Defence establishment is spread all over India, and hence residences of officers also. Presently due to standardization residences, are similar irrespective of local climate. Local climate has been the key factor in shaping and developing form as well as plan of residences. Local architecture is derived during course of time to achieve comfort against extremities of climate without much use depending upon artificial means of heating, cooling and ventilation. This part of literature has been compiled with a view to understand different climate prevailing in India, and to understand various elements to enhance comfort level of indoor so as to reduce load on artificial way of ventilation. This literature will help in accessing in formulation of guidelines.

2.5.2 INTRODUCTION

Provision of thermal comfort in buildings is an important consideration in the design of buildings for efficiency and well being of occupants.

2.5.3 CLIMATIC CLASSIFICATION

Classification of climate in respect of building design means zoning the country into regions in such a way that the differences of climate from region to region are reflected in the building design, warranting some special provision for each region. Based on these criteria, there are four major climatic zones,

1. Hot-dry
2. Warm-humid
3. Cold
4. Composite

A given station is categorized under a particular zone if its climate conforms to that zone for six or more months, otherwise it falls under the composite zone. A map of India depicting various climatic zones is shown in Figure below.

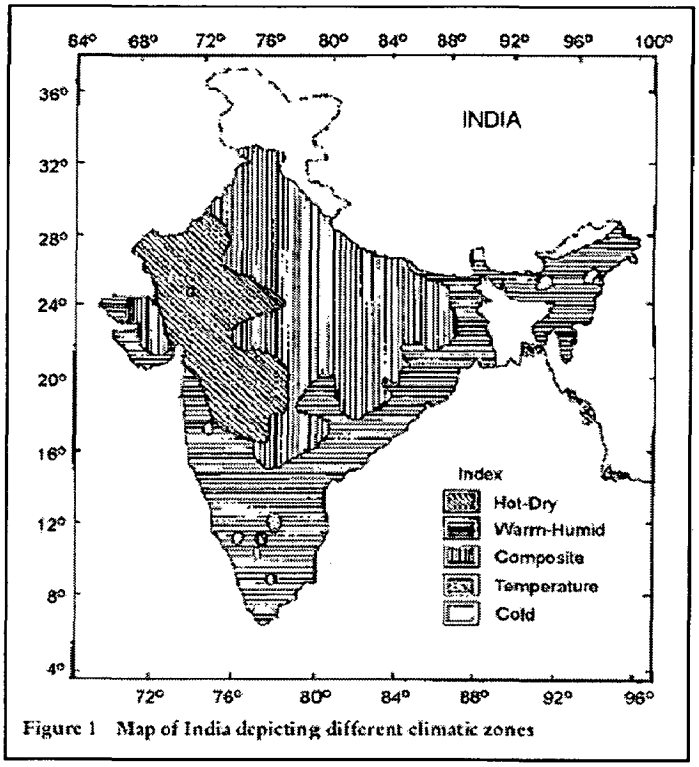


Figure 1 Map of India depicting different climatic zones

2.5.3.1 HOT DRY CLIMATE

a) FORM AND PLANNING

i) An enclosed, compactly planned and essentially inward-looking buildings should be planned for this type of climate. Surfaces exposed to the sun should be reduced as much as possible. Site conditions permitting, the larger dimensions of a building should preferably face north. And south, as these elevations receive the lowest heat loads from solar radiation.

ii) Non-habitable rooms (stores, toilets, etc.), can be effectively used as thermal barriers if planned and placed on the east and, especially, the west end of the building.

iii) Shading of roofs, walls and out-door spaces is critical. Projecting roofs, verandahs, shading devices, trees and utilization of surrounding walls and buildings are familiar techniques of solving this problem. There is a very great variety of possible shading devices and the prediction of their performance is a relatively easy task by using the solar charts and protractors or the heliodor.

iv) Care must be taken to use low thermal capacity materials for shading devices close to openings, to ensure their quick cooling after sunset.

v) By aligning buildings close to each other, especially if east and west walls are placed close together, mutual shading will decrease the heat gains on external walls. For this reason in hot-dry climates the tendency is to have close groups of buildings, narrow roads and streets, arcades, colonnades and small enclosed courtyards, in order to get the maximum amount of shade and coolness.

vi) The cost of a double roof, in the true sense of the term, would be in most cases prohibitive. However, a simple ceiling, with a ventilated roof-space would be almost as effective

b) EXTERNAL SPACES

i) Trees, plants and water in the enclosed space will cool the air by evaporation, help to keep dust down and provide shade, visual and psychological relief.

ii) The best external space in this type of climate is a small courtyard. Here a pool of cool night air can be retained, as this is

heavier than the surrounding warm air. The best external space in this type of climate is a courtyard. Here a pool of cool night air can be retained, as this is heavier than the surrounding warm air.

c) OPENING

The design of openings is governed by following requirements:

i) During the day the absence of openings would be most desirable or at least openings as small as possible, located high on the walls during the night the openings should be large enough to provide adequate ventilation for the dissipation of heat emitted by the walls and roof. A solution satisfying both requirements is the use of large openings, with massive shutters, with a thermal capacity approaching that of the wall.

ii) Surface treatment and the selection of surface materials will also influence the thermal behavior of the building and can help in reducing the heat load. Light colored or shiny external surfaces will reflect a large part of the incident solar radiation, thus much less heat will actually enter the building fabric. Undoubtedly the most critical part of the whole building surface is the roof.

iii) But it is also' the surface most exposed to the clear night sky; therefore it will most readily emit heat by radiation to outer space. The selection of roof surface materials will have the greatest effect, far more than that of the walls. Although a bright metal surface, such as an aluminum sheet, and a white painted surface both will absorb much less heat.

iv) For a vertical wall, which is opposed by other surfaces of buildings and ground at a similar temperature and accordingly

has little opportunity to emit any heat by radiation, the emittance value will be of little consequence; the use of a bright metal surface may give better results. Dark colored surfaces should in all cases be avoided.

d) VENTILATION AND AIR FLOW

i) Air intake openings should be located so that the coolest and most dust-free air is taken, and, if necessary, the air can be ducted to *the* points where it is needed. Thus the cool conditions existing at dawn can be maintained inside the building for the longest possible period.

ii) Ample ventilation at night, as we have seen, is necessary where the stored heat is to be dissipated. It will be an advantage if the indoor air stream at night can be directed so that it passes the hottest inside surfaces. As the hottest surface is likely to be the ceiling or the underside of the roof. It is advisable to have the top of the openings level with the ceiling.

2.5.3.2 WARM HUMID CLIMATE

a) MAIN CHARACTERISTICS

i) Air temperature remains moderately high, between 21 and 32.C, with little variation between day and night.

ii) Humidity is high during all seasons.

iii) Heavy cloud and water vapor in the air act as a filter to direct solar radiation; it is thus reduced and mostly diffused - but clouds also prevent re-radiation from the earth at night.

iv) High rainfall is favorable to the growth of vegetation. The plant cover of the ground reduces reflected radiation, and lessens the heating up of the ground surface.

v) Winds are generally of low speed, variable in speed, but almost constant in direction.

b) PHYSIOLOGICAL OBJECTIVES

i) Encouraging out-door breezes to pass not only through the building, but across the body surface of the occupants

ii) Radiant heat gain from the sun and sky should, be prevented.

c) KEY DESIGN PURPOSES

i) Because the humidity is high, air movement is crucial, to help perspiration to evaporate.

d) WE NEED

i) Open elongated plan shapes, with a single row of rooms to allow cross-ventilation.

ii) Windows opposite each other to allow cross-ventilation;

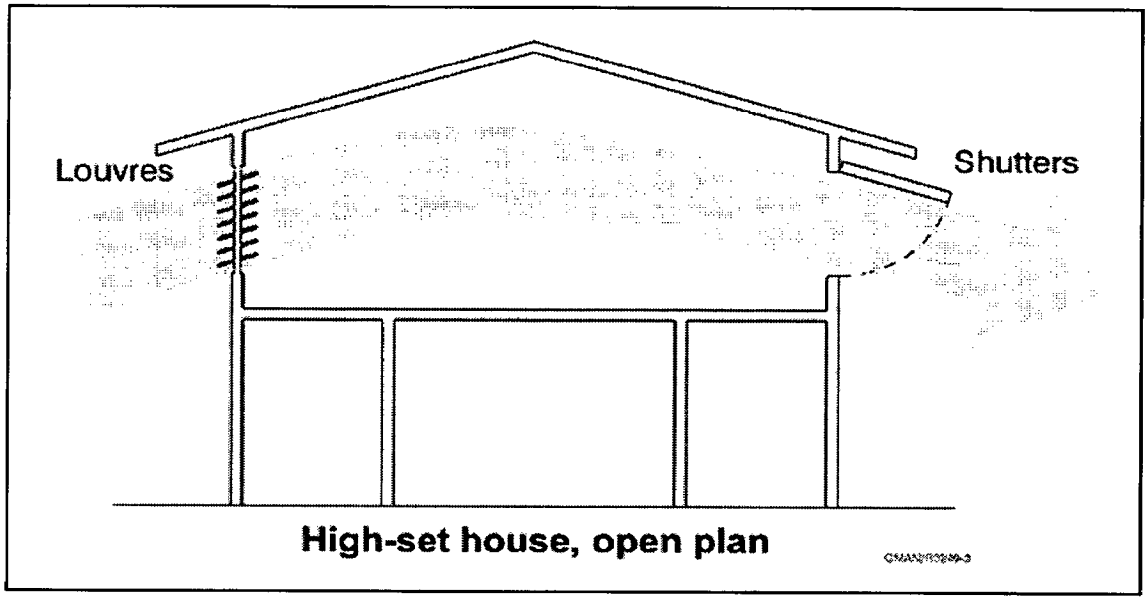
iii) Long, narrow floor-plan in sleeping zone, to maximize through ventilation in bedrooms;

iv) Open-plan living areas with high ceilings, to maximize air movement and reduce radiant heat to occupants

v) Choose window type for good airflow egg, louvers rather than awning/hopper windows

vi) Elevate house to catch the breezes (in areas prone to tropical cyclones, there is a trade-off - construction cost increases)

vii) Boundary fences should not block airflow (a low cyclone-wire fence is preferable to a high brick wall)



viii) Because the night-to-day temperature swing is rather small materials with heat-storage capacity such as bricks and concrete are of little benefit, particularly for bedrooms - a lighter house construction (timber, fibro) will cool quicker at night;

ix) Because the climate is warm all year, building heat gain should be minimized by:

- Orienting the long axis of the house east-west (if you cannot orient for cross-ventilation, The long north- and south-facing walls can easily be shaded by the eaves;
- Keeping windows on east and west walls to a minimum;
- Shading the walls and windows - use shutters, verandahs, canopies and/or eaves and fixed overhangs
- Using pale colors for walls and roof, to reflect the heat of the sun;

- Reflective foil insulation is good, because it reflects incoming sunshine, but bulk insulation is not desirable, because it prevents the house cooling down at night;
- Ventilation of the roof space, to reduce heat build-up there: the increased heat loss in the cooler season is not important
- Metal roofs which cool rapidly at night. Daytime heat gain can be minimized by using sheeting with a reflective coating on its underside

x) Because of the warm climate outdoor living areas (verandahs or under an elevated house) will be particularly useful. Shelter from the rain is needed in summer; shade is also desirable.

2.5.3.3 COLD CLIMATE

a) DESIGN PRINCIPLES

i) Minimal surface-to-volume ratio
ii) Insulation of all external surfaces is very important
iii) Small windows and openings, preferably double-glazed
iv) Annual solar gains through windows are generally less that associated heat losses
v) Use of exposed internal thermal mass
vi) Lightweight insulated structures are quick to heat up but also quick to cool,
vii) Heavyweight structures are slow to heat up and cool down.

b) MAJOR FACTORS DETERMINING ENVELOPE HEAT FLOW

i) Temperature differential, ΔT
ii) Area of exposed building surfaces, A
iii) Heat transmission properties, like U-value
iv) Thermal storage capacity

c) EFFECT OF THERMAL MASS

i) Delay heat transfer and store heat

ii) Important for intermittently heated spaces

2.5.3.4 COMPOSITE CLIMATE

Climates with changing seasons set a difficult task for the designer. Solutions suitable for one season may be unsatisfactory for others. Thermal design criteria recommended for hot-dry climates are applicable not only to the hot-dry season of composite climates, but also to the cold season, except for minor details. For the 'monsoon' or rainy season however, buildings should be designed according to the criteria of warm-humid climates, which would require entirely different solutions.

Comprises of three seasons:

1. Summer
2. Winter
3. Rainy

a) FORM AND PLANNING

i) Courtyard type buildings are very suitable.

ii) Buildings should be grouped in such a way as to take advantage of prevailing breezes during the short period when air movement is necessary.

iii) A moderately dense, low rise development is suitable for these climates, which will ensure protection of out-door spaces, mutual shading of external walls, shelter from the wind in the cold

season, shelter from dust and reduction of surfaces exposed to solar radiation.

iv) Houses with separate day and night rooms, which were suggested for hot-dry regions, are equally good for composite climates, except that they would only be used during the hottest months.

v) Shading of walls is desirable but not critical. Provided that the roof has a low transmittance value and a good thermal capacity, the question of a double roof does not arise.

vi) Thermal loading of roofs in hot-dry and cold seasons is reduced by outgoing radiation to the clear sky. External openings, however, do require shading during the hot and warm seasons.

b) EXTERNAL SPACES

i) A courtyard is the most pleasant out-door space for most of the year, because it excludes the wind and traps the sun. It should be designed in such a way as to allow sun penetration during the winter months, but provide shading in the hot season.

ii) Deciduous plants can serve a useful purpose. Courtyards may even be covered by a pergola, carrying deciduous creepers. These would provide shade in the hot season but admit the sun in the 'winter'.

c) ROOFS AND WALLS

i) The retention of night-time low wall temperatures is desirable in the hot-dry season only but the same thermal properties will be useful in the cold season to retain the heat of the day for the uncomfortably cold nights.

ii) Roofs and external walls should, therefore, be constructed of solid masonry or concrete, to have a 9 to 12 hour time-lag in heat transmission.

iii) The thermal capacity will be of advantage in both the cold and hot-dry seasons.

d) OPENINGS

Orientation of openings is determined by following factors:

i) Towards the breeze prevailing during the warm-humid season, to utilize its cooling effect.

ii) Towards the sun during the cold season, to utilize the heating effect of radiation entering through the windows.

iii) Reasonably large openings in apposite walls are suitable, preferably with solid shutters which can be opened when crass-ventilation is necessary, possibly during the warm-humid season or far evening cooling in the hot-dry season.

iv) The area of such openings should not normally (exceed the area of solid walling) the same elevation (Le. the walls facing the wind and the apposite). On the adjacent walls the windows (if any) should not occupy mare than about (25% of the total area).

Chapter 3

DESIGN ISSUES

3.1 INTRODUCTION

"In the fast changing life style it has become a challenge to handle sensitively a small scale project (residences).Development of modern equipment and furniture which are functional in use and space saving, form guidelines for residence design. It is, after all, the interaction between the equipment and furnishing and the spatial dimensions which is of paramount importance to the designer as well as to the user."[3.1](Dr Sk Mishara)

For designing any residence correctly understanding the needs of users are very important. The problem at present is manifold. Where the world around has started racing with the modern culture and in persuade of glittering modern materials and comfort level the present residential buildings are lacking behind.

For designing any residence users' involvement is very much necessary. But for designing residences of any government officials we have to understand present day need and there nature of job.

Today every body is trying to compact things, to achieve ***maximum in minimum***. The entire product designers are breaking their heads for compatibility of product and ease of handling. In such a fast changing world shape of defence officers' residences are still rigid compartments. Where as it should have, following considerations.

3.2 RELEVANT DESIGN ISSUES

Following issues need design consideration came to light during study.

3.2.1 STATUS OF DEFENCE OFFICERS

a. External form and typology of residences
b. Internal planning of residences

3.2.2 SOCIAL SYSTEM

a. Call on
b. Ladies meet

3.2.3 HIGH RATE OF TRANSFER

a. Store of packing boxes
b. Store of unwanted items

3.2.4. LOCATION OF DEFENCE ESTABLISHMENT

a. Different climate
b. Different local architecture
c. Different local material

3.2.5 AFFORDABILITY

3.2.7 UNKNOWN USER

3.2.6 MAINTENANCE

3.2.1 STATUS OF DEFENCE OFFICERS

3.2.1.1 INTRODUCTION

Officers are considered to be the leader on all fronts, whether it is war or peace time. The officers have to set an example on all fronts. This elite lot has to be treated in way which has to show grandeur, richness and manners even in the rest time

Indian defence officer's residence should epitomize the art of graceful, dignified and aesthetic living. Customs and traditions in Army may look trivial to a civilian and out of tune with present time. But these have since times immemorial acted as a unifying and driving force which motivates an individual to rise to the occasion for protecting the honour and interest of his regiment, arms or service and the nation.

3.2.1.2 HOUSE TYPOLOGY

a. EXTERNAL FORM AND TYPOLOGY OF RESIDENCES

Due to pressure on land and increased no of officers during 1950s, major concern for Government and planners was standardization of areas depending on number of users and authorized strength of regiments.

New form of officers buildings came into existence i.e. double storeyed block,four residences in one block, with a common staircase. Few officers were provided with Appointment Houses i.e bunglow type of residences,for commanding officer, commandent, deputy commandent etc. Rest of the officers of the unit were provided flat type residences.

First of all due to this type of arrangement status of officers was hurt.Officers residences appeared same as subordinates except for few features e.g dining area,attached toilet to one bed room and garage whole unit was same externally as well as internally.

b. INTERNAL PLANNING

Due to rigidity in planning and flat type buildings no scope has been left for change in volume of certain rooms to give grendus effect.

3.2.2 SOCIAL SYSTEM

a. Call on

As defence officers get their postings in every 2-3 years. When they arrive at new station they have a system of calling on. They become acquainted with their colleagues by calling on and arranging social get to gathers and small parties. Hence the need arises for the space for social gathering. These gatherings are very formal in nature.

b. Ladies meet

There is a culture of arranging a meeting of officer's wives once in a month, so that they should come to gather. In such type of parties they arrange certain games like tambola etc. and have snacks and tea at the end of meet

3.2.3 HIGH RATE OF TRANSFER

High rate of transfers need spaces for packing, unpacking of house holds .space for storing unwanted items gathered at earlier station e.g. winter cloths and appliances not required in hot climate areas ,summer appliances etc.
Due to frequent transfers they have there own set of packing boxes. These packing boxes need proper store space.

3.2.4 LOCATION OF DEFENCE ESTABLISHMENT

Architecture of any region depends upon its local climate, local material, and local construction technology, but defence officers residences are more or less similar irrespective of its location.

Defence establishments are spread all over India. There is a wide variation of climate and locale architecture in India. So following consideration for designing defence officers residences should be considered.

a. Different climate
b. Different local architecture
c. Different local material

3.2.5 AFFORDABILITY

Due to affordability and living with pride, defence officers normally accumulate latest gadgets available in market. These electronic gadgets and domestic appliances have inspired people for aspirations and better quality of life. The increased buying capacity and consumerism has given rise to newer type of space requirements which need rethinking for design of RESIDENCE.

3.2.6 UNKNOWN USER

Though it is clear, the residences are for defence officers' according to their entitlement. But these officers are having different family structure, some may have to accommodate their parents, some may have grown up children. Hence requirement of spaces changes person to person

3.2.7 MAINTENANCE

Defence is not only providing residences to officers but also taking responsibility of maintenance of it. Hence design consideration from point of ease of maintenances is an important issue. Many reforms have been carried out by framing policies for maintenance. Still problem of leakage and seepage persist.

3.2.7.1 LEAKAGE AND SEEPAGE ISSUES

a. From over head water tank
b. From roof in rainy season
c. Through wet area i.e. toilets and kitchen

a. OVER HEAD WATER TANK

Leakage and seepage through over head water tank has been taken care by adapting HDPE tanks.

b. **ROOF**

Leakages through roof are reduced considerably by adapting 3-4 layer of water proofing treatment. But still this problem can be further reduced by adapting sloping roof with roof till on it.

c. Leakage and seepage through toilet

General

Toilets are very important activity area of any house whether it is one room kitchen or multi-bed room house. Being wet area of house toilets are prone to

leakage and seepage. If not maintained in time may lead to dirty look of building, life of building also get affected and unhygienic condition may develop. It is like that *"a stitch in time saves nine"* this is true for private buildings where owners are taking care right from the construction stage to day to day use.

Situation of maintenance is different in government organization because of procedures and maintenance fund allocation; the suggestion mentioned below is for the residences, which have mass repeated type of accommodation units.

FACTORS RESPONSIBLE

Despite having excellent procedure of building construction, maintenance, supervision, and availability of water proofing treatment govt. residential buildings are facing problem of leakage and seepage.

i. **Attitude:** attitude of the users is a very important factor to curb this problem .As any leakage needs quick repair but many a time report of leakage are not launched in time because user of the building is going to stay for only two to three years and he do not want to hamper his stay for repair work.

ii. **Departmental procedure:** Due to financial matter, engineering unit has certain procedure for repair, depending upon financial involvement hence paper work takes some time to start repair, this delay exaggerates the problem

iii. **Contemporary materials in toilet construction:** The basic building materials are brick, cement mortar etc. due to varying temperature during different seasons these materials have a tendency to expand and contract leaving cracks. These cracks act as capillary for smallest leakage in supply water system or wastewater disposal pipelines. If not rectified in time may lead to serious damage to the structure. Constant increased dead load of the wall due to seepage may develop

cracks in the beams supporting wall .These cracks allows penetration of water up to reinforcement resulting rusting and further damage to structural member of building which makes building beyond economical repair.

iv. **Location of toilets in building:** Generally in all type of officers' residences the configuration is two bed room, kitchen, living, toilets. If toilets attached as shown in Fig.1. The red color shows extent of dampness in adjoining areas.

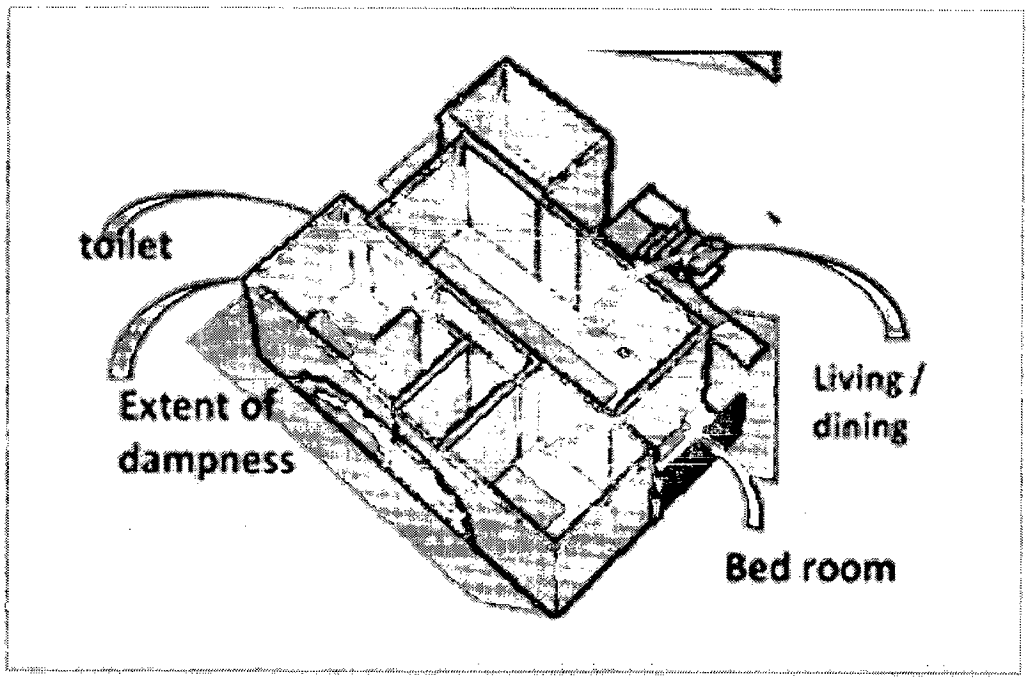


fig.3.1 showing location of toilets, and extent of dampness in a residential building

Findings: The conditions of any government residential building is good from all sides except the portion where toilets are located. The portion of toilet is mostly damp and dirty with plaster peeling off and patches showing themselves. Whole maintenance money goes for the maintenance of toilets. Further for any repairs to be carried out during the use of building, it disturbs the whole lot of users of that particular building. The reason being, the material and technique used for toilets like embedded plumbing and water supply pipes if to be repaired has to be first exposed from walls and floors. Then after repair it has to be sealed in a proper manner taking a lot of considerations like sealed joints and properly plastered surfaces.

Above identified issues will dictate the guidelines and proposal for any residence to be constructed for defence officers of Indian defence forces.

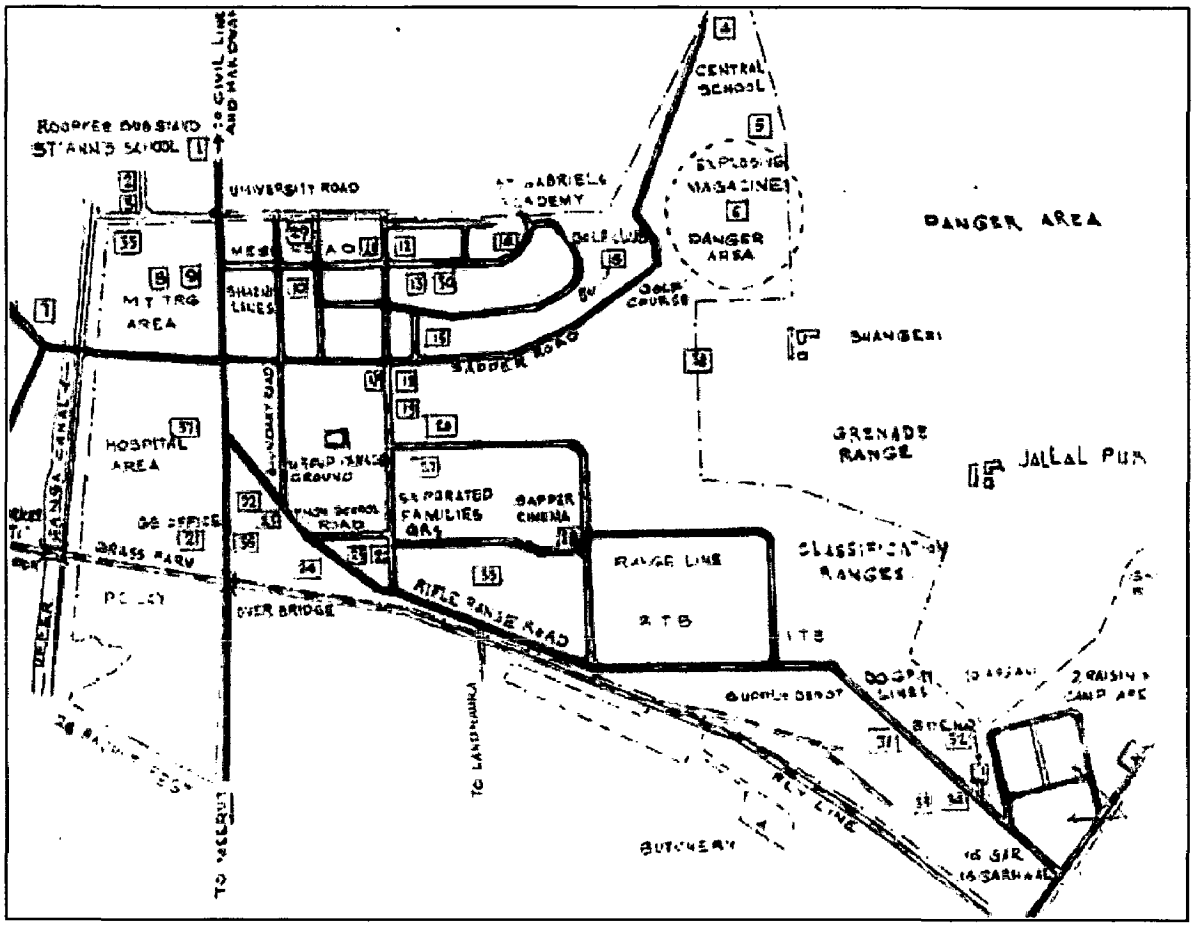
CHAPTER 4

CASE STUDY

4.1 BENGAL ENGINEER GROUP ROORKEE (BEG & C)

4.1.1 A SHORT HISTORY

The history of the Bengal Engineer Group is 200 year old, one of the three Groups of the Corps of Engineers. 1803 - Bengal Pioneers were raised at Kanpur. In 1819 the Bengal Sappers & Miners came into existence. Though the name has changed several times, the two favorite unofficial names are 'God's Own' and 'Roorkee Safar Maina. 1853 The HQ moved to Roorkee and has been here, since.



drg 4.1: BEG, Roorkee location plan
Source: GE (MES), Roorkee

4.1.2 LOCATION

Bengal Sappers is located 168 Kms from Delhi, 70 Kms from Dehradun. 28 Kms from Haridwar and 40 Krns from Saharanpur.

4.1.3 ABOUT EXISTING BLOCKS

a. CONFIGURATION

Maximum blocks are of four units, and the structure is 2 storey high. Big lawns have been provided for the housing units at the ground floor as compared to the small terrace for the units at first floor.

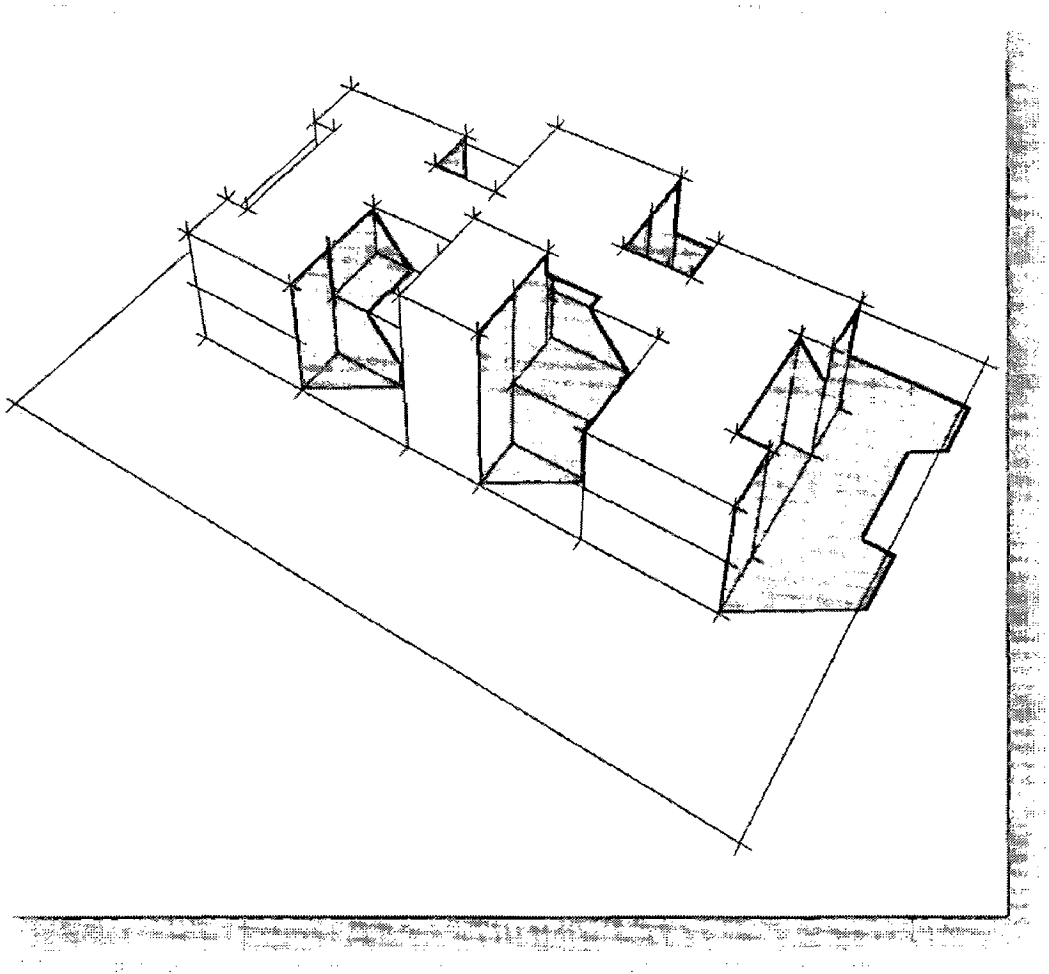


Plate 4.1: Sketch of blocking in of residences
Source: By Author

b. FEATURES

i) While designing and placing the building blocks on the site no considerations for climate have been taken care off. The blocks have been just placed randomly aligned to the roads.

ii) No considerations have been given for the use of locally available material in the construction to reduce the cost of construction.

iii) Absence of the local construction technologies in these housing units is prominent, by incorporation some of those technologies the aesthetics and the cost of these buildings can be improved considerably.

iv) Every province has some of its unique architectural features and elements woven in the fabrics of the buildings of that area. These elements and features depict the honor, pride and the unspoken glory of its past. So by incorporating some of the local architecture in to these buildings, these buildings can be made more historic as well modern at the same time.

v) Attractive forms should be evolved for these buildings. At present the basic unit is mirrored and a staircase is placed in between. Lack of attention on the overall built form of the building blocks.

Such type of housing have advantages as well disadvantages. Few of them are mentioned below.

c. ADVANTAGES FOR GROUND FLOOR UNITS

Such type of housing have advantages as well disadvantages.

i) linkages with nature

ii) Big lawn for gardening

iii) Transition of spaces

iv) Thermal comfort

v) Easy to install A/C and air cooler

vi) Convenient for old age parents

vii) Convenient for kids

viii) Useful outdoor space for all seasons

d. DISADVANTAGES FOR GROUND FLOOR UNITS

i) Big out door space difficult to maintain

ii) Noise nuisance from first floor

iii) Privacy problem if abetting to any busy road of cantonment

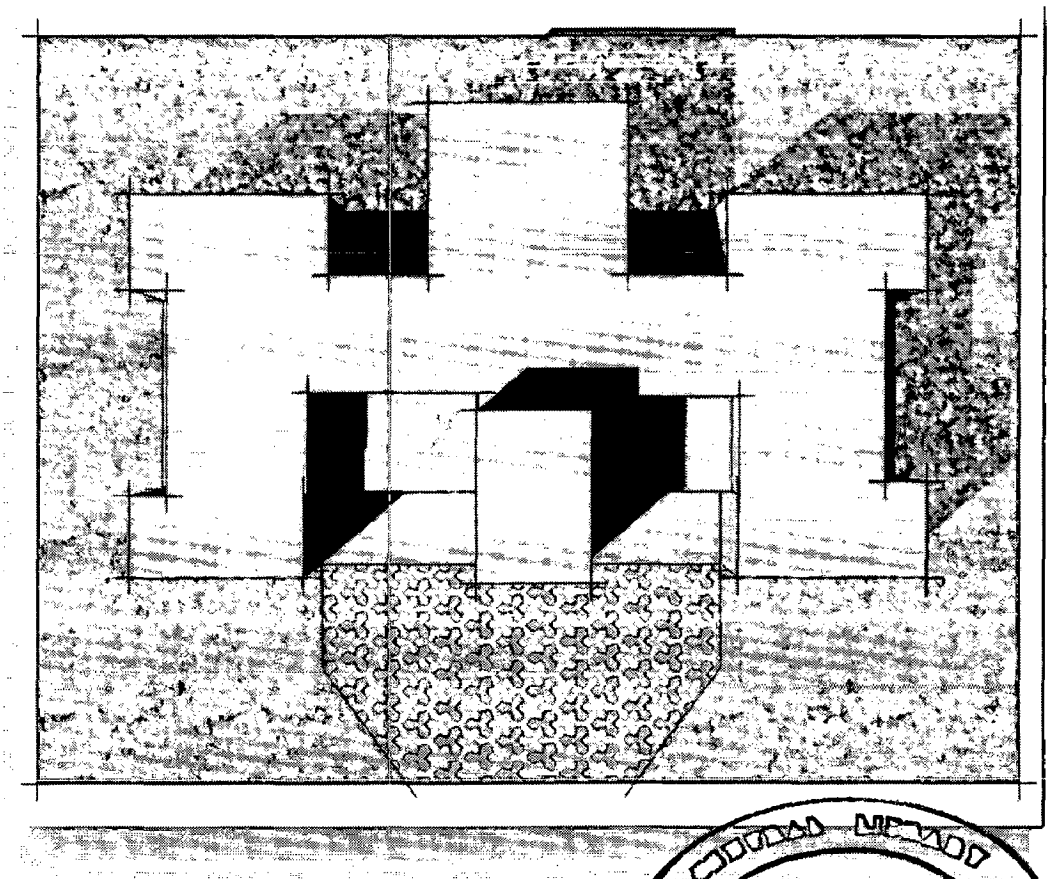


Plate 4.2: Sketch of siting
Source: By Author

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e. ADVANTAGES FOR FIRST FLOOR UNITS

i) Big out door space difficult to maintain

ii) No noise nuisance from first floor

iii) No privacy problem if abetting to any busy road of cantonment

f. DISADVANTAGES FOR FIRST FLOOR UNITS

i) No linkages with nature

ii) Small terrace not sufficient

iii) No transition of spaces

iv) No thermal comfort

v) Difficult to install A/C and air cooler

vi) Not Convenient for old age parents

vii) Not Convenient for kids

viii) No Useful outdoor space for all seasons

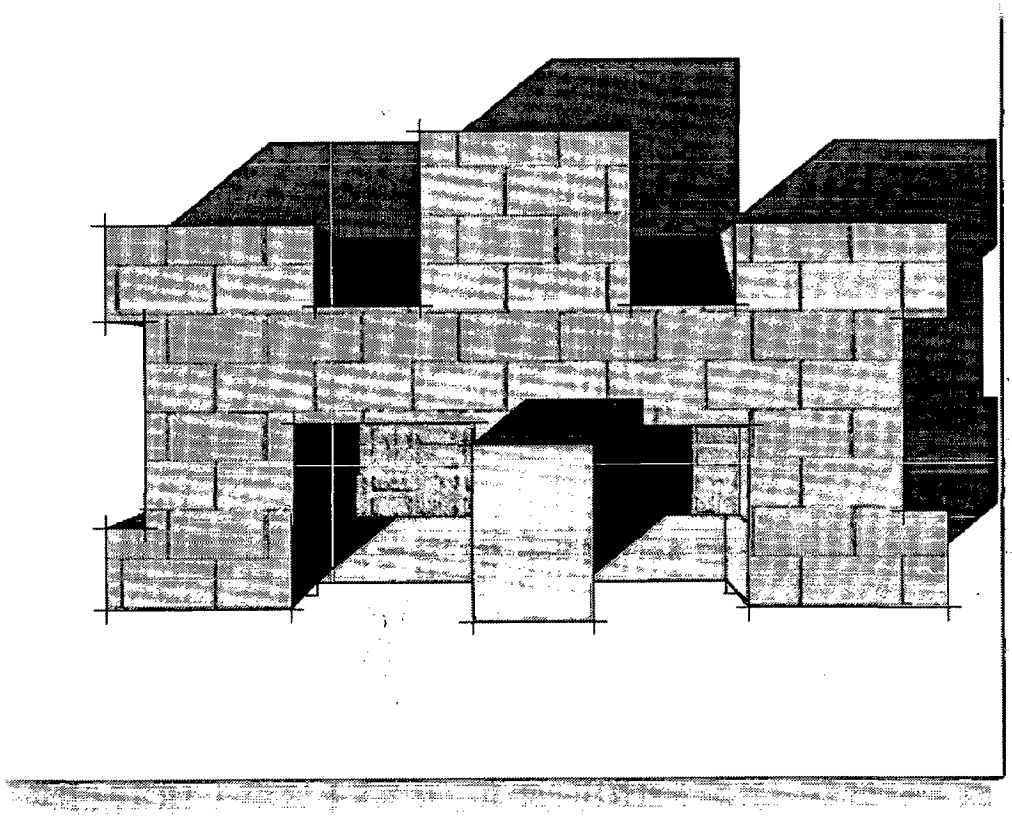
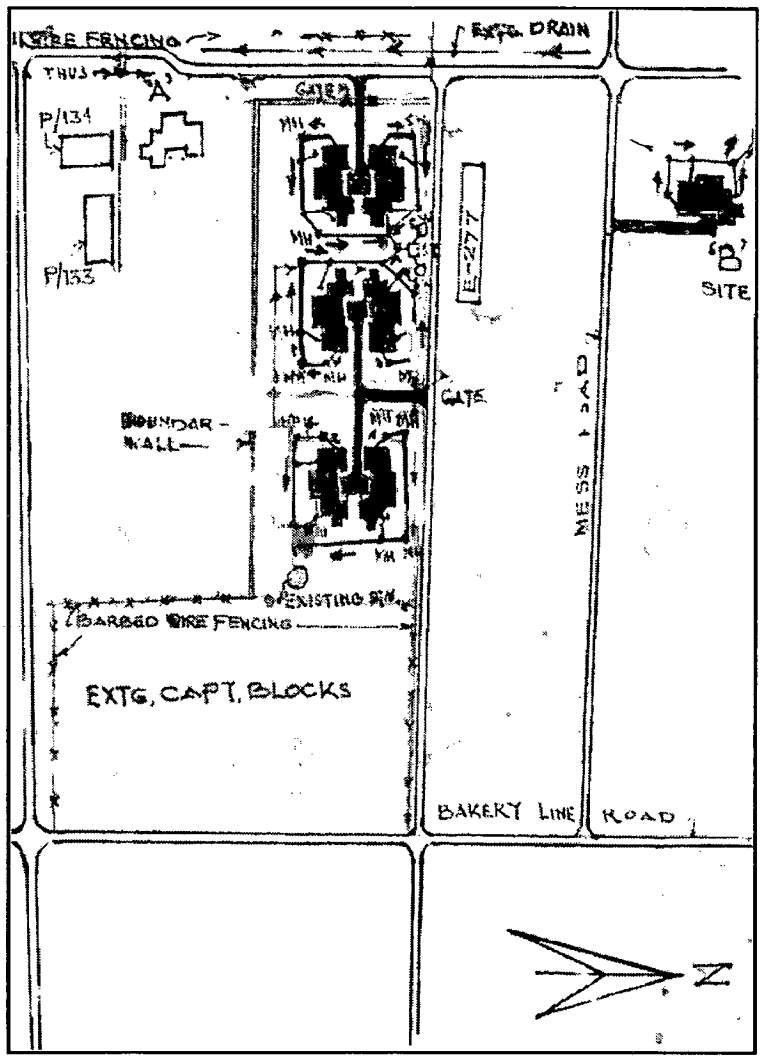


Plate 4.3: Sketch first floor
Source: By Author

4.2.1 CASE STUDY -1 – MAJ TO BRIG



drg 4.2: Site plan, Maj to Brig accommodation
Source:GE (MES), Roorkee

Type of house Maj to brig

No of floors gr +1

Area of each unit

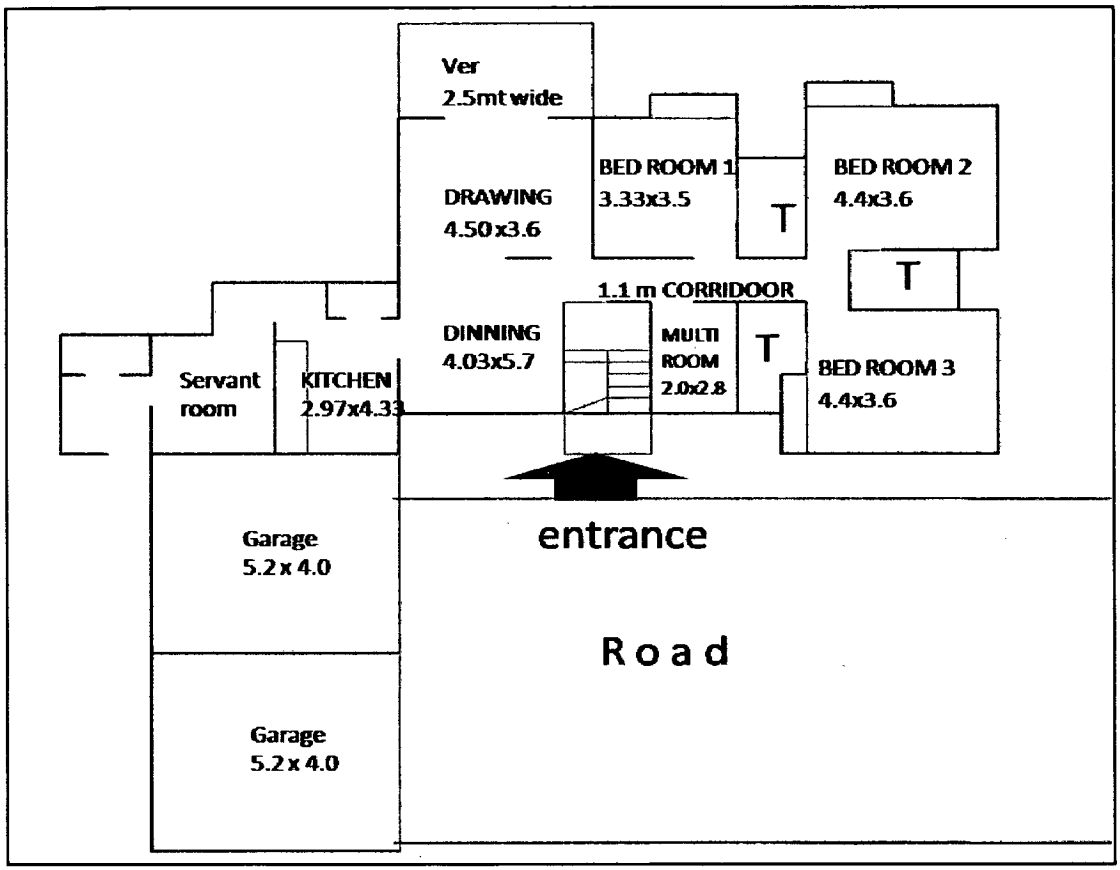
Main unit: 139 sqmt(built up area)

Servant quarter: 22.90sqmt

Garage: 20sqmt

Year of construction: 1987

a. SPACE UTILIZATION IN DIFFERENT ACTIVITY MAJ TO BRIG ACCOMMODATION



drg 4.3: ***House plan, Maj to Brig accommodation***
Source:GE (MES), Roorkee

b. SPACE UTILIZATION IN DIFFERENT ACTIVITY MAJ TO BRIG

Table 4.1: Space utilization in different activities

	ACTIVITY	Size in mts	Carpet area SQ MT	% of total carpet area
1	CORRIDOR	7.26 x 1.10	7.986	7.06of 113.46
2	DINING	4.03 x 3.57	14.387	12.7%
3	KITCHEN	4.33 x 2.97	12.860	11.3%
4	DRAWING	3.60 x 4.50	16.200	14.2%
5	MULTIPURPOSE ROOM	2.80 x 2.00	5.600	4.9%
6	BED ROOM 1	3.50 x 3.33	11.655	10.26%
7	TOILET 1	2.50 x 1.50	3.750	3.2%
8	BED ROOM 2	3.60 x 4.40	15.84	13.9%
9	TOILET 2	1.50 x 2.50	3.750	3.2%
10	BED ROOM 3	3.60 x 4.40	15.84	13.9%
11	TOILET 3	2.80 x 1.60	4.48	3.9%
12	STORE	1.09 X 1.02	1.112	0.9%
13	**TOTAL CARPET AREA**		**113.46**	

Source: Analyzed by Author

c. % OF AREA FOR DIFFERENT ACTIVITY MAJ TO BRIG

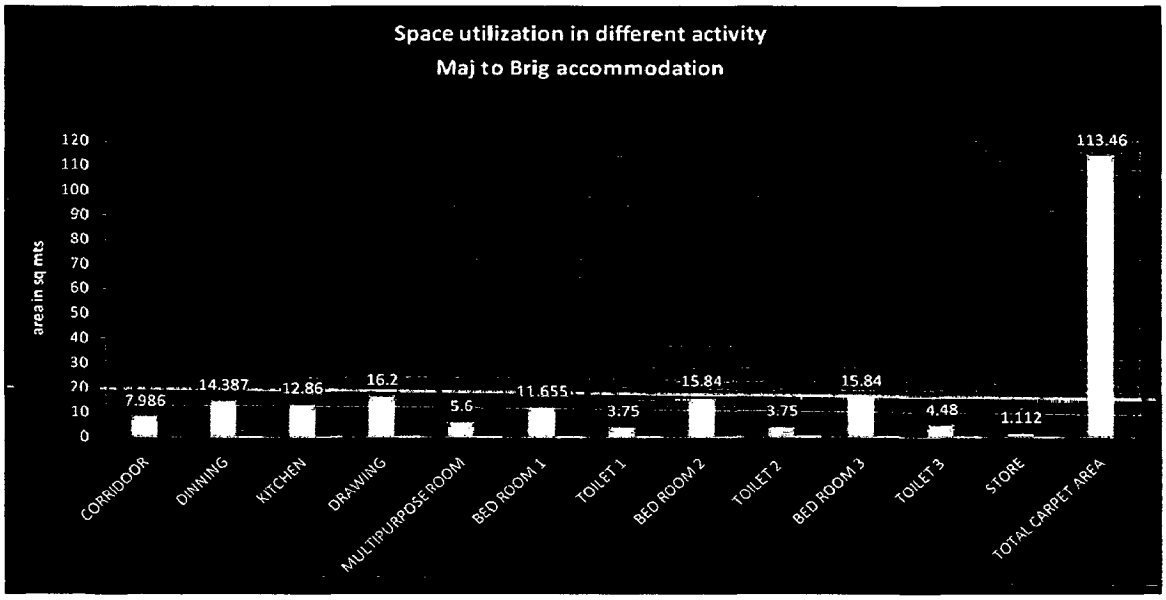


Plate 4.4: bar chart floor area (Maj to Brig)
Source: Analyzed by author

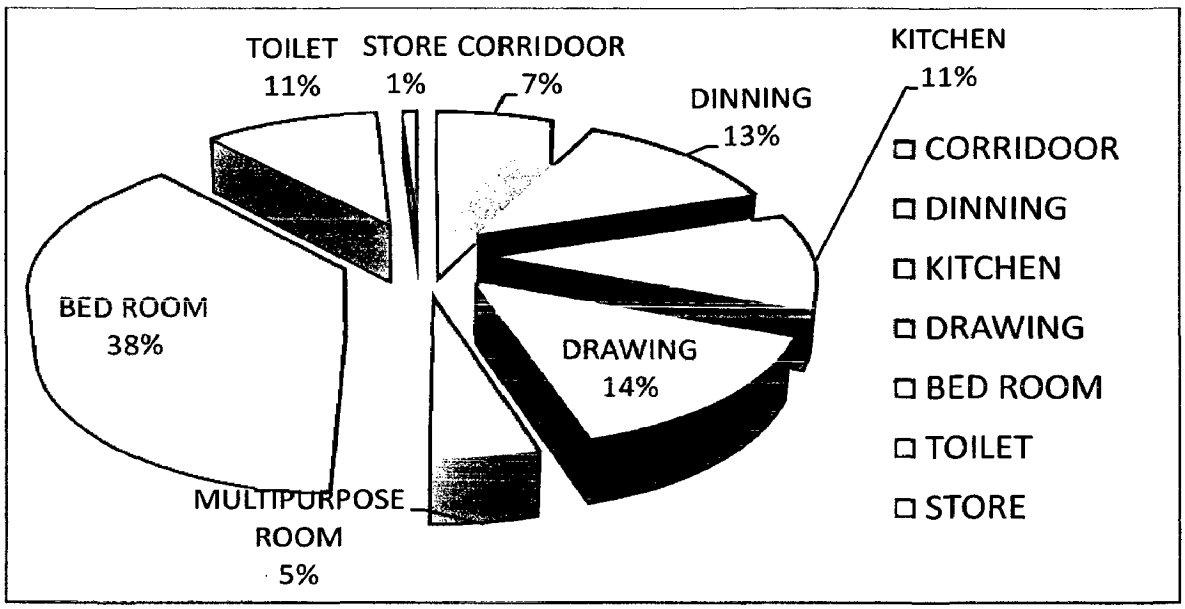


plate4.5: pie chart, floor area (Maj to Brig)
Source: Analyzed by author

d. FINDINGS

i) Area for sleeping is more than drawing room where as at senior level area of drawing room required more.
ii) Area for corridor is 7% which seems to be more.
iii) Wet area (toilets) is sufficient but divided in to three small parts.
iv) Kitchen area needs extension.
v) Verandah provided at the rear side does not have sufficient size for seating and other activities.

Plate 4.6 ***Drawing room***
Source: By author

vi) Size of drawing room is good for sitting 8 persons ,sliding door opening in verandah increase space at the time of party
vii) No space in kitchen for microwave hence kept in dining room

Plate 4.7: ***Dining room***
Source: By author

viii) Long narrow corridor which give tunnel effect

Plate 4.8: ***Passage***
Source: By author

ix) Main entrance below the landing

Plate 4.9: ***Entrance***
Source: By author

x) Most of the officers own big cars

Plate 4.10: ***Front view***
Source: By author

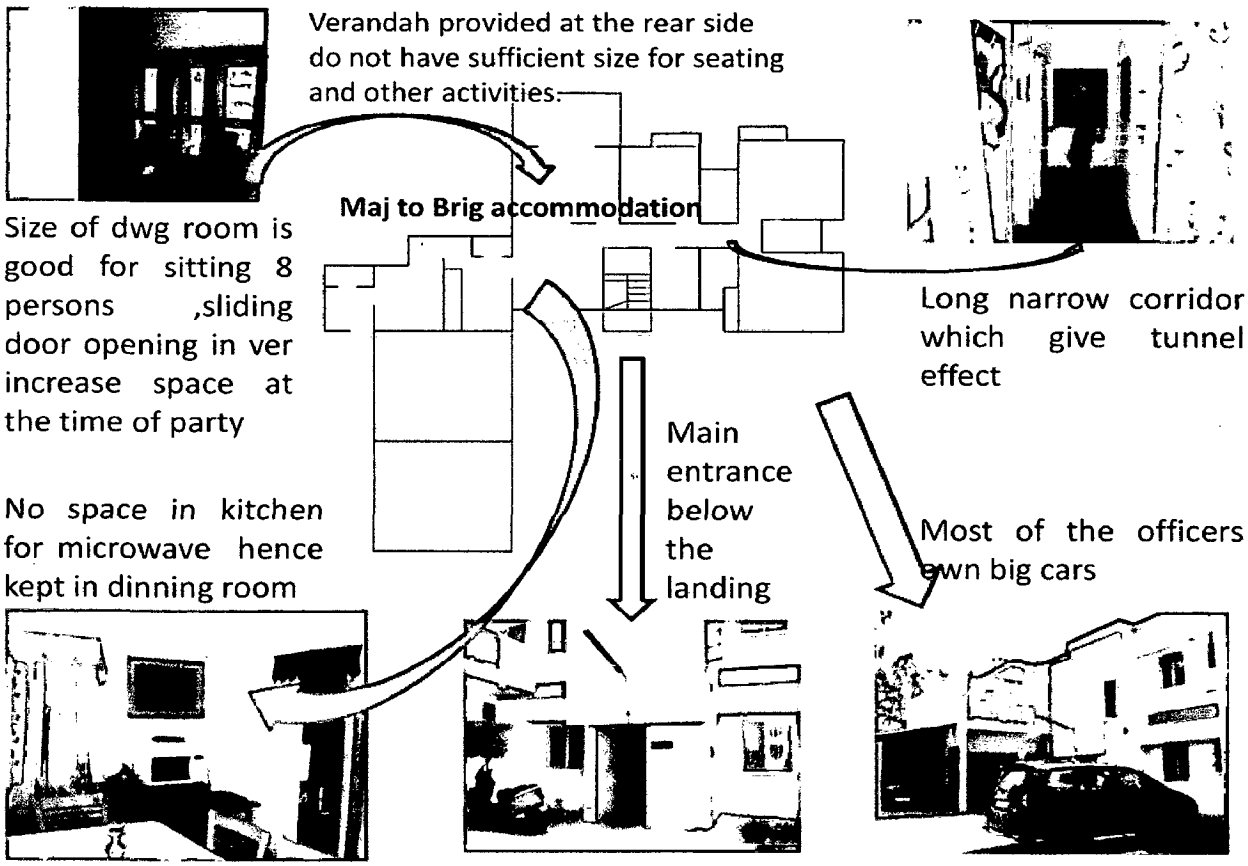


Plate 4.11: *photographs of various rooms*

e. INFERENCES

i) Main entrance to residence is from ,below the staircase landing

ii) Toilets (wet area) positioned on three sides of building

iii) Form of the building is ordinary do not look part of the 200 year old campus

iv) Long dark corridor

v) No space for microwave in kitchen

vi) Washing machine is kept in one of the toilet

vii) Size of drawing room is good for sitting 8 persons, sliding door opening in verandah increase space at the time of party.

viii) Verandah provided at the rear side does not have sufficient size for seating and other activities.

ix) Dressing room is not provided.

x) Rigid plan.

xi) Servant room can not be made in to use if required by main unit of residence

4.2.2 CASE STUD-2 MAJ TO BRIG *Married accommodation project* (MAP)

a. SPACE UTILIZATION IN DIFFERENT ACTIVITY MAJ TO BRIG ACCOMMODATION

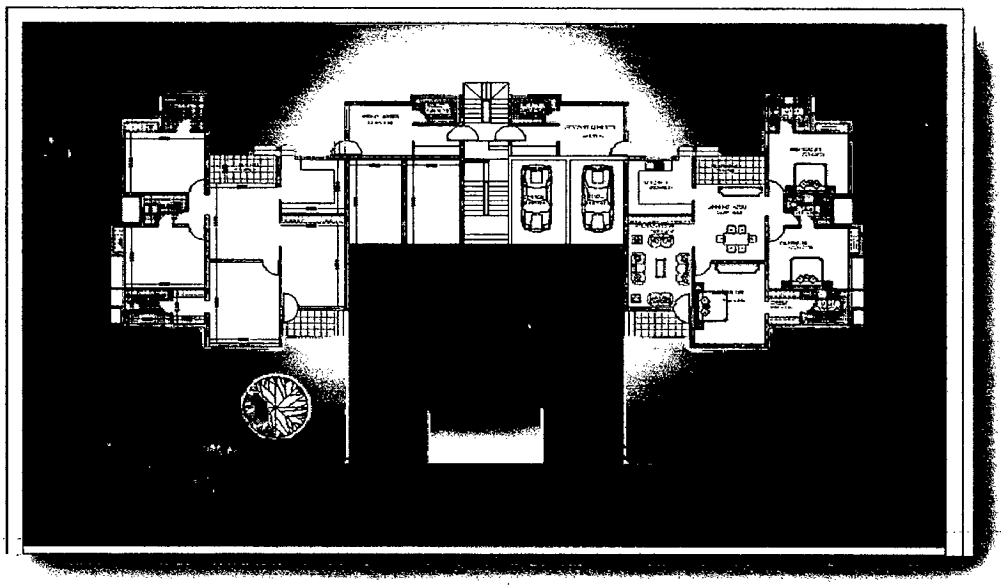


Plate 4.12: ***Married accommodation project (map) ground floor plan***
Source: Engineer in chief, New Delhi

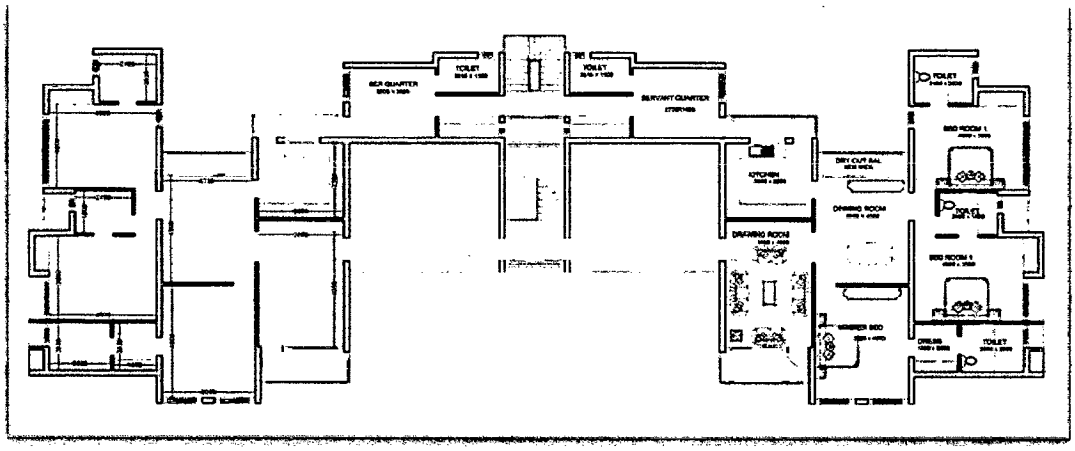


Plate 4.13: ***Married accommodation project (map) first floor plan***
Source: Engineer in chief, New Delhi

b. SPACE UTILIZATION IN DIFFERENT ACTIVITY MAJ TO BRIG(Map)

Table 4.2: ***Space utilization in different activities***

	ACTIVITY	Size in mts	Carpet area SQ MT	per cent of total carpet area
1	CORRIDOR	1.8 x 0.9	1.6	1.44%
2	DINING	3.0x 4.5	12.15	10.9%
3	KITCHEN	3.6 x 3.2	11.52	10.39%
4	DRAWING	3.60 x 4.9	17.64	15.9%
5	dressing	1.8 x 2	3.6	3.2%
6	BED ROOM 1	3.9 x4.5	17.55	15.8%
7	TOILET 1	2.50 x 2	5	4.5%
8	BED ROOM 2	4.5 x 3.6	16.2	14.62%
9	TOILET 2	2.4 x1.8	4.32	3.9
10	BED ROOM 3	4.5 x 3.6	15.16.2	14.62%
11	TOILET 3	2.4 x 2	4.8	4.3%
12	STORE	0	0	0
13	TOTAL CARPET AREA		110.8	

Source: Analyzed by author

c. % OF AREA FOR DIFFERENT ACTIVITY MAJ TO BRIG (Map)

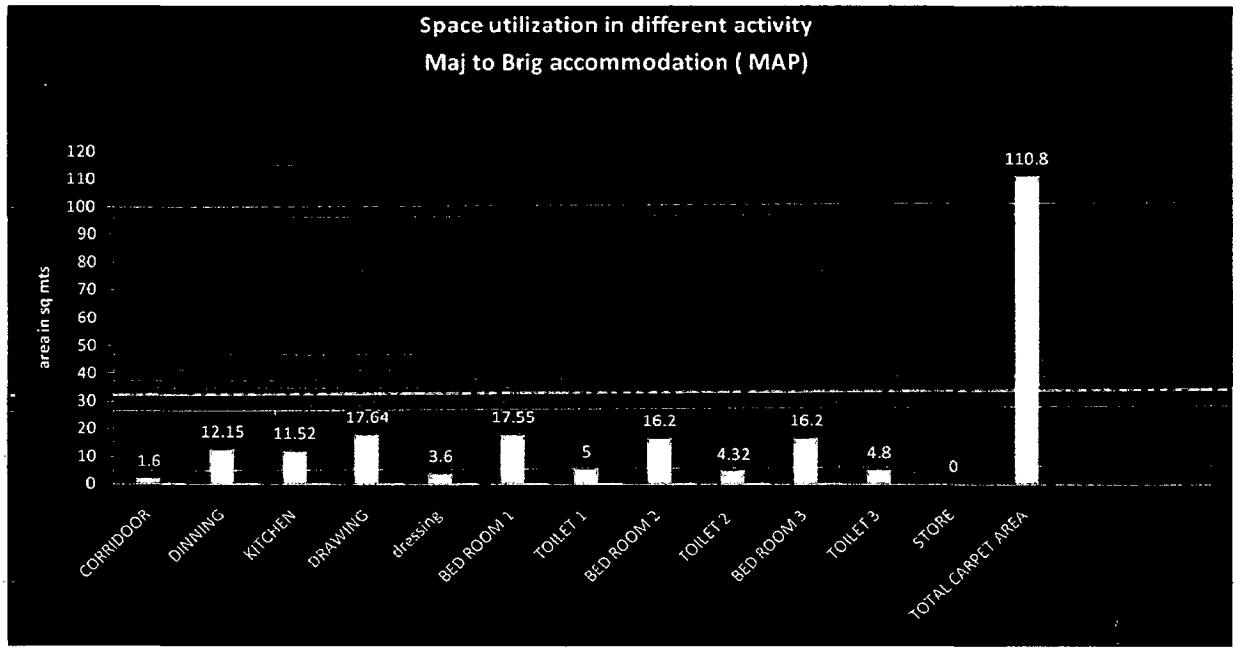


Plate 4.14: ***Space utilization***
Source: By author

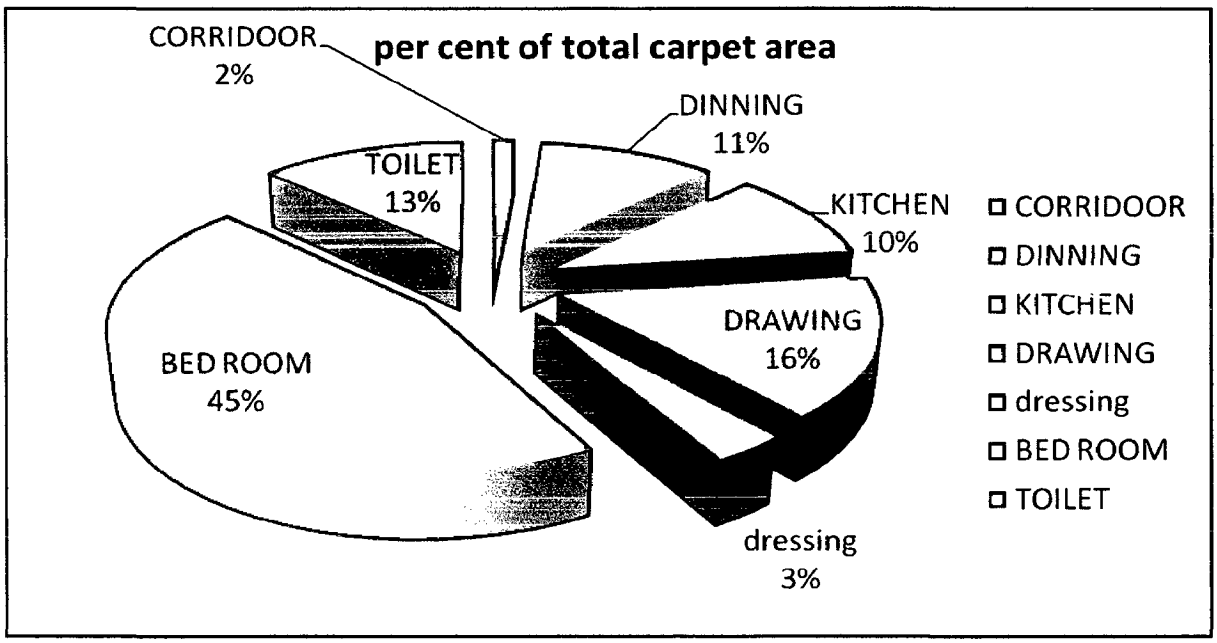
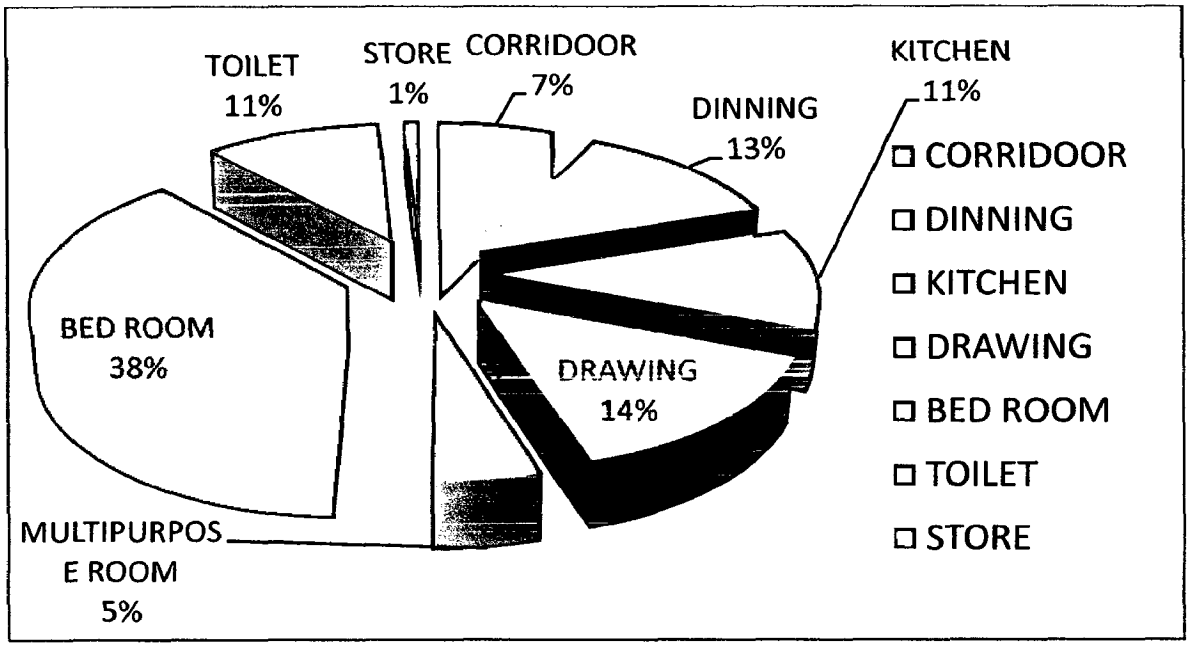
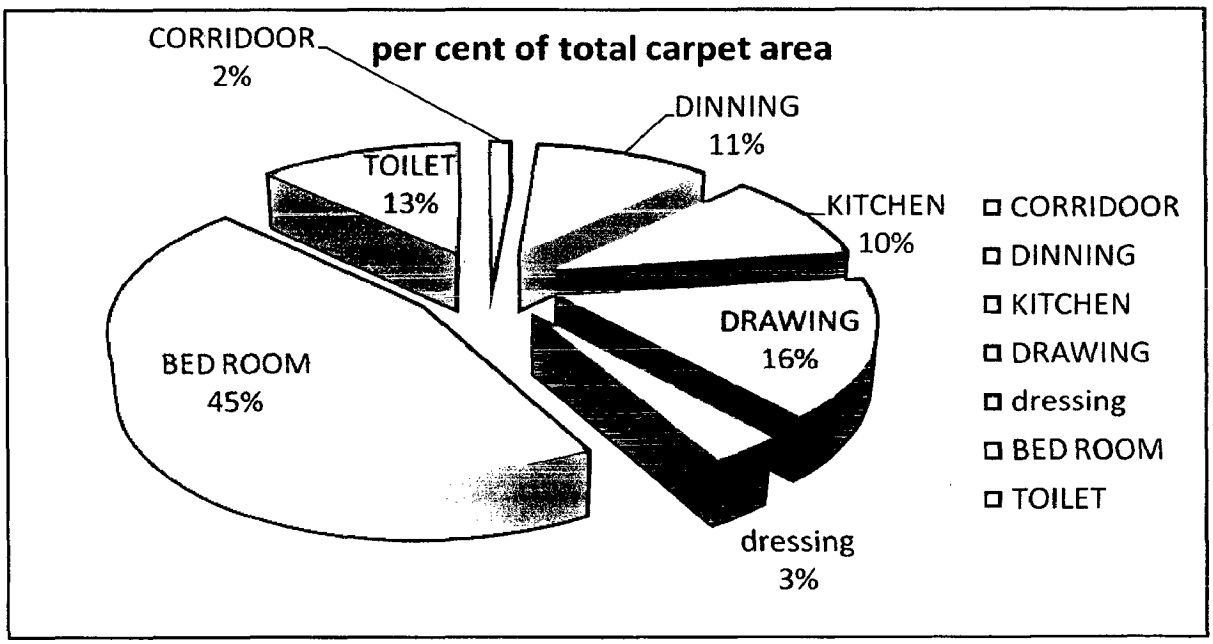


Plate 4.15: ***Space utilization***
Source: By author

Comparative analysis



MAJ TO BRIG



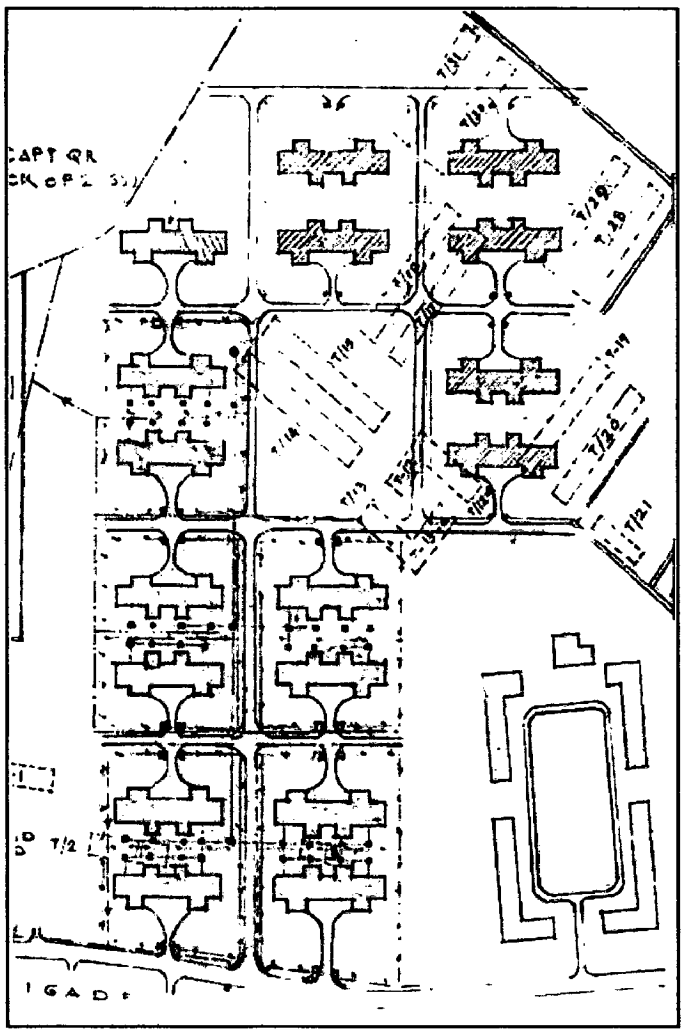
MAJ TO BRIG (Map)

Plate 4.16: ***Space utilization comparative***
Source: By author

Table 4.3: ***comparative Space utilization in different activities***

	ACTIVITY	BEG & C roorkeeCarpet area SQ MT	% of total carpet area	Map project Carpet area SQ MT	per cent of total carpet area
1	CORRIDOR	7.986	7.06	1.6	1.44%
2	DINING	14.387	12.7%	12.15	10.9%
3	KITCHEN	12.860	11.3%	11.52	10.39%
4	DRAWING	16.200	14.2%	17.64	15.9%
5	MULTIPURPOSE ROOM	5.600	4.9%	3.6	3.2%
6	BED ROOM 1	11.655	10.26%	17.55	15.8%
7	TOILET 1	3.750	3.2%	5	4.5%
8	BED ROOM 2	15.84	13.9%	16.2	14.62%
9	TOILET 2	3.750	3.2%	4.32	3.9
10	BED ROOM 3	15.84	13.9%	15.16.2	14.62%
11	TOILET 3	4.48	3.9%	4.8	4.3%
12	STORE	1.112	0.9%	0	0
13	**TOTAL CARPET AREA**	**113.46**		110.8	

4.2.3 CASE STUDY-3 – CAPT ACCOMMODATION



drg 4.4: ***Site plan***
Source: GE (MES), Roorkee

a. CONFIGURATION

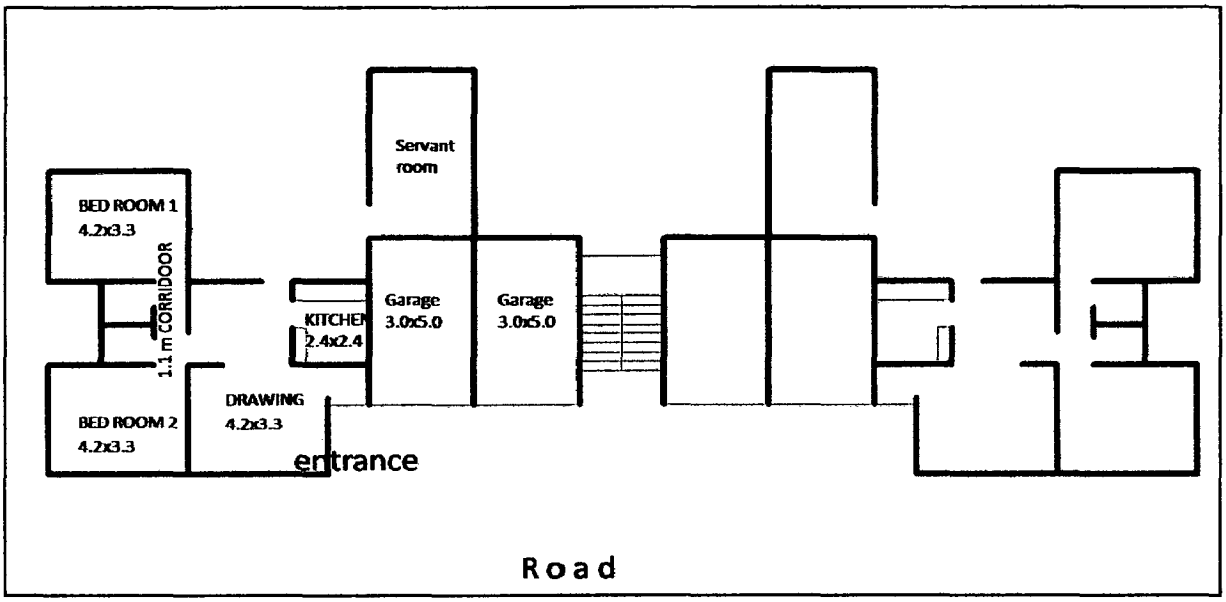
BEG&C

Type of houses:	Capt. accommodation
No of floors:	gr +1
Area of each unit	
Main unit:	83.61sqmt (built up area)
Servant quarter:	22.90sqmt

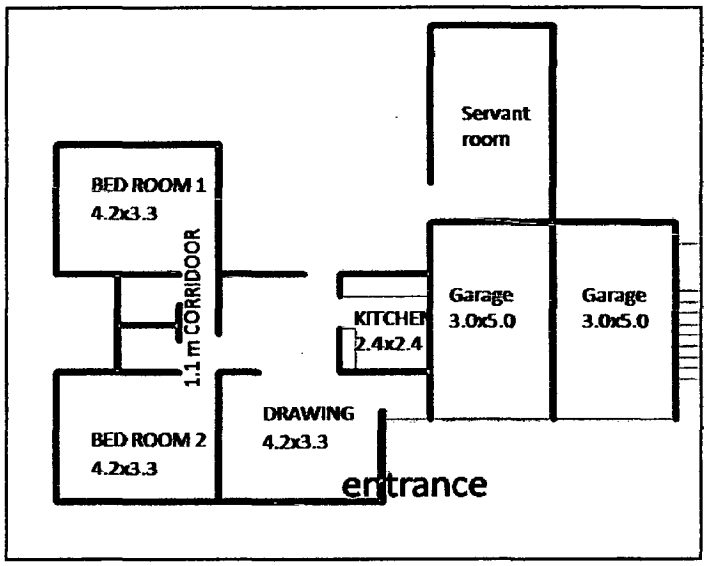
Garage: 15.67sqmt

Year of construction: 1987

b. SPACE UTILIZATION IN DIFFERENT ACTIVITY CAPTAINS ACCOMMODATION



Drg 4.5: ***House plan captains'***
Source: GE (MES), Roorkee



Drg 4.6: ***House plan captains'*** *(one unit)*
Source: GE (MES), Roorkee

c. SPACE UTILIZATION IN DIFFERENT ACTIVITY CAPTAINS ACCOMMODATION

Table 4.4: ***Space utilization in different activities***

	ACTIVITY	Size in mts	Carpet area SQ MT	per cent of total carpet area
1	CORRIDOR	1. 10 x2.4	3.36	5.4%of 62.22
2	DINING	3.30 x 2.40	7.92	12.7%
3	KITCHEN	2.4 x 2.4	5.76	9.2%
4	DRAWING	4.20 x 3.30	13.86	22.2%
6	BED ROOM 1	4.20 x 3.30	13.86	22.2%
8	BED ROOM 2	4.20 x 3.30	13.86	22.2%
9	TOILET 2	1.50 x 1.4	2.10	3.3%
11	WC	1.00 x 1.50	1.5	2.4 %
12	STORE	00	00	00
13	TOTAL CARPET AREA		62.22	

Source: Analyzed by author

d. % OF AREA FOR DIFFERENT ACTIVITY CAPTAINS ACCOMMODATION

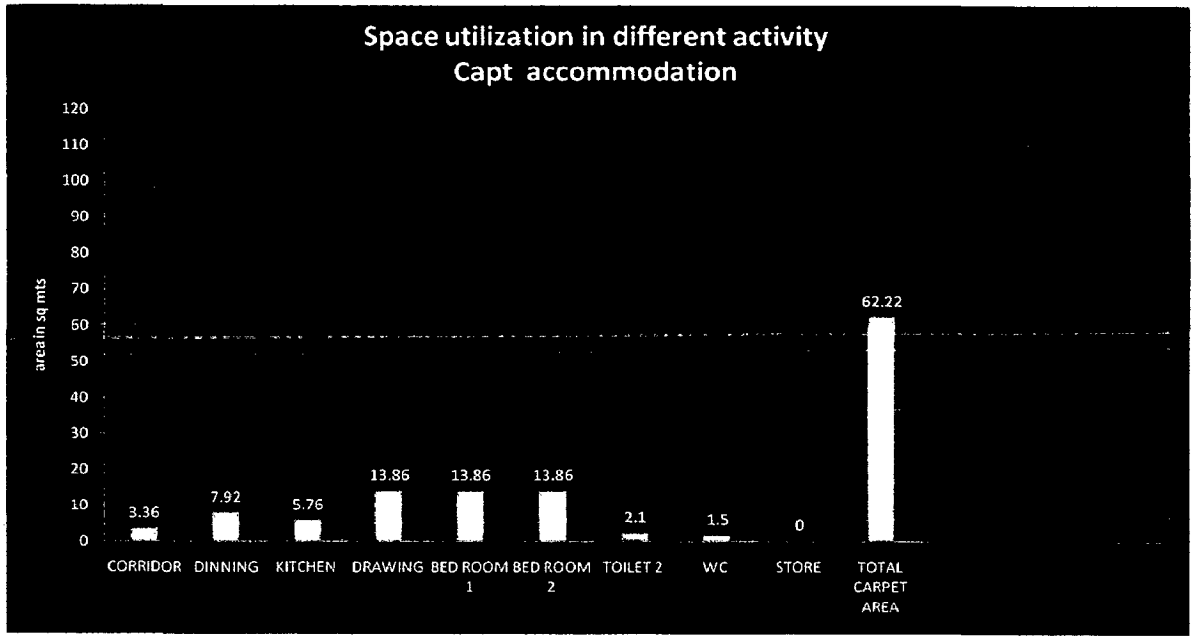


Plate 4.17: ***Space utilization***
Source: By author

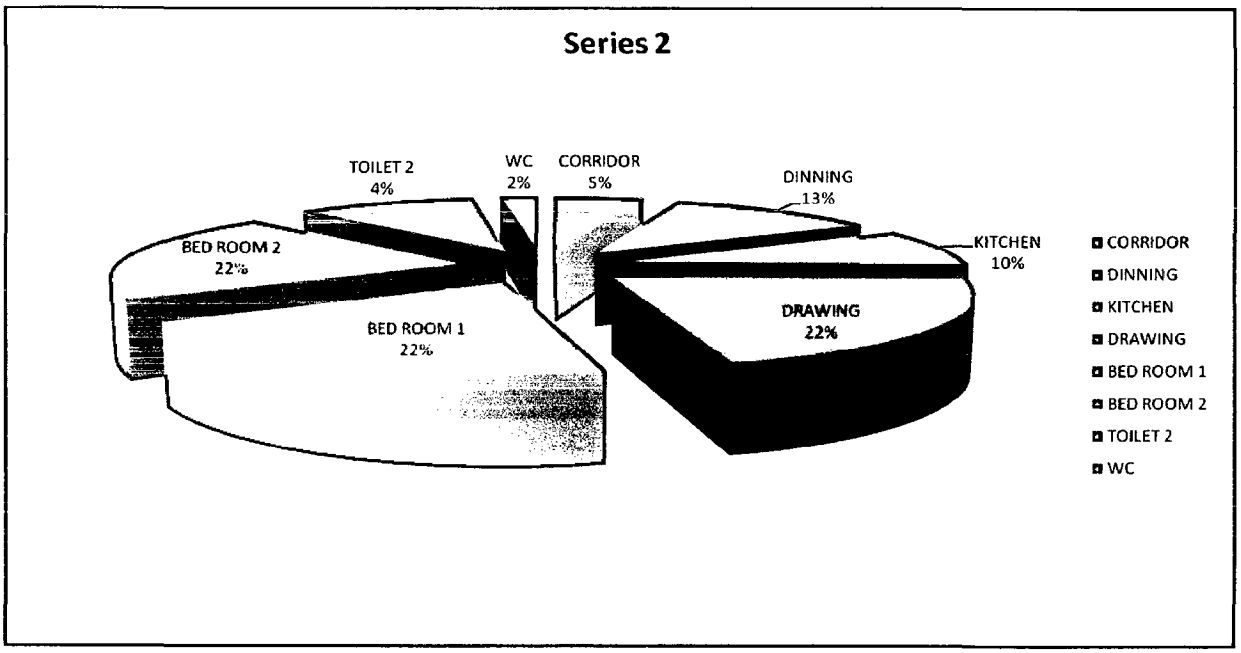


Plate 4.18: ***Space utilization***
Source: By author

e. CONCLUSION

i) Area of both the bed room is same where as one big bed room is needed at junior level to accommodate small age children.
ii) Area for corridor is 5% which is required for privacy to each room.
iii) Wet area (toilets) is sufficient but divided in to three small parts.
iv) Kitchen area needs extension.
v) Packing boxes kept in bed room lack of store space

Plate 4.19: ***Bed room***
Source: By author

vi) Microwave kept on dining table

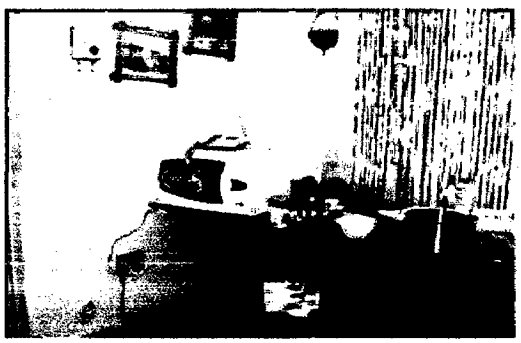


Plate 4.20: ***Dining room***
Source: By author

vii) Kitchen items kept in dining room because no store space In kitchen

*Plate 4.21: **Dining room***
Source: By author

viii) Washing machine kept in passage, may create inconvenience in movement

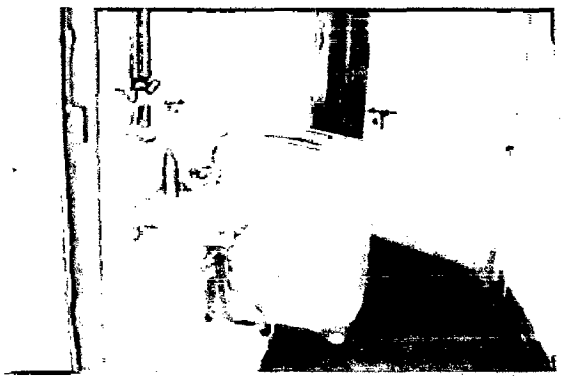


*Plate 4.22: **Lobby***
Source: By author

ix) Clutter in kitchen

*Plate 4.23: **Kitchen***
Source: By author

x) Computer has become part of bed room

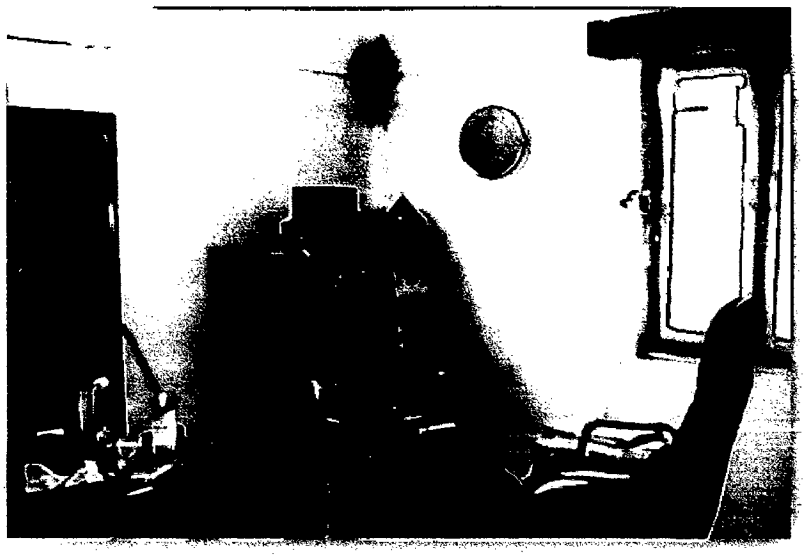


Plate 4.24: ***Bed room***
Source: By author

xi) Store space over loft is inconvenient

Plate 4.25: ***Kitchen***
Source: By author

xii) Bed room door used for hanging cloths

Plate 4.26: ***Bed room***
Source: By author

xiii)no scope for proper arrangement of aqua guard

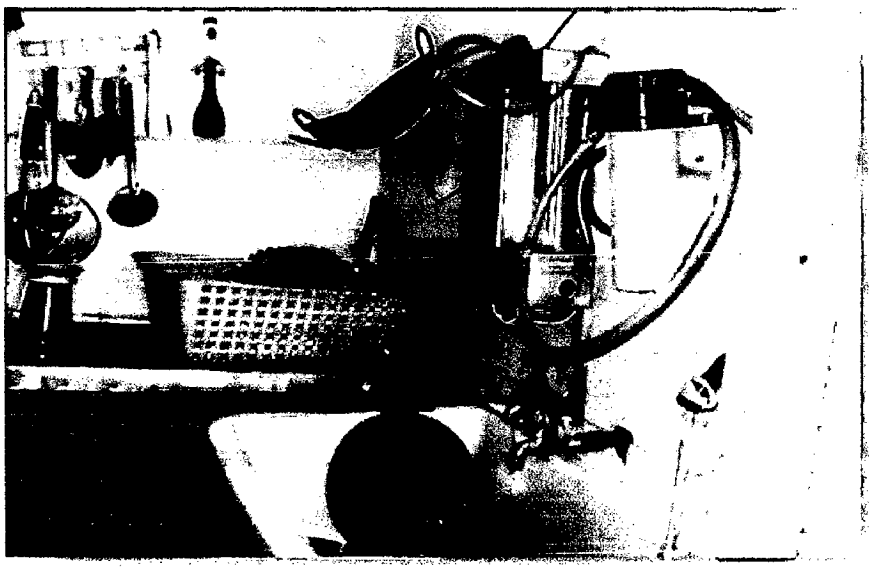


Plate 4.27: ***Kitchen***
Source: By author

f. FINDINGS

i) Form of the building is ordinary do not look part of the 200 year old campus

ii) Long dark corridor

iii) No space for microwave in kitchen

iv) Washing machine kept in passage may create inconvenience in movement.

v) Packing boxes kept in bed room-due to lack of storing space

vi) Need of extra space is required in captains residence

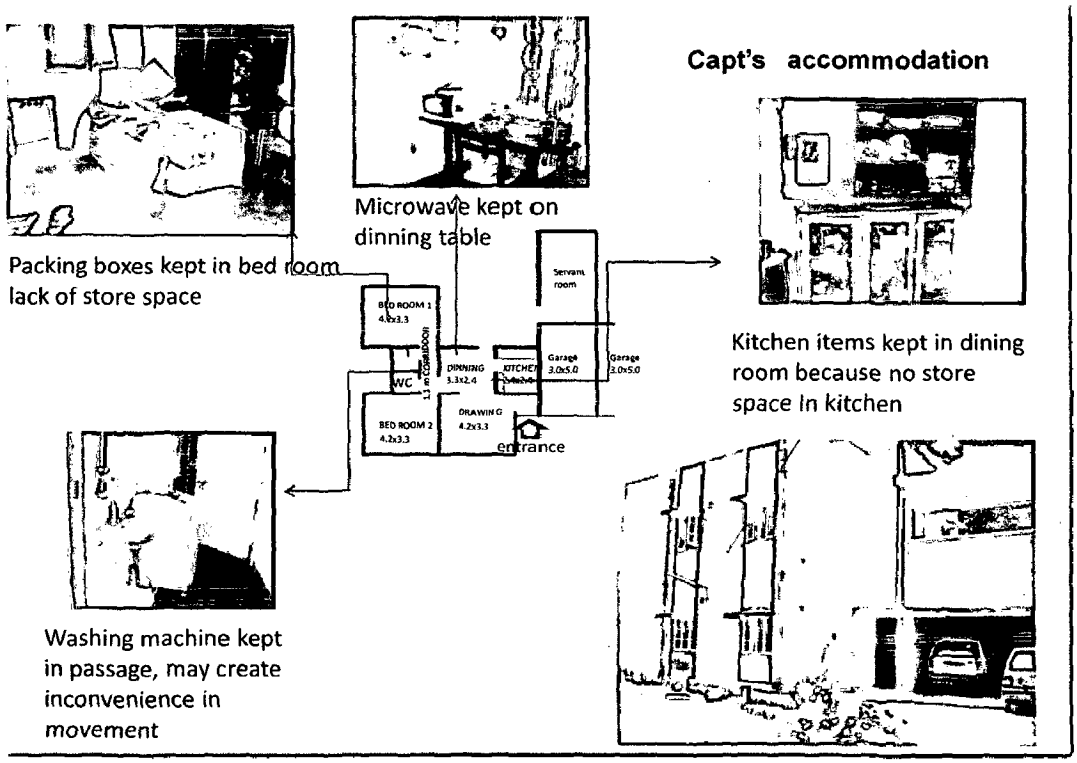
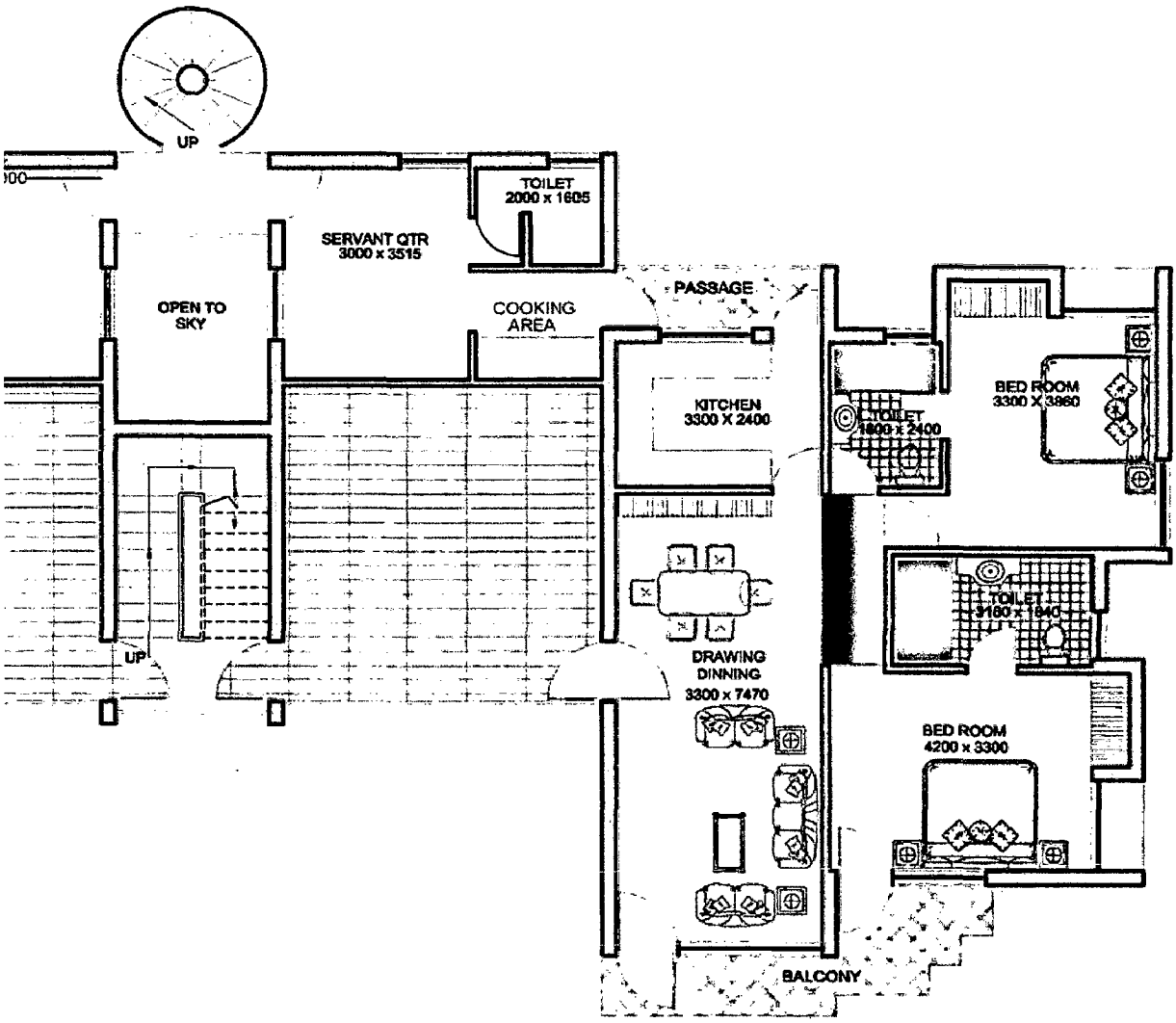


Plate 4.28: *photographs of various rooms, captains' residence*

4.2.4 CASE STUDY -4 – CAPT ACCOMMODATION (MAP)



drg 4.7: ***House plan captains'***
Source: E-in-CES NEW DELHI (MAP)

Table 4.5: *space utilization captains (map)*

	ACTIVITY	Size in mts	Carpet area SQ MT	per cent of total carpet area
1	CORRIDOR	1. 10 x2.8	2.85	5.4%of 62.22
2	DINING	3.30 x 3.7	12.21	12.7%
3	KITCHEN	3.3 x 2.4	7.92	9.2%
4	DRAWING	3.7 x 3.30	12.21	22.2%
6	BED ROOM 1	4.20 x 3.30	13.86	22.2%
8	BED ROOM 2	3.86 x 3.30	12.73	22.2%
9	TOILET 1	1.84 x 3.18	5.85	3.3%
11	TOILET 2	1.8 x 2.4	4,32	2.4 %
12	STORE	00	00	00
13	TOTAL CARPET AREA		71.95	

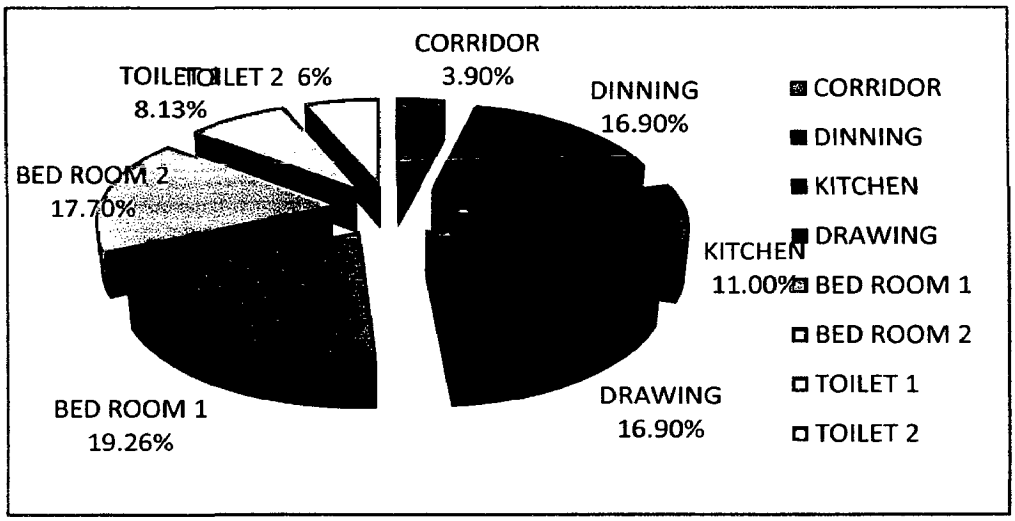


plate4.29: *space utilization captains (map)*

Chapter 5
INFERENCES

5.1 INTRODUCTION

There is a distinct transformation in architecture of the defence officers' residences from the times of Britishers and to what exists now. There are marked changes that have come up in the past 50 years in the construction technology and materials. The socio economic effects have also made lot of difference in the style of living and comfort levels of all sectors. Army is also witnessing these changes by means of new and coming up educational, clubs and other office buildings laboratory of DRDO. But residential buildings are still lacking behind. The change in residential buildings is due to land economy and space economy.

But during curse of time certain consideration, which are paramount importance have been missed. Present development of houses i.e. block of four, ground plus first floor may be suitable for any class of society but it does not suit a defence officer

After having gone through varies issues inferences can be drawn under following heads

1. external form of building
2. internal planning

5.2 EXTERNAL FORM OF BUILDING

Various type of typology of housing exists in every cantonment. Some residences are bungalow type (appointment houses) for commandant, commanding officers of unit. But flat type of residences g+1 block of four is common.

Such type of houses offers different type of advantages and disadvantages to ground floor and first floor occupants. These are as given below.

5.2.1 ADVANTAGES FOR GROUND FLOOR UNITS

i) linkages with nature

ii) Big lawn for gardening

iii) Transition of spaces

iv) Thermal comfort

v) Easy to install A/C and air cooler

vi) Convenient for old age parents

vii) Convenient for kids

viii) Useful outdoor space for all seasons

ix) Thermal comfort if first floor exist

5.2.2 DISADVANTAGES FOR GROUND FLOOR UNITS

i) Big out door space difficult to maintain

ii) Noise nuisance from first floor

iii) Privacy problem if abetting to any busy road of cantonment

5.2.3 ADVANTAGES FOR FIRST FLOOR UNITS

i) No Big out door space, difficult to maintain

ii) No noise nuisance from first floor

iii) No privacy problem if abetting to any busy road of cantonment

iv) Comparatively airy

5.2.4 DISADVANTAGES FOR FIRST FLOOR UNITS

i) linkages with nature absent

ii) Small terrace not sufficient

iii) transition of spaces absent

iv) comparatively hot due to heat gain through roof

v) Difficult to install A/C and air cooler

vi) Not Convenient for old age parents

vii) Not Convenient for kids

viii) Useful outdoor space for all seasons not available

5.3 INTERNAL PLANNING

Following points can be drawn after study

i. Rigid planning
ii. scope for change of uses of any room if required is not workable
iii. scope of expansion of space if required is not workable
iv. Entrance verandah is not provided ,which disturbs privacy whenever opened to attend any person at door
v. Location of servant quarter can not be made in to use for main unit due to its location
vi. Garage can not be used for keeping boxes due to common door opening for two quarters
vii. Authorized area for stair goes in to common use, which can not be made in to use of individual
viii. entrance through drawing room to any part of residence, disturbs activity of drawing room
ix. dining room become circulation lobby due to more number of opening in to it
x. privacy of master bed room get disturbed due to its location

xi. kitchen space is not sufficient to accommodate additional appliance for example refrigerator, microwave, foot pro etc

xii. wall between kitchen and dinning gives feeling of small compartment

xiii. no proper place for microwave ,washing machine, computer aqua guard etc

xiv. store space is insufficient for keeping boxes, etc

Chapter 6

RECOMMENDATIONS AND PROPOSALS

6.1 GENERAL

House no longer fortress or crude shelter; it is or should be a beautiful unobstructed frame work for our lives – open to nature but protected from it. Between 1500's and present time science, technology and industry have transformed outlooks forms.

Everyone has different concept, different ideas about the planning of houses, some need more private space ,some people who are not interested in socializing ,don't need a bigger living and dining area but they need bigger private spaces, like bedrooms study rooms, etc. In government accommodations there is rigidity due to standardization.

Here the need arises for flexible spaces. Inter-relationships between different spaces and their flexibility are important aspect of consideration.

Studies of flexibility in residences should normally include multi-purpose use of spaces equipments and furnishings. It should also include exploring the possibilities of allocating and re- allocating different activities requiring varying quantity of spaces, especially because the needs, demands and wishes of the house-hold keep on changing. This can be achieved by giving flexibility to the access areas by movable partitions, sliding doors, curtain walling and other space dividing elements.

Officers are considered to be the leader on all fronts, whether it is war or peace time. The officers have to set an example on all fronts. This elite lot has to be treated in way which has to show grandeur, richness and manners even in the rest time

Indian defence officer's residence should epitomize the art of graceful, dignified and aesthetic living. Customs and traditions in Army may look trivial to a civilian and out of tune with present time. But these have since times immemorial acted

as a unifying and driving force which motivates an individual to rise to the occasion for protecting the honour and interest of his regiment, arms or service and the nation.

Recommendations are framed to look in to the possibility of changed use of spaces, potential to increase dimension of rooms, climatic consideration has also be taken care, Flexibility, privacy, and ease of circulation is the key factor of proposals. All affords for clutter free spaces, by giving distributed storage has been achieved.

6.2 RECOMMENDATIONS

6.2.1 UNIT LEVEL

i. All residences should suite to officers dignity
ii. All residences should have equal distribution of ground except appointment houses.
iii. Local area architecture should be explored.
iv. Local building material, along with local construction techniques should also be explored.
v. Local climate should be considered at the time of sitting building.
vi. Form of the building should be state of art, and should enhance visual appearance

6.2.2 INTERNAL SPACES

i. All season use spaces should be explored
ii. Spaces should have potential of expand if required
iii. All age useful spaces should be created
iv. Use of servant quarter by main unit should be made convenient
v. Garage should have a door from inside house
vi. Master bed room should be provided with separate study room, dressing room with full length wardrobe
vii. Bed in master bed should have drawers for store space
viii. Children/guest bed should be sofa cum bed
ix. Every residence should have a small utility room, with water point and 3-4 electric points,

x. Utility room should be located near dining room

Table 6.1 ***Broad out Lines of Recommendation***

S.No	Issues	Identification of problem	Recommendations
1	Status	Existing Residences does not show the status of residing officer.	i) By changing typology of housing i.e. semi detached, duplex, house with independent gardens. ii) Increasing height of drawing room. iii) Changing form of building i.e. sloping tiled roof which has always been associated with rich and aesthetic living.
2	Rigidity in floor plans	Due to rigid compartment type of planning there is no scope for change in space.	i) This could be done by providing wall free spaces in semi private area. ii) Certain rooms can be provided with 2.4 mts wide sliding folding doors.
3	Additional Space requirement	Old floor plans does not provide enough space for increasing number of home appliances	i) This can be achieve by readjusting space from other areas like children bed room. ii) By providing barrier free kitchen abating to dining room, where additional storage space can be provided.
4	Transferable job	Lots of packing boxes, No storage space for Winter/summer cloths/ gadgets	i) Can be stacked in garage by increasing its length. ii) To make this area in active use a door from inside the house is recommended.
5	Requirement of additional room	No scope for such areas in existing floor plans	Authorized area for servant quarter when not in use can be made to use as an additional room. This can be achieved at the time of planning so that it should have access to house

			directly at the same time it should be detached from other servant quarter.
6	Climatic considerations	No concern for climatic comfort	Residences should be provided with certain design features according to the climatic of the particular area. In each residence different seasonal use areas should be provided.

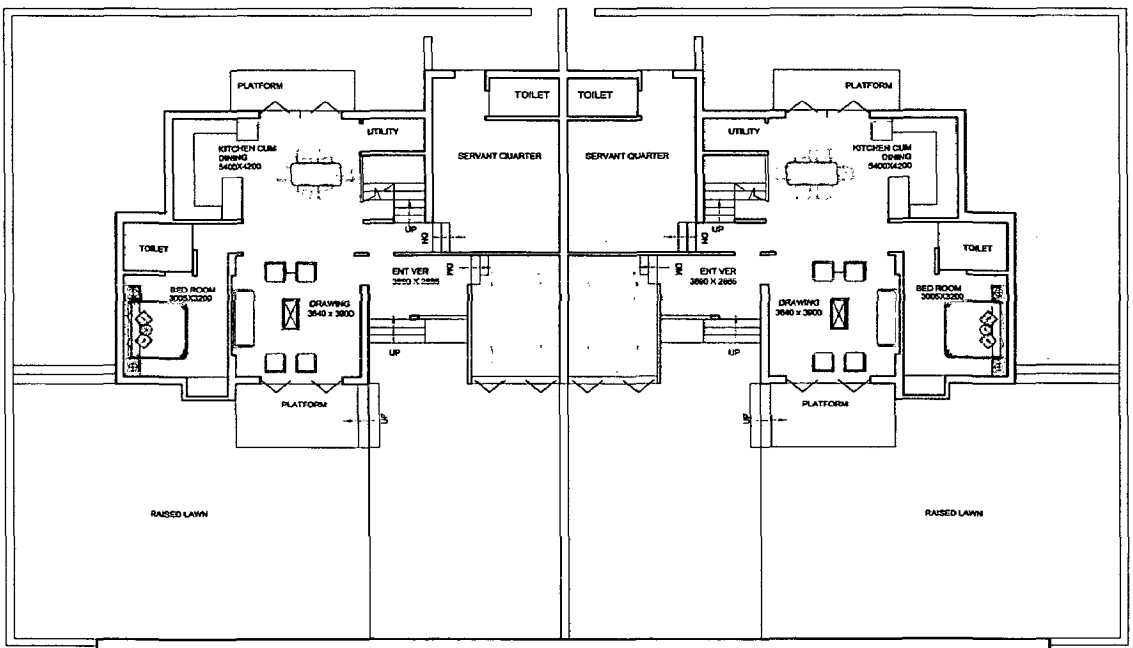
6.3 PROPOSALS

After having gone through all the positive and the negative aspect of present residences and the design practice ,a residence which can have a flexibility to satisfy individuals need is the demand of today,

Hence proposal is also based on, to be possible in a department where standardization is must for administrative purpose.

A "semi detached duplex bungalow within the same plot area is the right way of defence officer's residences. This type of residences will give all the advantages of ground floor and first floor to all officers.

6.3.1CAPTAINS RESIDENCE

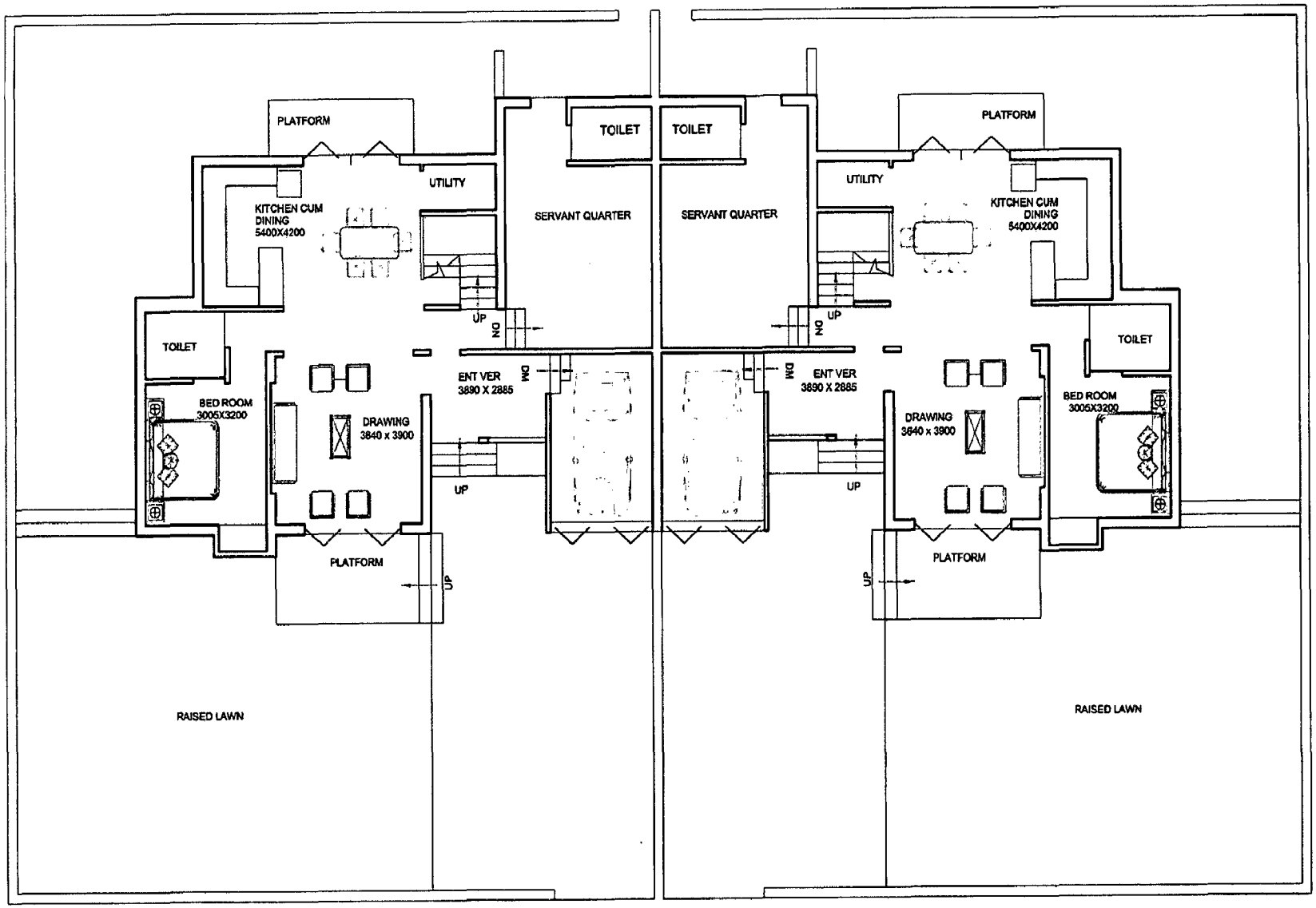


Drawing 6.1: ***conceptual plan, semidetached, duplex, twin bungalow for CAPTAIN***

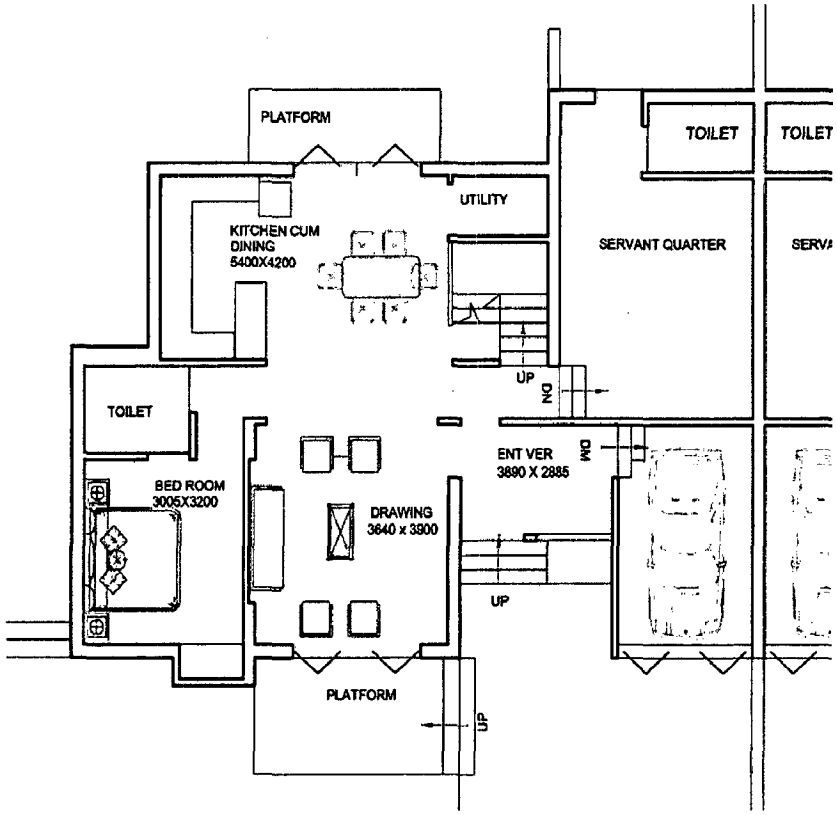
6.3.1.1 MAIN FEATURES

i. Independent small garden to each officer
ii. For any orientation, different seasonal useable spaces
iii. Cross ventilation to all rooms
iv. Entrance lobby allows complete privacy to drawing room during in side, out side movement.
v. Garage area and servant area can be made in to use of main unit depending upon depth of need.
vi. Form of the building and typology of housing differs from subordinate housing

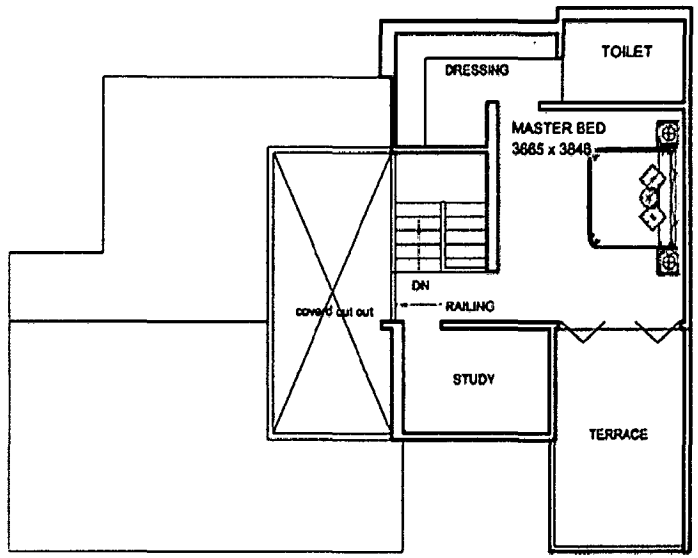
Following drawings shows some of main features of proposals



Drawing 6.1: ***conceptual plan, semidetached, duplex, twin bungalow for captains***



Ground floor plan



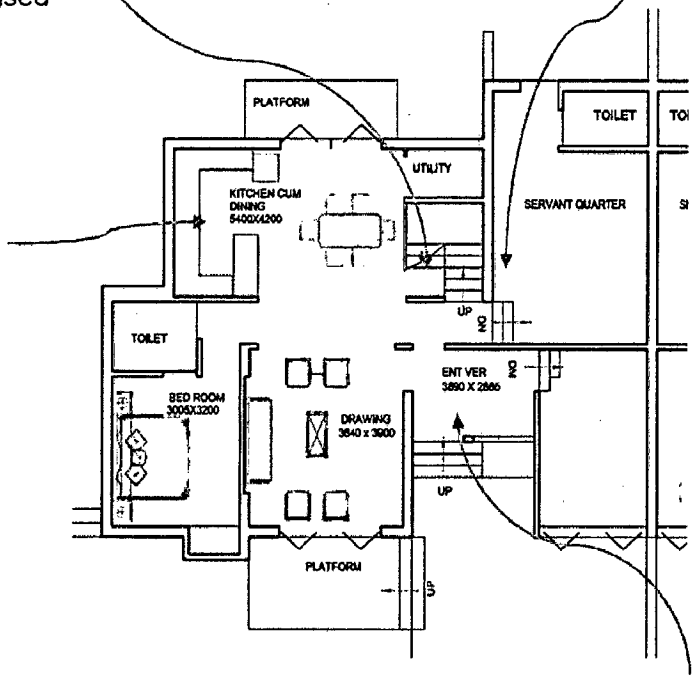
Mezenine floor plan

Drawing 6.2: ***conceptual plan, semidetached, duplex, twin bungalow for captains***

6, 04 sq mt area of staircase which is authorized has been made part of main unit, this will adds up visual grandness to dinning

Under the stair case area can be used as store

Open kitchen for visual grandness. House wife can look after children while working in kitchen



Captains' residence
Ground floor plan

22.4 sq mt area of servant quarter can be used by main unit by locating it in such a way, this could be additional space available to use when permanent servant is not required.

Garage and servant quarter used near common wall as don't need cross ventilation

Entrance lobby added to

i. Achieve privacy for drawing room
ii. Reduce wastage of circulation space for approaching in different part of residence
iii. Allow attending unwanted visitors
iv. Take care of shoes, caps keys umbrella etc

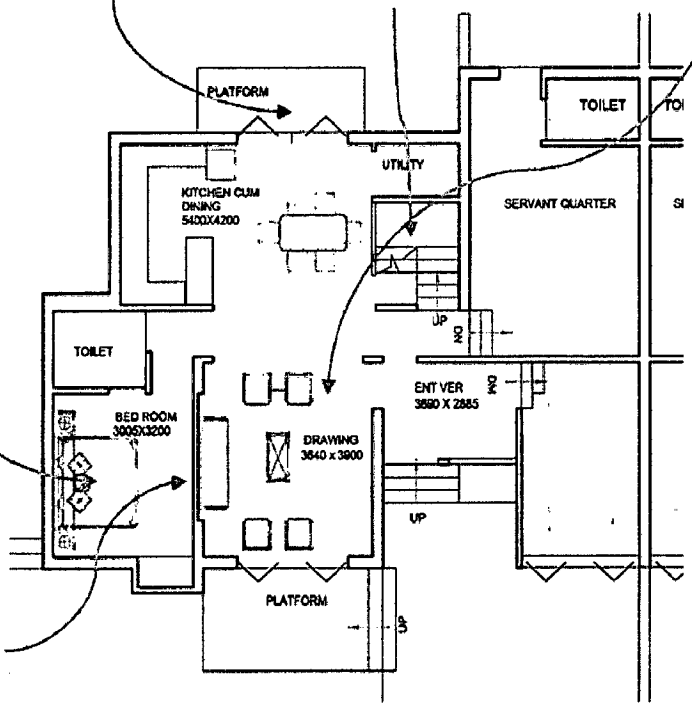
Drawing 6.3 main features

Sliding folding door provided which allows better and obstacle free use of out door spaces, as and when required.

Utility area provided to take care washing machine, aqua guard,

Children bed provided with sofa cum bed .this arrangement allows a bigger floor space for children to play at day time

Remove able gypsum board partition wall to incress drawing room size as and when required



etc

Drawing room has been provided with sliding folding door to make better use of lawn.

Drawing room combined with dinning room, which gives flexibility in usage of spaces as per individual's requirement.

For such areas visual privacy if required can be archived by curtains only

Height of drawing room increased to give feel of grandness

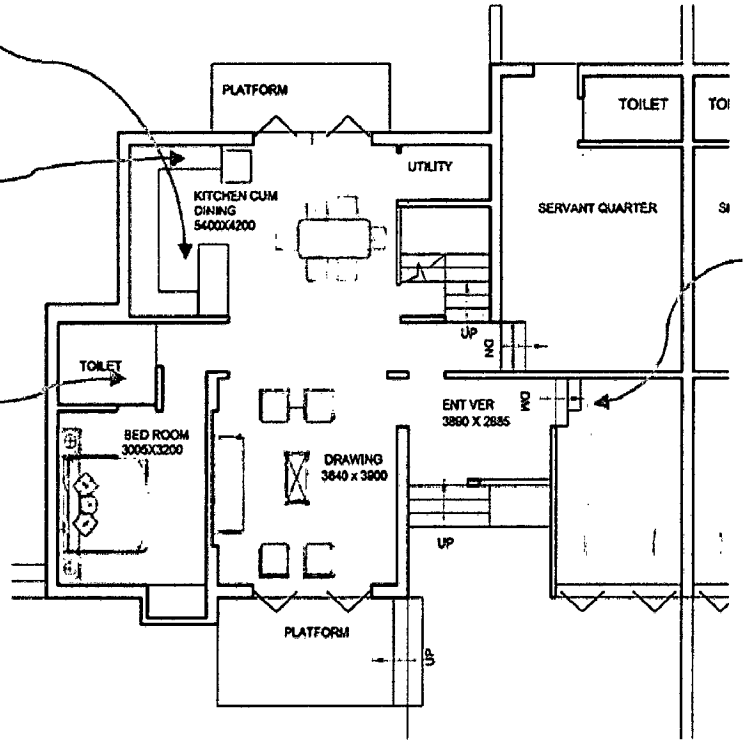
Captains' residence
Ground floor plan

Drawing 6.4 main features

Folding breakfast table allows space for movement when not in use

Space for fridge convenient for dinning as well as for kitchen

Two door provided to toilet .can be used as attached toilet for bed room when required



Approach to the garage through m unit, facilitates use of garage spa without lifting shutter.

This space can be used for packi and unpacking of boxes duri transfer.

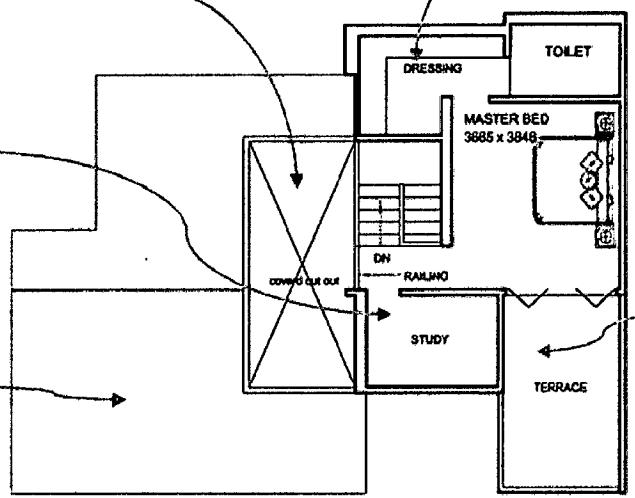
Captains' residence
Ground floor plan

Drawing 6.5 main features

A cut out in slab allows visual as well as audio able connectivity between ground floor and first floor

A study room provided by enclosing authorized balcony area

Sloping tilled roof for bungalow type appearance



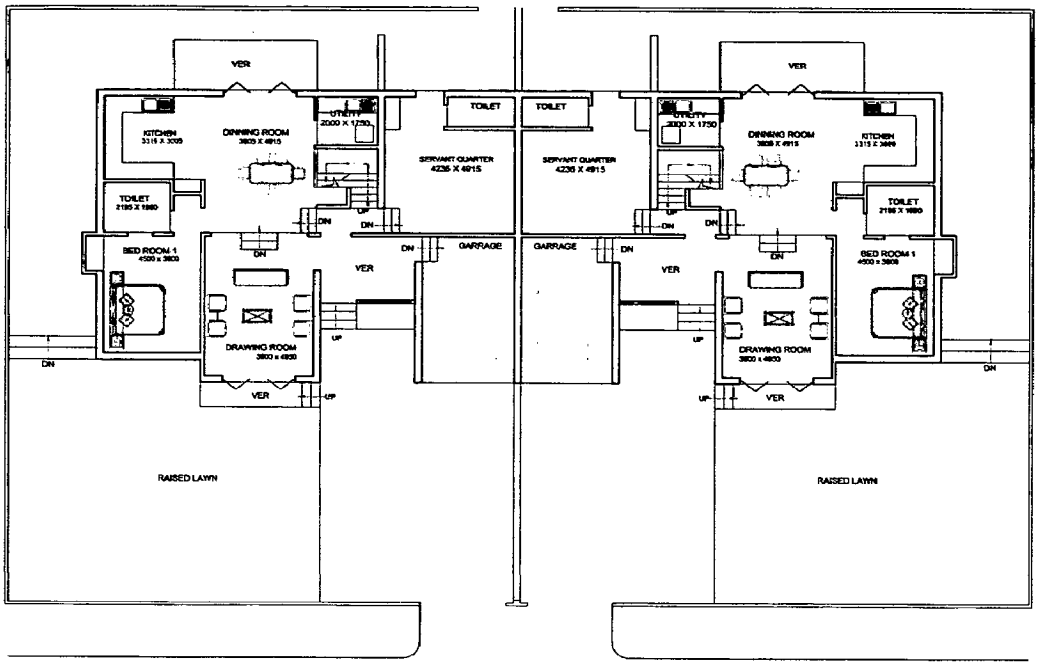
A dressing room along with bigger size ward robe provided to get clutter free bed room.

An independent terrace provided to master bed room so as to be linked with nature A 2.4 mt wide sliding folding door allows better use of terrace.

Captains' residence
First floor plan

Drawing 6.6 6Main features

6.3.2 MAJOR TO BRIGADIER

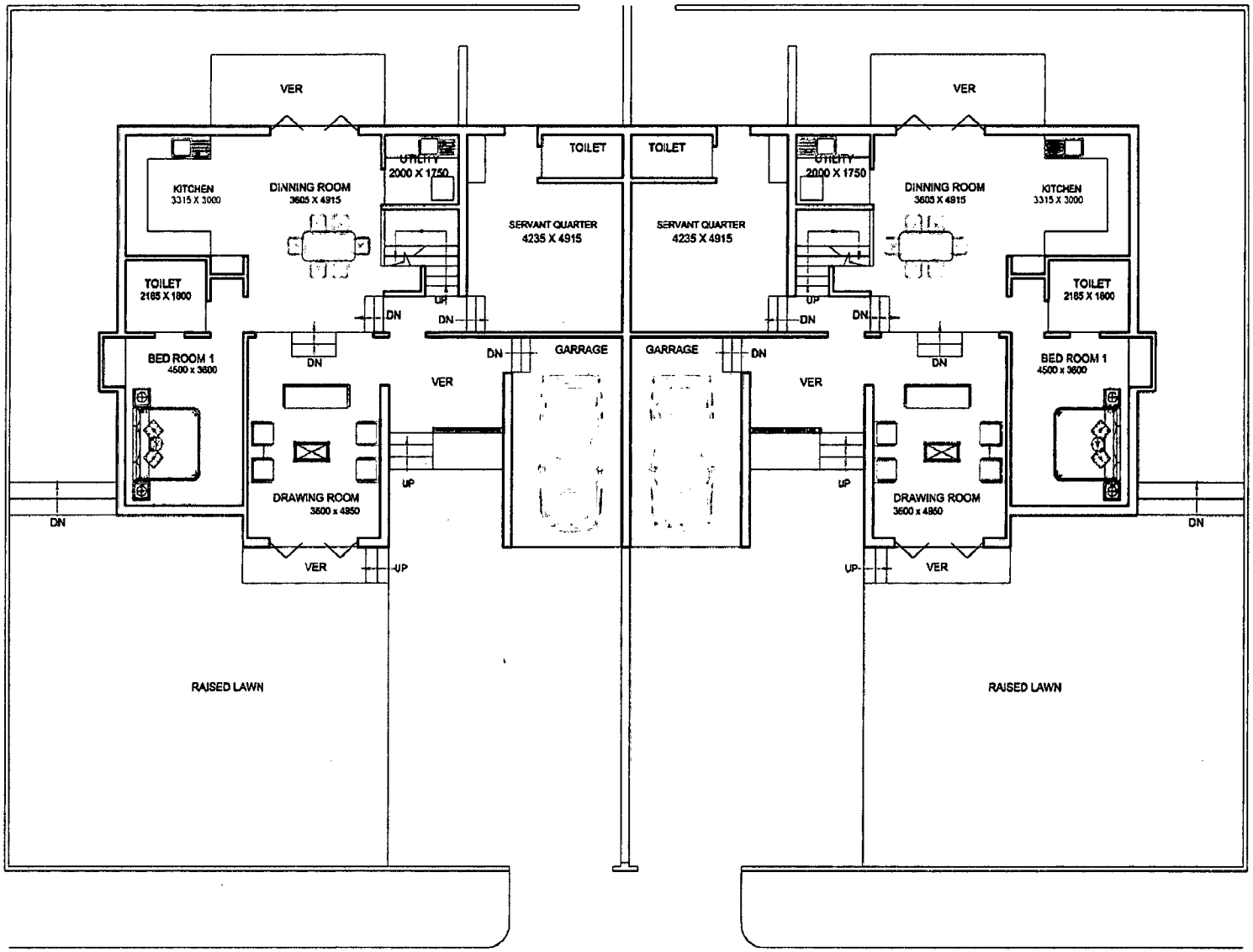


Drg. 6.7: conceptual plan, semidetached, duplex, twin bungalow for MAJOR TO BRIGADIER

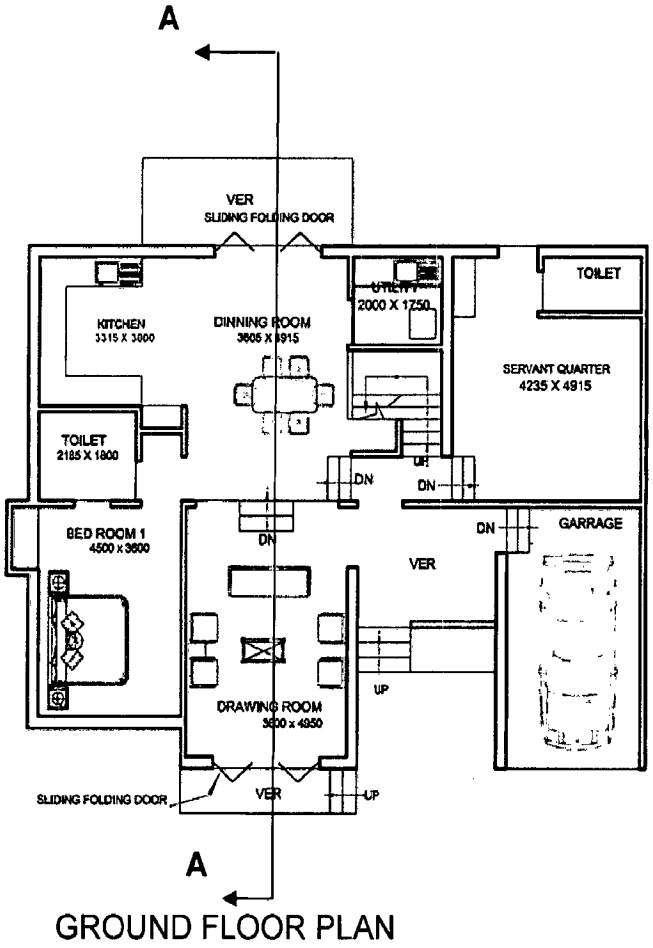
6.3.2.1MAIN FEATURES

i. Easily maintainable ,Independent small garden to each officer
ii. Despite any orientation, different seasonal useable spaces
iii. Cross ventilation to all rooms
iv. Entrance lobby allows complete privacy to drawing room during, in side, out side movement.
v. Garage area and servant area can be made in to use of main unit depending upon depth of need.
vi. Form of the building and typology of housing differs from subordinate housing

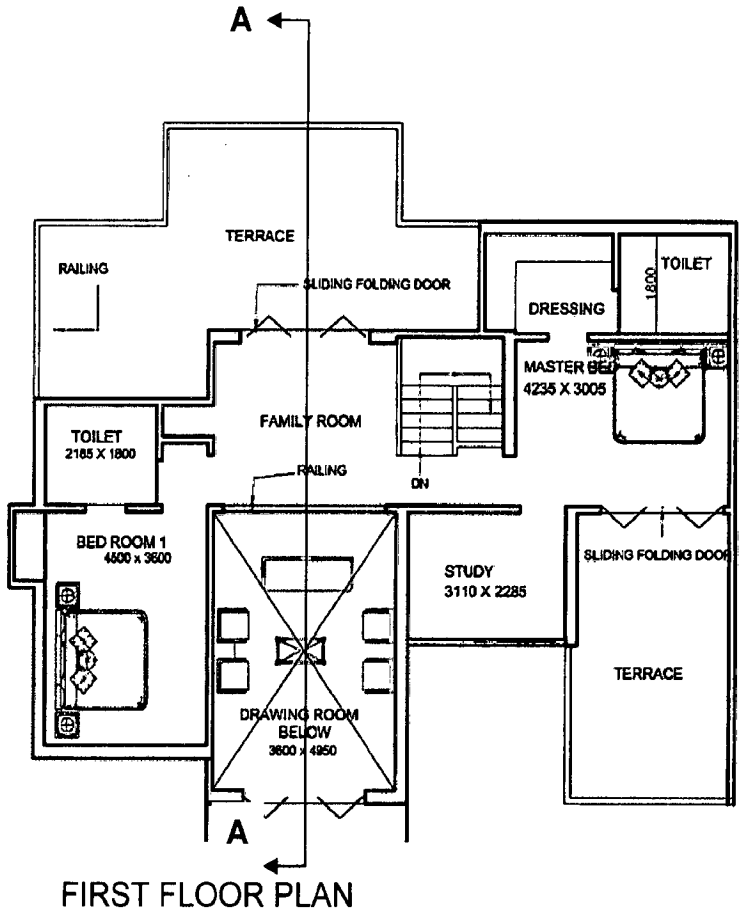
Following drawings shows some of main features of proposals.



Drawing 6.7: ***conceptual plan, semidetached, duplex, twin bungalow for MAJOR TO BRIGADIER***



GROUND FLOOR PLAN



FIRST FLOOR PLAN

Drawing 6 .8: ***conceptual plan, semidetached, duplex, twin bungalow for MAJOR TO BRIGADIER***

6, 04 sq mt area of staircase which is authorized has been made part of main unit, this will adds up visual grandness to dinning.

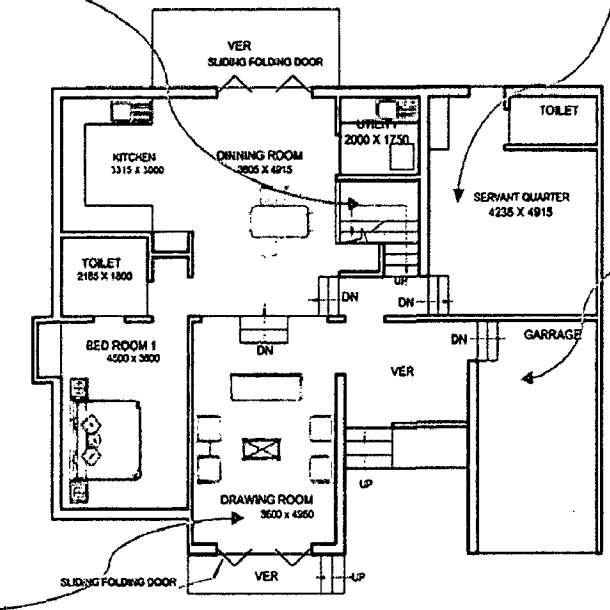
Under the stair case area can be used as store

Drawing room has been provided with sliding folding door to make better use of lawn.

Drawing room combined with dinning room, which gives flexibility in usage of spaces as per individual's requirement.

For such areas visual privacy if required can be archived by curtains only

Height of drawing room increased to give feel of grandness



Major to Brigadier residence
Ground floor plan

22.4 sq mt area of servant quarter can be used by main unit by locating it in such a way, this could be additional space available to use when permanent servant is not required.

Approach to the garage through main unit, facilitates use of garage space without lifting shutter.

This space can be used for packing and unpacking of boxes during transfer.

Drawing 6.9 main features

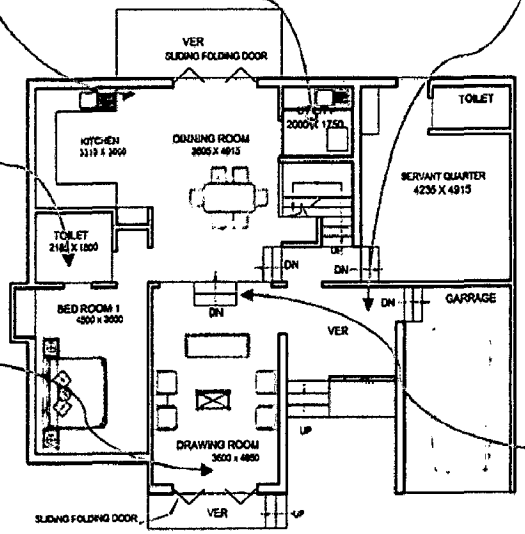
Space for fridge convenient for dinning as well as for kitchen

Utility area provided to take care of washing machine, aqua guard, etc

Entrance lobby added to

i. Archive privacy for drawing room
ii. Reduce wastage of circulation space for approaching in different part of residence
iii. Allow attending unwanted visitors
iv. Take care of shoes, caps keys umbrella etc

Two door provided to toilet .can be used as attached toilet for bed room when required



Sliding folding door provided which allows better and obstacle free use of out door spaces, as and when required.

Level difference to remarket dinning and drawing room

Increase in height of drawing room for better inside appearance

Major to Brigadier residence
Ground floor plan

Drawing 6.10 main features

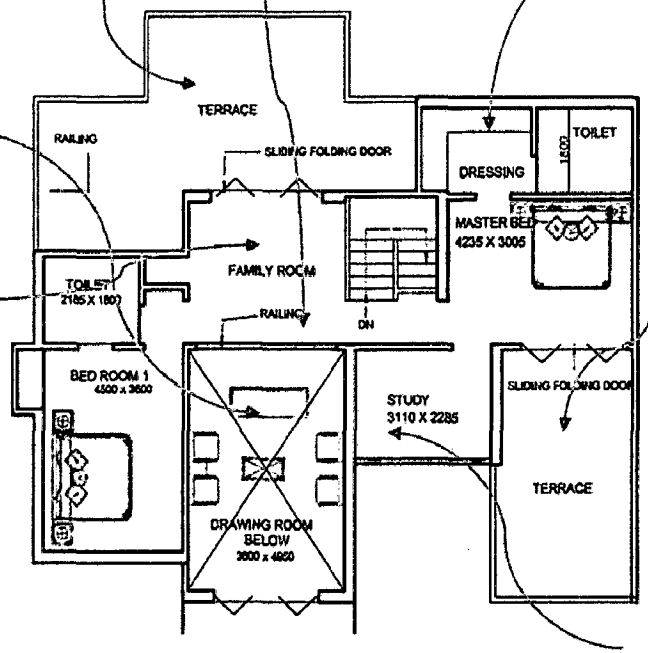
An independent terrace provided to family room so as to be linked with nature A 2.4 mt wide sliding folding door allows better use of terrace.

Balcony for better connectivity between ground floor and first floor

A dressing room along with bigger size ward robe provided to get clutter free bed room.

Increased height drawing room may give feel of grandness

Family room located at first floor, which is required for better family interaction.

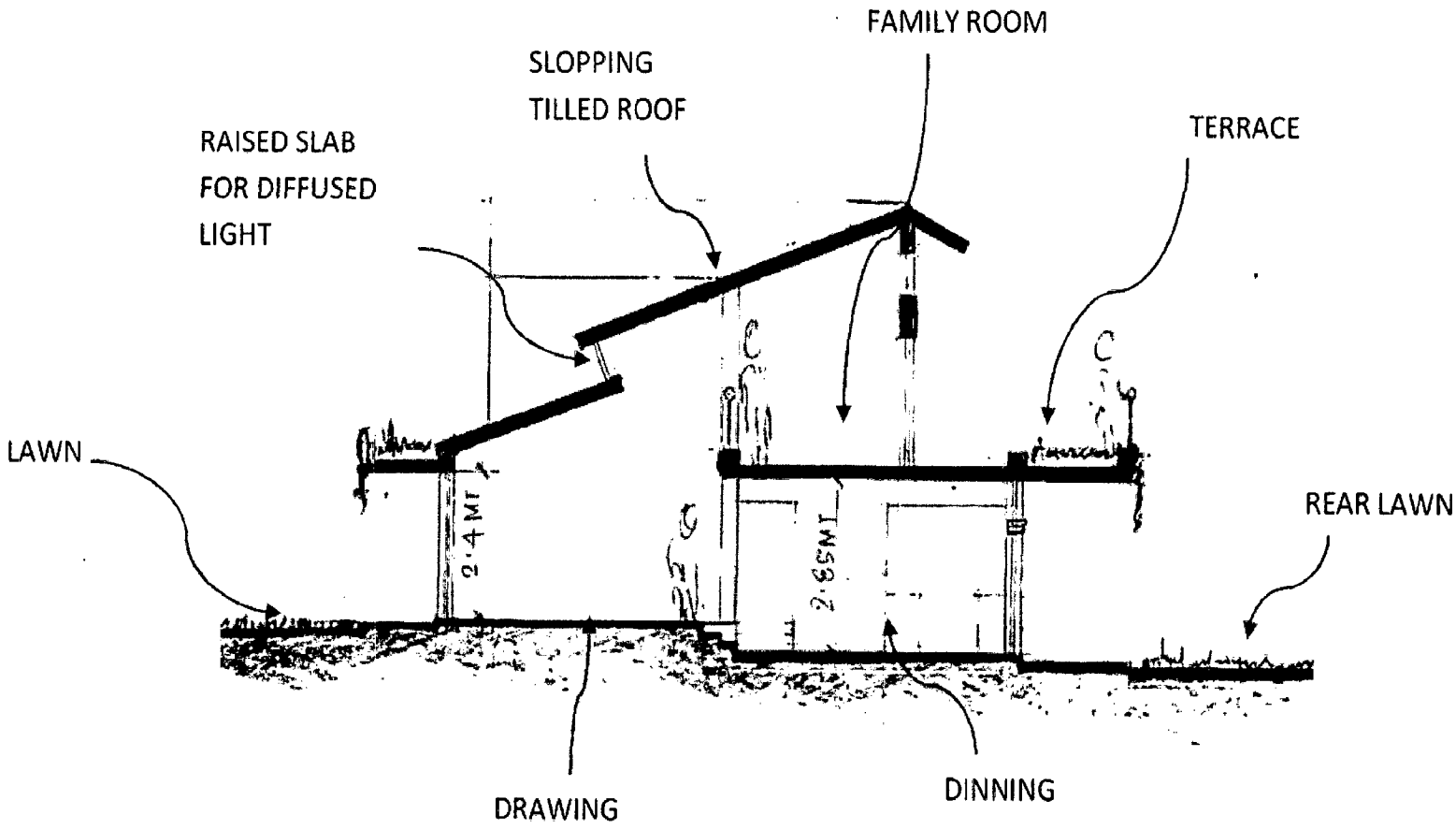


An independent terrace provided to master bed room so as to be linked with nature A 2.4 mt wide sliding folding door allows better use of terrace.

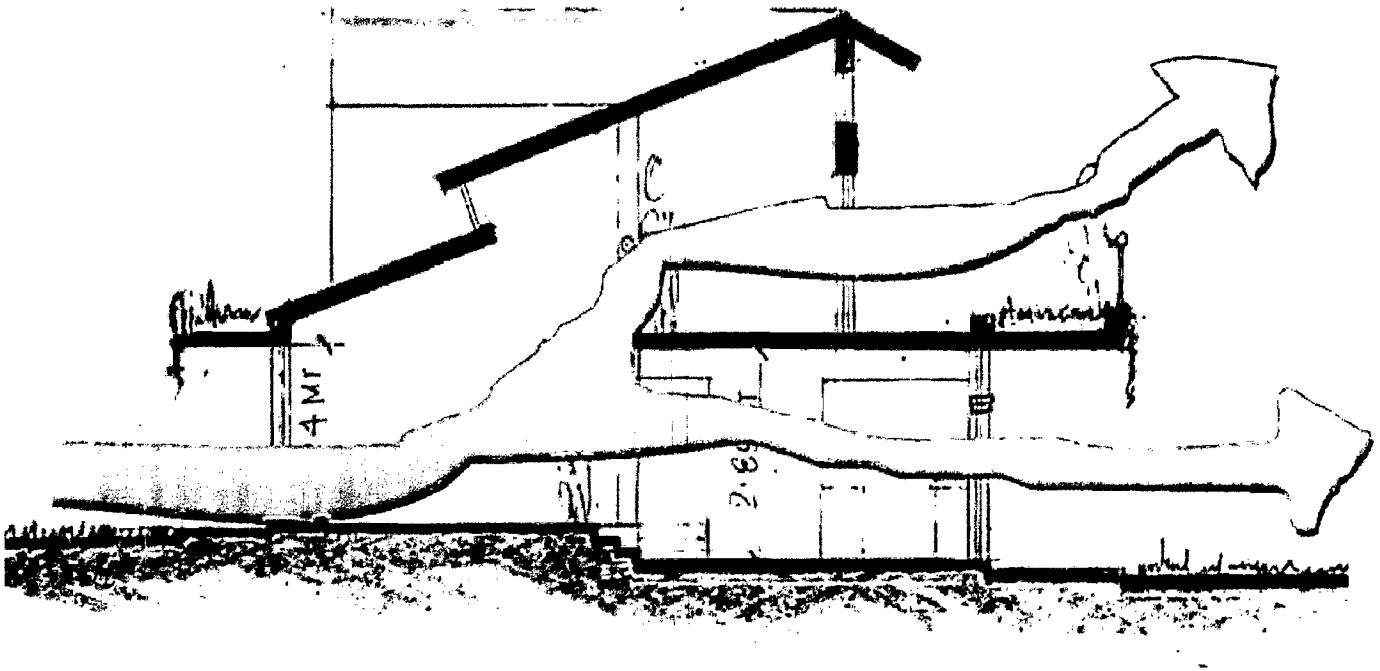
A study room provided by enclosing authorized balcony area

Major to Brigadier residence first floor plan

Drawing 6.11 main features

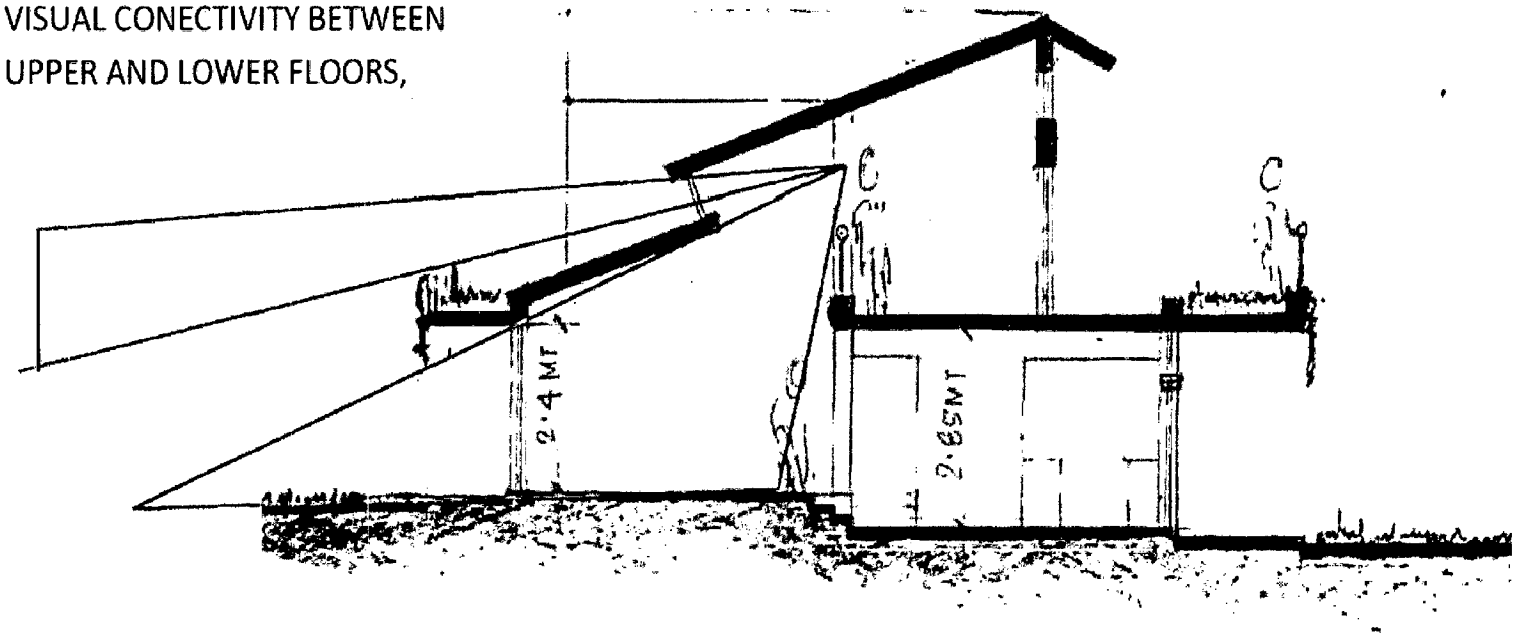


Drawing 6.12 Section- AA



Drawing 6.13 Section- AA

VISUAL CONECTIVITY BETWEEN
UPPER AND LOWER FLOORS,



Drawing 6.14 Section- AA

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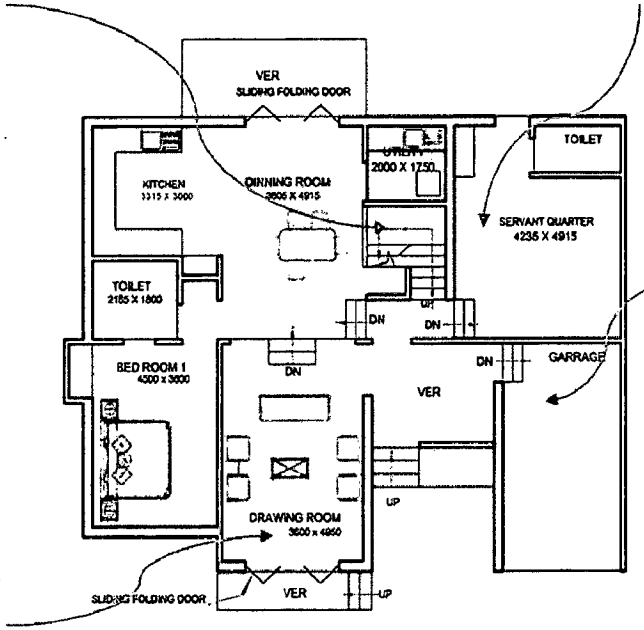

Major to Brigadier residence
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