

Introduction

A building serves as a support of an activity. Its value is derived from that activity. Buildings are built or renovated for new or expanded activities. Old buildings which no longer serve effectively are demolished.

A new building project begins with a manager or entrepreneur sensing a need in his organisation, department, or community for new activities which will require new support facilities. He makes a rough calculation of the value of the activity in rupees and the cost of the facility. If the value exceeds cost, he investigates further. The building process develops as a succession of expanded inputs regarding both the activity and the related building in orderly stages with recalculation of value and cost at the end of each stage. The value must exceed the cost or the project is revised or abandoned.

The process of creating a building must focus on service to the owner-entrepreneur, and on his objectives and priorities. Information must be available for the owner to effectively weigh value against cost. The design and building process must be controlled so that the results are consistent with estimates of cost, time, and quality on which the owner based his evaluations of value.

The traditional steps in the building process are:

1. **Programme.** The owner defines the activities anticipated. Certain activities are essential, others are supportive, and some are enrichments. Often the owner asks his architect or construction manager to place a cost on the proposed programme and parts of it for comparison with value.

2. **Conceptual Design.** The architect defines the spaces required for each activity and analyses their functional relationships,

adds required support spaces (toilet, stairs, mechanical rooms), and then arranges the parts into an orderly whole within which people will function efficiently and final aesthetic pleasure. This requires a dialogue with the owner to translate his activities programme into a space arrangement with approximate dimensions and cost estimates.

3. Design Development. The architect and his engineers analyse the systems of the building described to plan the structure, heating, ventilation, lighting, facade, site work, etc. The needs for columns, ducts, electricity, closets, fire exits, windows, etc. require adjustments to the earlier design. The additional knowledge allows a more precise estimate of costs of the building ; and the process helps the owner redefine his activity programme and the values expected from it.



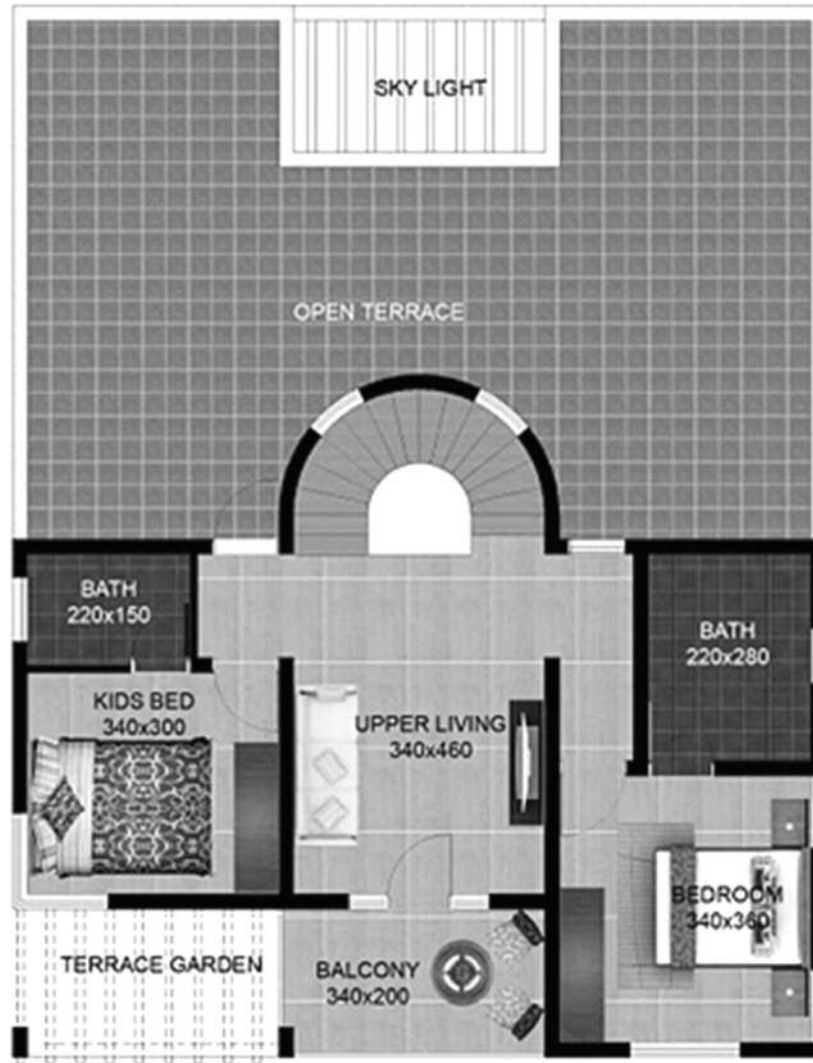
Photograph 1.1. Perspective view of a well planned residential house
(Courtesy: keralahomedesign.blogspot.com)



Photograph 1.2. Perspective view of a well planned residential house
(Courtesy: keralahomedesign.blogspot.com)



Photograph 1.3. Ground Floor Plan for the Building shown above (Total Area: 161.60 m²).
(Courtesy: keralahomedesign.blogspot.com)



Photograph 1.4. First Floor Plan for the Building shown above (Total Area: 76.70 m²).
(Courtesy: keralahomedesign.blogspot.com)

Requirements of Good Buildings

Fundamental requirements of good buildings are that they should fulfill the physical, emotional, social and biological needs of the persons who are going to occupy them for specific activity. It should

also incorporate the peculiarities of nature and habits of that particular the group of persons for whom it is intended.

All the requirements can be grouped under two main headings—Form and Function.

Form covers the emotional and aesthetic portion of the human requirements while *Function* covers the biological, social and physical needs.

Both are important and if possible should be achieved to the maximum extent, depending, of course, on the caliber of the designer. Both in case of comparison of the importance of the two, 'Function' out-weighs 'Form'. Functionally a building should be well satisfied before one can skip on the importance of 'Form'. If a piece of architecture does not fulfill the basic requirements of 'function' and all importance is stressed on 'form', it reduces to mere piece of sculpture and ceases to be architecture. It is difficult to achieve good aesthetic without sacrificing a bit of 'function' and that depends on the intelligence of the designer or architect to make a reasonable compromise between the two.

Lastly, the structure plays a very vital role in the creation of good architecture. It gives the practical shape to the imagination of the architect. It should be as economical as possible so that it comes within the reach of the client and a practical shape of the building can be executed.

Allied to this sphere comes the services which are essential to complete the piece of imagination created with the help of structure. These services are varied in nature and the methods of implementation go on changing with advance of modern technology.

Classification of Buildings

Based on occupancy, buildings may be classified as follows:

- | | |
|-------------------|-----------------|
| (a) Residential | (b) Educational |
| (c) Institutional | (d) Hospitals |
| (e) Commercial | (f) Industrial. |

General Principles of Planning

The main objective of planning of a building is to arrange the required units of a building at various floor levels according to their functional requirements, making best possible use of the space available for the building. The shape of such a plan is governed by several factors such as climate, site location, nature of activity, accommodation requirements, local bye-laws, surrounding environment, etc. In spite

of these variable factors, certain general principles, which govern the theory of planning are common to all buildings of all classes. These principles, enunciated below, are not perfect but just guiding factors to be considered in planning:

- | | |
|--|------------------|
| (1) Aspect | (2) Prospect |
| (3) Privacy | (4) Grouping |
| (5) External Appearance
of the Building | (6) Utility |
| (7) Sanitation | (8) Flexibility |
| (9) Circulation | (10) Furnishing. |

(1) **Aspect.** It means the peculiarity of the arrangement of the doors and windows in the outside wall of a building, which allows it to enjoy, to the utmost, the gifts of nature such as sunshine, breeze, views of the landscape, etc. Aspect is a very important consideration in planning as it provides not only comfort and good environment to live in but from hygienic point of view also.

A room which receives light and air from a particular side is said to have aspect of that direction. All such rooms making a dwelling need particular aspect. On this consideration, the following aspects for various rooms in a building are preferred:

- (a) Bed rooms — S-W aspect or W-aspect.
- (b) Kitchen — E-aspect
- (c) Dining room — S-aspect
- (d) Drawing and Living rooms — S-aspect or S-E aspect
- (e) Verandahs — S-W aspect or W-aspect
- (f) Reading rooms, stores, class-rooms, studios, stairs, etc.
— N-aspect

(2) **Prospect.** Prospect is the impression that the building is likely to make on a person who looks at it from the outside. Therefore, it includes the attainment of pleasing appearance by the use of natural beauties; disposition of doors and windows; and concealment of some undesirable views in a given outlook.

(3) **Privacy.** If a residential building lacks in the respect of privacy, it is a deplorable fault which cannot be compensated for by a host of other merits. Privacy is of two kinds:

- (a) The one is in respect of screening the interior of any one room from the other rooms of the house and also from the main entrance.

(b) The other is privacy of the building as a whole from the neighbouring buildings, streets and lanes.

(4) **Grouping.** Proper grouping of various parts of the building in their relation to each other, which specially in economic and compact planning, requires great skill on the part of the architect. The dining room must be close to the kitchen, and the kitchen should be away from the drawing or the main living room, otherwise kitchen smells and smoke would detract from their usefulness. Services must be nearer to and independently accessible from every bed room.

(5) **External Appearance of the Building.** It is the effect produced by the elevation and general layout of the plan. The elevation, therefore, should speak out the internal facts and be indicative of the character. Elevation should be impressive and should be developed together with the plan simultaneously. With the economy limitations, elevation should be aesthetically good and attractive.

(6) **Utility.** The maximum advantage must be taken of every square metre space of the house. It is the accomplishment of economy of space at the same time avoiding cramping of the plan. A great skill should be exercised in making suitable arrangements of the rooms, doors and passages for accommodation in such a way that the maximum utility is achieved without adversely affecting the other essential factors such as privacy, aspect, etc.

(7) **Sanitation.** Health and happiness of the dwellers depend upon the sanitation. It embodies provisions of ample light, ventilation and due attention to general cleanliness and sanitary conveniences.

(i) **Light.** Light has two fold significance, (i) it illuminates and (ii) it is essential from hygienic point of view. Light interiors of the building may be provided by natural or artificial lighting. Glare in light distracts and disables the vision and hence the source of glare must be eliminated.

Uniform distribution of light is necessary particularly in schools, hospitals, workshops, etc. A room should get sunlight as long as and as much possible. Vertical windows are therefore, better than horizontal ones.

Generally, the minimum window area for proper lighting should not be less than 1/10th of floor area. This may be increased to 1/5th for buildings like schools, hospitals, workshops, factories, dormitories, etc.

Good lighting is necessary in all buildings for (i) to promote the activity in proper manner, (ii) to ensure safety of the people, and (iii) to create, in conjunction with the structure and decoration, a pleasing environment conducive to interest and a sense of well being.

(ii) **Ventilation.** It is the supply of outside air either by direct ventilation or by infiltration into the building. Good ventilation is an important factor conducive to comfort in buildings. Ventilation may be natural or mechanical.

(iii) **Cleanliness and sanitary conveniences.** Though the general cleaning and upkeep is the responsibility of the occupants but even then some provisions to facilitate cleaning and prevention of dust are necessary in planning. The floors should be non-absorbent, smooth and have proper slope to facilitate washing with suitable outlets in the walls.

Sanitary convenience include the provisions of bathrooms, water closets, urinals, etc. in the building. Provision of such conveniences is not an optional matter but is a statutory requirement.

(8) **Flexibility.** This means making a room, originally designed for one specific purpose, to serve other overlapping purposes also. A building is constructed to last many years. During this period, the use of a space may be required to change. This element of flexibility is incorporated at the planning stage itself.

(9) **Circulation.** To preserve the privacy of every room and also not to disturb any member of the household doing his or her work, a straight, short and separate passage is required. This passage which is the means of circulation should be direct and well lighted.

(10) **Furnishing:** This aspect should get considerable attention in advance. Bed rooms must be designed with due thought and attention to the prospective position of the beds and similarly other places should be also examined from utility and furnishing point of view.

One should always bear in mind that a house once built, is calculated to last for several decades. Hence one should not practice false economy and erect a weak structure which fast depreciates in value requiring continual repairs.

Not all but few points of planning in house building has been outlined above, which requires proper attention before constructing a modern building.

Orientation of Buildings

Orientation is the process of fixing the direction of the plan of the building in such a way that it may derive maximum benefit from the elements of nature such as sun, wind and rain. Once the site is selected for construction of building, the architect fixes the orientation of the building plan prior to planning and design. Proper orientation means to utilise the natural gifts in achieving functional comfort inside the building through the planned aspects of the building units. In other words, good orientation is the proper placement of plan units of the building in relation to the sun, wind, rain, topography and outlook besides providing convenient access both to the street and backyard.

Orientation in case of non-square buildings is indicated by the direction of the normal to the longer axis. For example, if the length of the building is East-West, its orientation is said to be North-South. The poor orientation of the buildings results in uncomfortable conditions inside the building. Though the comfort conditions in such buildings can be created through artificial devices but the operational cost of such devices is very high.

Factors Affecting Orientation

Some of the factors which affect orientation are as follows:

(i) It is essential to know sun's path throughout the year and its relative position with respect to the locality, to calculate solar heat gain for the proposed building.

(ii) Prevalent wind direction should be ascertained. The wind is welcome inside the house during summer whereas the wind in winter is most unwelcome.

(iii) The knowledge of the direction and intensity of rain in the locality should be determined before fixing the orientation of the building.

(iv) Location of the site and the direction of the street also plays vital role in deciding the orientation of the building.

For places, where summer causes greater thermal discomfort, the building as a whole should be oriented to intercept minimum solar radiation in summer, and *vice-versa*.

Orientation under Indian Conditions

Solar heat and humidity are the two important controlling factors in the orientation of a building. Indian climate for design purpose is generally classified either hot-arid or hot-humid.

(i) **Hot-Arid Zones.** Such zones having hot dry climate are found in the interior of the country, away from the coastal belt. Hot-dry climate is characterised by the high summer day-time temperature, low relative humidity and wide range of temperatures between day and night and between summer and winter such as for example, prevails generally in the Northern India and Central India.

Therefore, comfort requirements call for the removal of the hot air through walls, roof, doors, windows, etc., for orientation in such Hot Arid Zones.

(ii) **Hot-Humid Zones.** Such zones having wet climate are found generally along the coastal belt of India. Hot-humid climate is characterised by low summer day-time temperatures. High relative humidity due to violent monsoon conditions, prevail generally in West coast, East coast, etc.

Based on available data in India, on prevailing monsoon winds the following orientations have been suggested by C.B.R.I. Roorkee, keeping in view the indoor comfort conditions for a dwelling.

(i) **Northern India.** Orientation should be done along the direction East and West, facing North.

(ii) **Central India.** Orientation should be done along the direction E-SE and W-NW, facing N-NE.

(iii) **Delhi Proper.** The best position of a building from orientation point of view is considered when the longer side makes an angle of 22.5° on the East-West line towards East-South.

(iv) **West Coast Regions.** Orientation should be along the direction S-E and N-W, facing S-W.

(v) **East Coast Regions.** Orientation should be along the direction S-E and N-W, facing N-W.

(vi) **Bengal.** The best orientation is considered to be along E and W, facing S.

(vii) **Hill stations.** At hill stations, the winter season causes more discomfort and, therefore, deserves greater consideration in orientation of buildings. The sole criterion for optimum orientation, therefore, is to obtain maximum solar energy on the building in winter. The orientation of the buildings in hill stations should be such that the living rooms are open on the South and West sides of the sun.

Economy in House Building

A house is modern, if it is designed to support the required activity or to suit the personal habits of the family; if it is flexible in plan, so that its space can be used for various activities; if it takes full advantage of nature—sun, wind and outside views; if it is easy to run and keep clean, and if it is bright and cheerful, then, occupants are sure to enjoy working or living in it. Whether rich or poor, there is always a desire to economise the cost of building a house. In fact, it is social duty of engineers, architects or any other persons involved to practice economy whenever it is possible to do so but not at the cost of function, safety, convenience and comfort. A few points are suggested as follows on how to achieve economy in house building:

(1) The more the dimensions of length and breadth of a house approach each other, the less is its cost.

(2) A double storey building, having half number of rooms on the ground and half on the first floor, is much cheaper than only ground floor structure, because the expenditure on the foundations and roof for the double storeyed building is nearly half of that for the ground-floor structure. Secondly, for certain amount of accommodation a ground floor structure requires a larger plot of land than a double storeyed building. Where the site is very costly, this consideration alone outweighs all others.

(3) For middle class people, there is no better way of affecting a considerable economy than by restricting the height of floors. Western countries including U.S.A. allows about 2.5 metres height of ceiling in residential buildings. However, there is difference in climate as compared to India.

However, it is not advisable to try to bring economy by unduly curtailing the height of the plinth. A high plinth contributes to preserve sanitation and health of the occupants and hence, it should not be reduced to less than 600 mm in any case.

(4) Another means of reducing the cost of a building is to build the outer walls thick enough to protect the house from heat of the sun and thieves, and to build inner wall of half or one brick thickness with intermediate posts of wood, steel or R.C.C. framework to support the weight of the upper floors and roof. Generally, 200 mm thick wall is sufficient upto three storeyed buildings. It is sheer wastage to make the walls very thick as people did it in the ancient time.

(5) Maximum advantage should be taken of the materials and labour locally available.

(6) Division of labour and specialisation are great points in saving money, particularly when work is being done departmentally. Masons who are used to dressing should be employed on dressing only.

(7) The season in which the building work is commenced also plays important role.

(8) If the doors and windows are of uniform size, the carpenters who had to work on uniform size find it much easier and finish it more speedily. In other words, standardisation of sizes and materials is very helpful in reducing costs.

(9) Settle, once for all, the plan of the building, stick to it and never make any change or alternation except under the advice of experts who will consider the effect of such alterations on the work already done.

(10) Plane and simple architecture not only looks well but is also very economical.

(11) If the sinks, bathrooms, water closets and urinals are so placed that all the sanitary fittings come near each other, a considerable amount is saved and also flushing becomes easier.

(12) A considerable saving may be made by buying materials at the proper time and in the best market and by maintaining a continuous supply of them at the job.

(13) Research has proved that for outside plaster, lime mortar to which 10% cement is added is cheaper and better in every respect than cement plaster.

(14) Now-a-days cement has become very costly. Its use, therefore, may be restricted to R.C.C. work only and it should be substituted by lime with addition of surkhi. The latter increases the bulk and reduces cost, and provides equal strength to wall.

(15) The last and important suggestion for economy is to get an estimate of the house framed by an expert, in which the thickness and the size of materials to be used is specified.

There is, however another important aspect of economy, *viz.*, economy in construction, which is of equal or perhaps of greater importance. Planning is another essential part which should be properly taken care of before starting the construction. Generally, the shape of a plan is governed by the configuration of the building plot and the climate of the place. For cold or very hot climate, a compact and closed plan may be suitable, but on the sea-coast a much exposed and open house may be preferred.

Residential Buildings

Despite the rising cost of building construction and growing difficulties in obtaining suitable plots of land, the single family house has not lost any of its attractions. The multi-apartment flats are still regarded by many as a reluctantly accepted even with the fact that some most attractive designs of these have been developed in recent years.

What are, in fact, the advantages of the single family house? A well planned owner occupied house can provide an environment adopted to the owner's personal way of life, unrestricted by considerations for other people living in the building or in the immediate neighbourhood. Unlike, a rented flat, an owner occupied house offers the maximum of freedom and the attached garden, which can itself provide an extension of the living space. Just how important this living within and with the landscape is proved by numerous examples in the recent years.

Building sites are scarce and expensive particularly in bigger cities and even in moderate towns. For this reason sites are being developed which, even twenty years ago would have been considered unsuitable for the purpose. Steep sloping ground exposed positions, rocky or marshy subsoil all give rise to a number of difficulties. However, these are seldom inseparable and may on the contrary, often be turned to advantage. A steep slope for example, need not involve costly excavation work by stepping the building down the slope, both upper and lower floors can be given access at ground level and the raised living room will offer a wider view when the water table is high, the house can be set on stills. The open ground floor is useful as a covered play space for children or as a car park saving the cost of a garage.

Even the difficulties of rocky ground can be overcome without expensive blasting operations, by imaginative use of space and difficult access to the sites on mountain slopes counter—balanced by the advantages derived from the views and complete privacy. On a narrow plot, screen wall flanking the living room will achieve the necessary degree of seclusion. Where the houses are arranged in groups, it is still possible to comply with the dweller's personal requirements by varying their orientation and plan, where the distance from neighbours and the size of the plot allow, architects and builders nearly always to make use of this great advantage of the widely detached house by opening it up to its surroundings.

These two extremes mark the wide scale of possible treatment, ranging from houses on simple square or rectangular plans through L-shaped, T-shaped or cruciform plans built around a central courtyard or garden. Personal concept for certain forms of layout, *e.g.*, with open plan or juxtaposed cells, specific space requirements depending on the size and composition of the family and the personal touch of the designer confer on a well designed single family house a character of unique individuality. But such individuality is only due to various combinations of some elementary functions, *e.g.*, sleeping, eating, working, relaxing and playing. Although these basic functions may be related in a great variety of different ways, the means of service them are in most cases, the same.

The layout is frequently based on the open plan which is, however, in most cases confined to the living areas. In nearly all cases living room and dining room are combined. Sometimes general area may also include a place for a desk serving a study or more rarely the hall or kitchen. Among the devices used for separating the different sub-area are pieces of furniture, and storage units, the movable partitions, sliding doors and split level arrangements. A family is not a static unit but are undergoing continuous change. For a house to meet the ever changing requirements of a family which will first grow and then shrink, its layout must be flexible allowing for the outset for the possibility of extension by providing rooms which are not in continuous use or are not assigned to any specific purpose. Flexibility can also be aided by opening the children's bedrooms unto a playroom type hall or by including multipurpose rooms which may serve either as guest room or as study room. Open planning and flexibility can be most easily obtained by resorting to framed construction with non-structural partitions allowing for an adoption to changing requirements.

The living room is usually the focus of daily family life and its orientation is always governed by the desire to enjoy as much sun in winter as possible and cool breeze in summer. It is the open contact with the landscape even more than the flat roof, which must be regarded as the most significant characteristic of the modern house. Large windows make the natural surroundings part of the interior. Flower beds at the same level, inside and outside dissolve the boundary between interior and exterior. Balconies and lobbies serve as outdoor sitting areas. Terrace merging with the garden add a green room to the interior space. Recesses or projections in the facade and cantilevered floor slabs create projected out door spaces often adjoining a large lawn or swimming pool. One drawback of large

windows, the undesirable heating up of interior by solar heat can be easily avoided by sensible arrangements of plants or sun screening devices. The bed rooms, calling for special privacy and protection are preferably placed in a separate wing or storey. The master bedroom is nearly always the largest and is generally combined with a dressing room and a bathroom.

The children are sometimes assigned to a self-contained area with their bed rooms-cum-playrooms placed in a special wing to minimise mutual disturbance. Parents and children can thus remain in their separate parts of the house as they choose. The common place is the living room.

The widest choice of location applies to the kitchen. Its exact position depends on the number of family members and the possible domestic help to the house-wife by a servant or other family members. Where servant is available, the well tried layout of a self contained staff wing with kitchen and utility room accessible from a separate entrance is still resorted to. Where household help is not available, the housewife's activities are centred around the kitchen in which case the kitchen is most usefully placed in central place of the house. In this way, the house wife's walking distance is minimised and supervision of children is made easier. The kitchen must have cross-ventilation and arrangement for taking out smokes, if any. The garage or car parking is an indispensable adjunct to a modern house.

With the great range of building materials available there is, so far as the single family house is concerned, no longer any marked preference for specific materials selected on trends of regional tradition or special climatic condition. There is, however, a marked tendency to leave the materials in their natural state, not only externally but also inside the house. This applies in particular to those materials which because of their structural capabilities or surface texture can be used to obtain certain aesthetic effects like exposed brick, stone and concrete. But the use of such materials is generally confined to the living areas.

Housing Layouts of Flats and Appartments

Housing layout begins with the designs of the house and is generally recognised that apart from standards of internal space and equipment, a house must provide fresh air and sunlight, a view of natural objects, a reasonable degree of privacy and safety; and it must be in healthy position.

In designing a housing scheme we have to study and assimilate the character of the landscape itself; and simultaneously

with this we have to study the design of undivided dwelling. Functional problems associated with these needs may be solved by the planning technique of zoning, density and orientation. Next is the circulation problem, *i.e.*, (i) Linking up the dwellings to each other, and (ii) Linking up the dwelling units to the neighbourhood road system.

Sufficient area should be marked for parks and open spaces for community needs.

Detached House

The ideal detached house is specially designed to meet the occupants requirements like a tailor made suit. It stands in its own landscape setting aloof from the other building. While it fulfills all requirements of ventilation, light and circulation. It poses a difficult problem as far as the general outlook is concerned. Each house has separate aesthetic presentation, hence there is no aesthetic relationship among the various buildings of the neighbourhood.

In detached houses a pleasing effect can be achieved if the landscape on the road side of the house is kept quite open, air and light are allowed to flow up to the building uninterrupted by fences and walls.

Disadvantage

Detached houses are costly and need more land for the construction.

Semi-Detached House

When two identical houses are attached by a common entrance and stair case, it is called semi-detached house. It is successful because:

- (a) It is cheaper to construct.
- (b) It provides good accommodation for an average family.
- (c) Because being surrounded on three sides by open space it almost gives the impact of being a detached house.

Disadvantage

As with the detached house repetition of an identical design will give unity but when adjacent parts or gaps are different the appearance is generally non-uniform.

Row Houses or Terrace Houses

A terrace house or row house is any house in a continuous row of three or more. The row can be a complete and architectural whole or

just an assembly of different house designs, the two common factors to any type being separation by partition walls and a part elevation in one major plane.

The planner prefers this type as it makes broader and simpler composition than the equivalent number of detached or semi-detached house.

The terrace has a very obvious advantage that it saves space. In place of a gap of few meter between houses we have a few centimeters of partition wall, making possible a higher density, or alternatively if the density is kept the same, a better open space pattern.

Flats

A flat may be defined as a dwelling divided horizontally from another dwelling. It is the horizontal division between one flat and another, the floor, which distinguishes it from the house, in which the subdivision is always by a vertical division or partition wall. It is more compact as compared to detached or semi-detached house. Further, since the dwellings are more concentrated communal facilities such as gardens, central air-conditioning, hot water supply automatic refuse disposal are more easily and economically provided.

Advantages

(a) It makes possible a more compact design with saving in land, saving in services and saving in travelling time.

(b) There is far greater freedom in designing and composing the building on site and obtaining contrast in scale.

(c) It causes least disturbance to air area of natural landscape making possible for greater integration between landscape and building.

(d) Being more compact and more labour saving it is a more logical form of dwelling for small families.

Disadvantages

(a) It is usually more expensive in building cost.

(b) In taller buildings, dwellers are cut off from the community gardens.

(c) It is an impossible building form for those who wish their dwelling extended into a private garden.

Duplex Apartments

Duplex apartments may be described as living spaces at two or more levels. It enjoys both the advantages of living on ground floor as well as on the first floor. These types of apartment can very well be created in detached, semi-detached or multistorey housing split level is also another form of duplex housing. In multistoreyed structures these can be so arranged that the corridors fall on alternate floors or even beyond. The main advantage of this type of housing is that they offer a very good scope of adequate ventilation and light. Split levels have their own added advantage of good elevations and internal spaces alongwith the vertical traversing from adjacent levels of only half the height of floor to ceiling. Row houses with living spaces on two or more levels are known as masonites.

Advantages

- (a) Good light, air and ventilation.
- (b) Proper segregation of functions.
- (c) Interflow of spaces.
- (d) Internal spaces as well as the external form are more adoptable to good aesthetics.
- (e) Interesting spaces due to differences in levels.

Disadvantages

- (a) In traversing vertical heights, no matter, howsoever, small it may be, some strain is felt.
- (b) There is lesser scope for flexibility of function.

Office Building

In planning a commercial or office building whose success is measured in cost, the designer must analyse the site, the type of plan, and structure proposed, proportions of rentable public and service areas and code or other restrictions so that the owner may have an understandable approximation of building costs and potential returns.

Location and Proportioning of Areas

Service areas should be as close to the centre lines of the building as possible. Basements usually contain the principal items of equipments e.g. heating, air-conditioning, ventilation, etc. and storage.

Building entrances should be so located that they are in average pedestrians instinctive line of approach.

Height of Building

As the building increases in height the cost of all its components does not go up in simple proportions. The law of diminishing returns affects the height and area. The height of the building should be determined only after careful consideration of the following factors:

- (a) The additional expenses of steel including wind bracings.
- (b) The additional expense of larger elevator machines, larger pipe and tank sizes, power lines, etc.
- (c) The loss of space on intermediate and lower floors which will result from an increased number of service shafts.

Exterior Walls

Wall construction can be of any impervious material which will preserve the finished plaster. Leakage of water through stone, brick or tile should be taken care of by providing the interiors with water proofing.

Typical Bays

The spacing of the columns on the exterior wall of the building is dependent largely on the possibilities of subdividing the interior space efficiency and partly on design considerations. Wall space is useful in offices and it is, therefore, good practice to have the glass area about 50% of the outside wall area.

Corridors

It is best to plan corridors so that they can easily be altered at will or as dictated by the usage of the area.

Service Area

On a typical floor of an office building the service areas (stairs, toilets, lights and shafts) will usually occupy about 17% of the total area.

There is no fixed rule for determining the number of toilet fixtures in relation to the number of people they serve. The use of the building, building bye-laws of the locality and the desire of the owner must be considered. A general approximation is one toilet for every 15 people and two lavatories for each 3 toilets.

Lighting

It has been found that 25 feet candles are designed for work at office space. If the general lighting of the room is good the contrast between the brightly lighted spot and the surrounding area will not cause discomfort. Fluorescent lighting is becoming more and more popular for public offices and display spaces.

Air-conditioning

The adoption of air-conditioning for the building or part of the space within it should depend on:

- (a) The physical space and utility service available.
- (b) The benefits to be derived from installation.
- (c) The cost in relation to these, all layouts should be made with the accessibility in mind. Cooling coils often have to be replaced and repaired. There must be free access to the bearing of all moving machinery. Provision should be made for the complete removal of any part of the system that is subject to wear, deterioration and damage.

Hospitals

Hospital designing needs utmost care and thought in planning and detailing. Efficient hospital planning requires the following considerations:

- (1) Proper circulation for efficient utilisation of space by patients, doctors, nurses and other staff.
- (2) Minimum length of corridors to avoid unnecessary walking about and thus saving time and energy.
- (3) Minimum sharp corners to avoid bumping and collision.
- (4) Operation theater unit to be detached so as to form a sterilised zone but near enough to facilitate the wheeling of the patients from the ward and convenient for the doctors, nurses and anesthetist.
- (5) A complete mortuary detached from the main circulation, with post-mortem room, etc., and having a separate entrance altogether, though it has also to be connected with the operation theater unit and wards.
- (6) A nurse's cabin at a convenient place for the nurse to keep watch and to attend the patients by travelling minimum distance.

(7) Casualty unit to have a separate entrance and preferably located so as to make it convenient for the doctors and nurses to be on duty without any waste of time.

(8) The outdoor patient department and indoor wards are detached so as to eliminate mixing between the outdoor and indoor patient but circulation to be such which facilitates the doctors and staff to be able to deal with both.

(9) The entrance lounge and waiting hall should be attractive and well lighted and sufficient floor space for peak loads of out patients. Crowding of patients in main lounge should be discouraged and the patients should be directed to the special units from which they require treatment and diagnosis. The waiting hall should preferably be used for visitors needing consultation with administrative staff. Public toilets, telephone booths and drinking fountain should be located conveniently nearby. An information counter immediately adjoining the record space should be directly opposite or near the main entrance. Racks and shelf space should be provided for health, educational pamphlets and other literature.

(10) *Administrative wing.* Offices of the medical director, medical superintendent, health officers and assistant health officer should be accessible from the main waiting room through the secretaries' office. Each officer should have a separate and attached toilet comprising of a wash basin and water closet.

(11) *Wards.* Wards should have enough area to accommodate the number of beds desired, with bedside tables, having enough storage space and adequate circulation area for easy passage for wheeling trolley and movement of nurses and doctors. They should be well lighted and ventilated but glare and wind blast should preferably be avoided.

Industrial Housing

Ordinary principles of industrial housing and the appreciation of the maxim that cheapness and economy are not synonymous would help greatly towards proper planning of industrial houses. An incorrect appreciation of cost is really economical; can lead into dark from where we can never come back. It is important to remember that slums not only result in financial loss but perpetuate human misery on an incredible scale.

It is important to bear in mind that the technical approach to industrial housing in our country is rather different from that in Europe and that there is not much common ground between the two. Comparison on the following points will make it more clear:

India	Europe
(1) The room temperature in the use has to be lowered in the greater part of the country during 9 months of the year.	(1) The temperature in the house has to be raised during most of the period.
(2) Cross ventilation for humid condition is essential.	(2) Cross-ventilation for living rooms is not necessary.
(3) In most part of the country living is generally out of doors for most part of the year.	(3) Outdoor living extends to a few days during the year.
(4) Verandahs are essential.	(4) Verandah is not essential.
(5) The floor height may not be less than 3.2 m.	(5) The permissible height is 2.2 m only.
(6) Houses are mostly built as ground floor structures, because of climatic conditions.	(6) Houses are mostly built as two storeyed structures.
(7) The joint family system is quite an institution.	(7) The joint family system as an institution does not exist.
(8) Cooking is done by log of wood or coke fire.	(8) Cooking is done by electricity or gas.

In Europe, if a room is warm and ventilated, climatic conditions are mostly satisfied. A satisfactory dwelling in India has to provide for three extreme climatic conditions. In Europe, it has to cater for only one. The difficulties of Indian planner, considering the meager technical advances made in this country and its limited resources, are very great. But a good planner can design industrial houses that will satisfy to a great extent the requirements demanded by our climate and our mode of living.

Another factor that plays an important role in planning is the habits of the people. Our climate necessitates open-air life. As a race, we are open-air-dwelling people. Ten out of twelve months can be spent out of doors in comfort in most part of our country. A proper orientation of the house and planned arboriculture can give sufficient shady areas around the house, where long hours of June and July can be spent. This aspect of living should minimise rather than complicate planning problems. A well laid-out compound may be such as to permit sitting away from heat reflecting walls. An industrial dwelling cannot be deemed to be satisfactory if sanitary conveniences are not conveniently located. Every member of the family should be able to approach them at all hours of the day and night without having to

leave the house. The water-borne sanitary system for the planning of industrial housing colonies is necessary.

However, humble is dwelling, it would be desperately wanting in amenity if it did not have a verandah, considering all aspects of the life of an industrial worker. A verandah constitute an important department of a dwelling.

Planning of One Room Dwellings

The most important aspect of planning one room (single storey) quarters is their orientation. Oriented wrongly, the small rooms with thin walls and low roofs become ovens for four months in the year. With the shallow depth of the room and the not too liberal width of verandahs, the success or failure of an industrial housing scheme depends greatly upon the orientation. Two factors must be taken into consideration with regard to the problem of orientation, the first being the prevailing winds, and the other being the exposure of the walls and roof of the quarters to the rays of the sun and their penetration into the verandah.

One-room quarters should be built in rows. Six quarters in a row are sufficient for the purpose of circulation within the area. The size of the room suggested is either 3.5×3.0 m or $4.2 \text{ m} \times 2.5$ m. The front verandah should be 2.0 metre wide which may accommodate the cooking oven in one of its corner. If the verandah is covered with glazing, this space becomes more useful during day and night time.

Multi-storey buildings will always be built in areas where land values are high. Unless foresight is shown in their planning, slums will be created which no government or industry, however well to do, will be able to improve later on.

There are a few problems connected with multi-storeyed construction where one-room dwellings are concerned, two of these may be mentioned as follows:

(a) The provision of sanitary conveniences whether it should be communal or individual.

(b) The number of rooms per floor a staircase may be expected to serve.

If funds permit, individual sanitary conveniences are by far the best and are most popular.

Planning of Two-Room Dwellings

Next in importance to the one-room dwellings is the two-room dwellings. The following points should be considered in planning two-room dwellings.

- (i) The number of verandah which must be provided.
- (ii) The size of the two rooms.
- (iii) Whether sanitary conveniences should be individually provided or whether they should be communal.
- (iv) The land values and the availability of land.

For two-room dwellings, the semi-detached house with a piece of land around it, is the most popular. The planning should provide for a small verandah in the front and a large one in the rear. It should also be possible to approach, sanitary conveniences from both the rooms through a lobby. It should also be possible to convert one of the rooms into a living room during the day. The kitchen should be located in such manner that some of the rear verandah space can be utilised as dinning area. There should be sufficient storage area in the kitchen and in the living room. It should be possible to lock the house with not more than two locks.

Planning of Three-Room Dwellings

Three-room dwellings, in fact, means two bed rooms, a living room, a kitchen, verandah and sanitary conveniences. In a three-room dwellings, good planning requires that the sanitary conveniences be approachable easily from the two bedrooms. The location of kitchen should be such as to permit the serving of meals in the living room as well as on the verandah. A consideration of the personal habits and means of the dweller also enters into the planning of three-room quarters.

In site planning of single storeyed three-room quarters, a small front and a large rear garden are indicated. The Indian middle class is essentially verandah dwellers, not drawing room dwellers. This verandah should be at the rear of the house, overlooking the garden and its depth will represent the extent of the luxury the owner of the house can afford. The front verandah is to receive the visitors and their sitting. It should be properly furnished, otherwise it will present a bare look and will also be a problem in maintenance. In luxury flats, a deep verandah adjoining the drawing room is, however, necessary.

In broader sense, there is no difference between the principles which govern the planning of two-room and three-room flats in multi-storeyed buildings. However, whilst two-room dwellings can be built in rows without sacrificing cross ventilation in either room,

Two-side ventilation in three-room quarters is not economically possible and in luxury flats with large living rooms which permit wide openings, it is not absolutely necessary either. In the latter class of flats the entire depth of the drawing and dinning rooms is open for ventilation. Small cantilevered balconies serve for verandahs as the room behind is of fairly liberal size and provided with large openings. The importance of verandah is, therefore, less in luxury flats. But the planning of the three-room flat for industrial workers must not be confused with planning of luxury flats.

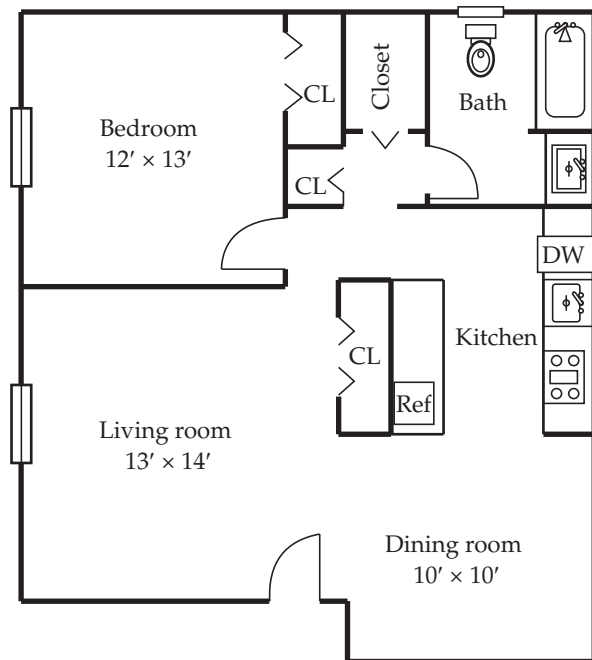


Fig. 1.1. One bedroom apartment plan with all amenities.

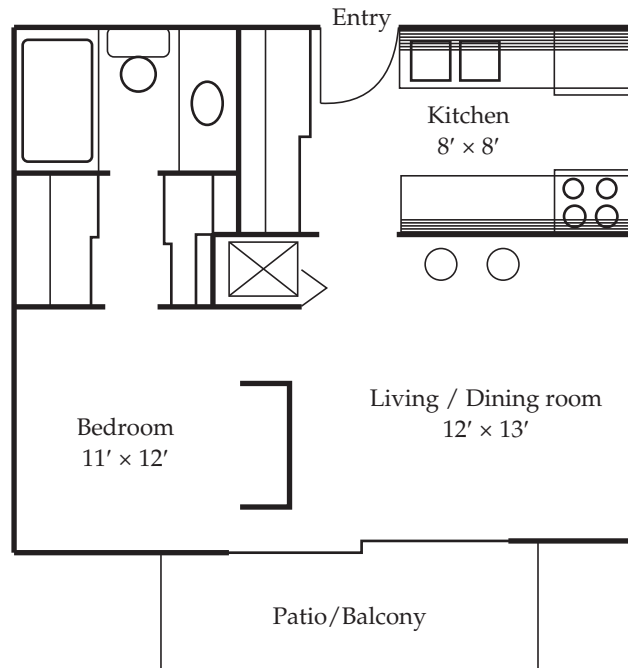


Fig. 1.2. One bedroom apartment plan with all amenities.

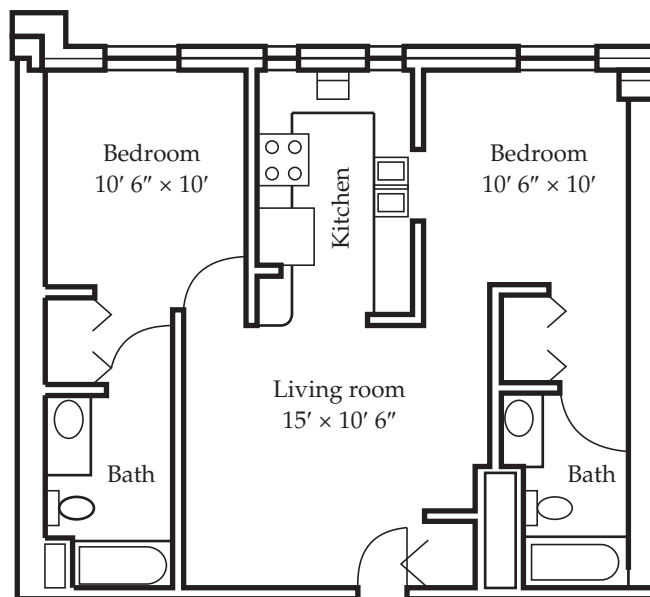


Fig. 1.3. Two bedroom compact apartment plan with all amenities.

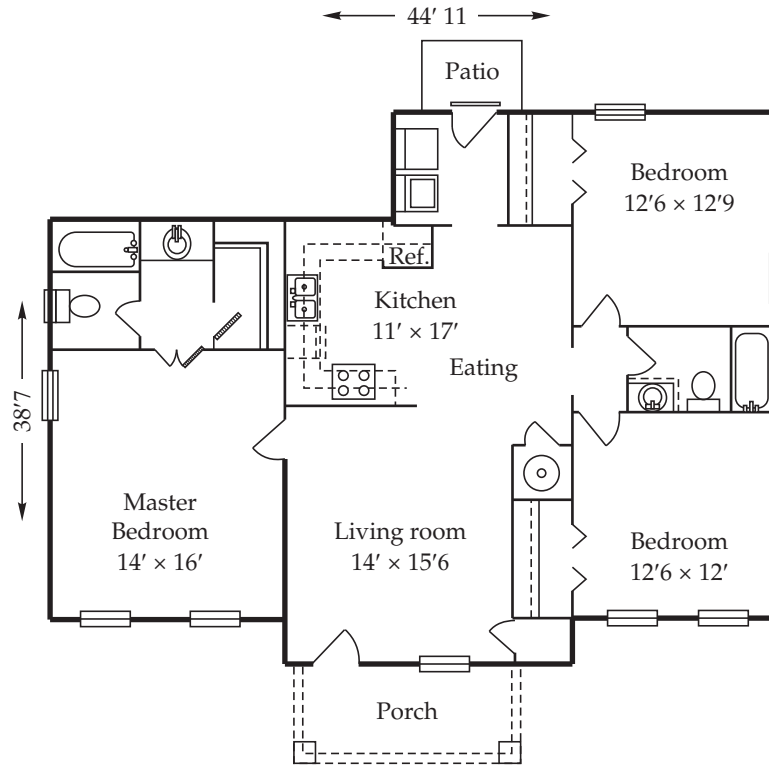


Fig. 1.4. Three bedroom apartment plan with all amenities.

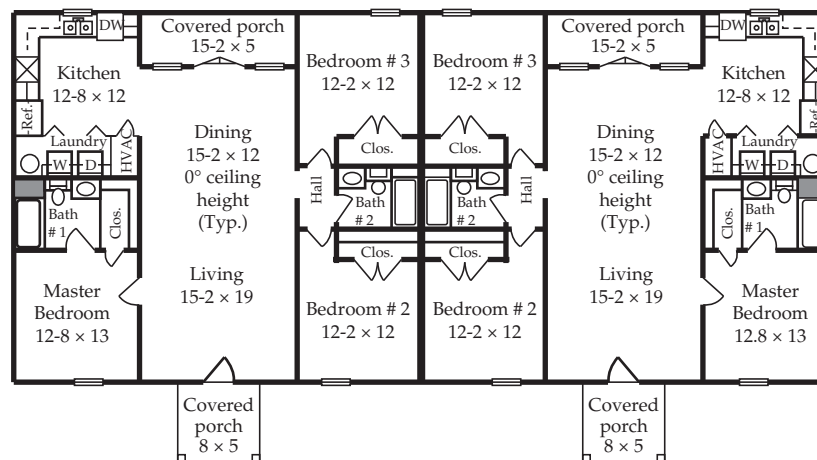


Fig. 1.5. Three bed room Duplex building plan with all amenities.



Photograph 1.5. Elevation of the building for the above shown plan (Courtesy: keralahomedesign.blogspot.com).

Modular Kitchen

Modular kitchens have become essential, now days, in the cities where there is shortage of space in the residential flats/apartments. The essential elements of a modular kitchen are a good working platform, provision of an effective chimney just above the cooking stove, a sink to clean the utensil, space for storing utensil, the place of water purifier, place for electric appliances including refrigerator and for all other activities spaces are assigned. Above and below the working platform a number of cupboards are provided with good quality timber, laminated boards and glass. These cupboards are to keep the grocery at least for a month, utensils, cutlery, spices and all other kitchen items. They may be provided with trolley to facilitate the opening and closure of cupboards. The wall of the kitchen and wooden boards are tastefully matched in elegance and appearance. The design of the modular kitchen depends on the habits of the dwellers, space available in the kitchen and capability to finance the project. Photographs-1.6 to 1.8 shows a few arrangements of the modular kitchen.



Photograph 1.6. An arrangement in the modular kitchen
(Courtesy: www.garnet.net).



Photograph 1.7. An arrangement in the modular kitchen
(Courtesy: www.garnet.net).



Photograph 1.8. An arrangement in the modular kitchen
(Courtesy: www.garnet.net).

Design of Modular Kitchen

A modular kitchen design is a type of kitchen furniture style which possesses various cabinet units that are designed for different functions. The following are some of the suggestions to design a modular kitchen.

When one decides to remodel his kitchen, he may find that the market has an array of materials and colours available to suit his taste. First of all he should properly plan for his kitchen design before starting the actual work. Therefore, one has to carefully select what all will fit into his kitchen and if the new fixtures go well with existing ones.

Fix up the budget before hand and choose the materials accordingly. For instance, wood is the most expensive of all the materials while glass and stone are comparatively cheaper. But one must consider the durability of the material too so that the kitchen design lasts for very long time.

When it comes to the design, the surrounding furniture along with the walls and flooring must also be considered, so that the

selection of best colours for new kitchen is facilitated. They will have to match well with the already existing furniture else it will look odd.

Speaking of the construction, the height as well as the depth of the cabinets must be taken into account. Proper measuring should be done and the cabinets should be such that they are not only comfortable but easy to reach too.

Last but not the least, proper lighting is also important, so that one can clearly see what he/she is doing in the kitchen.

Planning a Modern Kitchen

A modern kitchen has the following basic elements in term of their proper functions and ideal relationships. The actual assemblage of these work centres will vary according to the size and shape of space available in each case.

1. Food storage space
2. Food preparation space
3. Cooking centre
4. Space for electrical appliances
5. Serving space
6. Utencil cleaning space
7. Utencil storage space
8. Space for storing kitchen garbage.

The relative location of above mentioned work centres should permit the continuity of kitchen activities from storage, preparation and cleaning centre to the cooking and serving centre. In principle any plan which interrupts this continuity with doors, closets or other elements not constantly used in food preparation is faulty. A minimum of 1.8 m width will allow comfortable working for two persons and will permit use of drawers without interference. It will also accommodate a number of small cabinet units.

National building code recommends the minimum height of the kitchen measured from the surface of the floor to the ceiling as 2.75 m. The area of the kitchen should not be less than 5.5 m² and with a minimum width of 1.8 m. Where there is a separate store, the floor area of the kitchen may be reduced to 4.5 m². A kitchen, which is intended for use as dining room also, should have a floor area of not less than 9.5 m² with a minimum width of 2.4 m.

The floor of the kitchen should be impermeable such that cleaning is facilitated. A flue or exhaust fan may be provided for proper ventilation.

Windows are usually best located above the sink although it is practicable to locate them near the preparation and cleaning centre on either side, depending on the working habits of the housewife and location of mechanical equipments.

QUESTIONS

1. What are fundamental requirements of a good building? How they can be taken into consideration at the time of planning a building?
2. What are the advantages and disadvantages of a "Flat" over an "Independent Bungalow"?
3. Enumerate the factors to be considered while designing a district hospital.
4. How industrial housing in India is different than that of Europe? Explain briefly.
5. How economy can be achieved in the construction of residential buildings? Describe in detail with reference to Indian circumstances.
6. Discuss briefly the various principles of planning buildings. Explain the significance of aspect and prospect for residential buildings.
7. What do you understand by orientation? Discuss the criteria used in deciding orientation of building under Indian conditions.
8. Write short notes on:
 - (a) Residential Buildings
 - (b) Planning a modern kitchen
 - (c) Row Houses
 - (d) Duplex appartments
 - (e) Office Buildings
 - (f) Industrial Housing scheme
 - (g) Low-cost Housing scheme.