

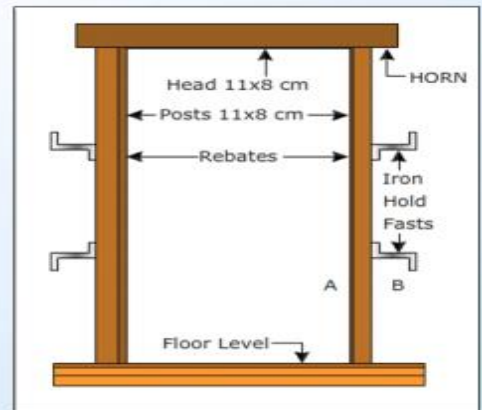
Doors, Windows, Ventilators and Roof

Different Type of Doors, Windows and Ventilators

- The definitions of the terms door, door Frame, window and window Frame
- The specifications of door and window
- The types of doors, windows, ventilators and their specifications

Door

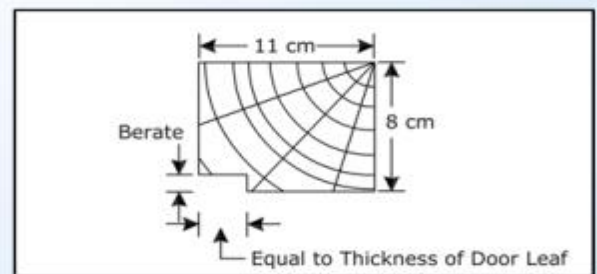
- A **door** is a framework of wood, steel, glass or combination of these materials.
- The purpose of door is to give access to the users of the structure. Hence doors should be placed in such a way that freedom of movement into and outside the structure is ensured. In general, the doors are placed in the corners of the rooms.
- When it is required to provide two doors in one room, they should be in one line, as far as possible, i.e., one door shall be just opposite to the other. This would provide a good ventilation.



Door

Door Frame

- The **Door frame** is made up of two vertical members called posts and which are secured by a cross piece at the top known as head. Sometimes, the posts are secured by two cross pieces, the bottom piece being the sill.
- The posts, head and sill are usually taken as 10 cm wide and 8 to 10 cm deep. The head (and sill) projects 5 to 10 cm beyond the posts, and the projections, called horns, assist in making the frame secure when it is built into the wall.
- But now a days hold-fasts are used in place of horns. They are placed inside the jambs of doors and windows. Generally 6 and 4 nos. hold-fast are used for doors and windows respectively. A rebate of 1.25 cm to 1.5 cm deep is formed inside the frame to receive the shutters. A door frame with details of hold-fast is shown in image.



Section AB

Door Size

- Internal doors for residential buildings should not be less than 0.90 × 1.95 m.
- The doors for bath rooms may be taken as 0.75 × 1.90 m.
- The doors should be of such a width that, if, two persons walking shoulder to shoulder may pass through it. So, a door of size 1.20 × 2.10 m is recommended as an average size to be used.
- In public places, the size of doors is increased accordingly.

Types of Doors

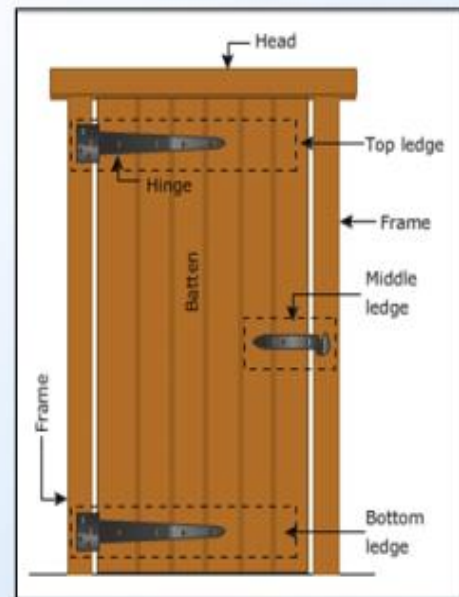
Doors are of various types depending on the material used, method of construction and arrangement of parts.

The different types of doors are:

1. Battened and Ledged
2. Battened, Ledged and Braced
3. Framed, Battened and Braced
4. Panelled and Framed
5. Panelled and Glazed
6. Flush Door
7. Wire Gauged Door

Types of Doors: Battened and Ledged

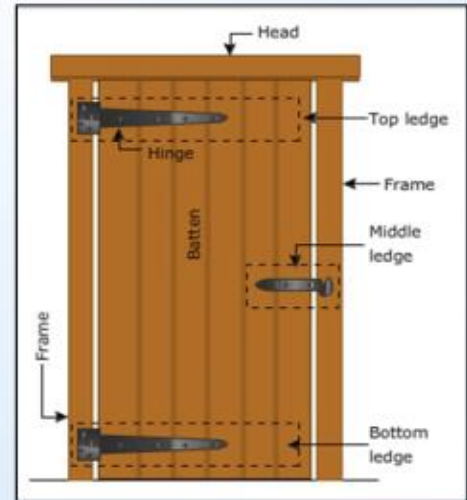
- This type of door is very simple and more commonly used.
- It consists of vertical boards or battens, tongued, grooved and fixed together with ledges.
- The battens width varies from 10 to 15 cm in varies in and 16 to 32 thick.
- Usually, three ledges are used, one each at the top and bottom of the battens and the third one is fixed in the middle which may be termed as lock ledge.
- The ledge thickness varies from 25 to 32 mm. Usually, the top ledge of battened and ledged door is 11 cm elevation, section and section plan.



Battened and Ledged

Types of Doors: Battened, Ledged and Braced

- This is a ledged and battened door in which inclined struts or braces are added. So, this type may be called an improved form of the battened and ledged door. The braces are taken 25 to 32 mm thick and 10 cm wide. These braces increase the rigidity of the door.
- This type of door is used at places, where appearance of the same is not so important as economy, such as in bath room and W.Cs this type of door is illustrated.



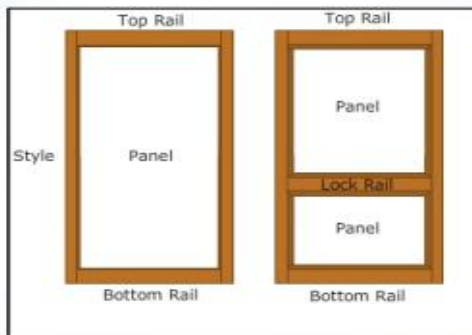
Battened and Ledged

Types of Doors: Framed, Battened, and Braced

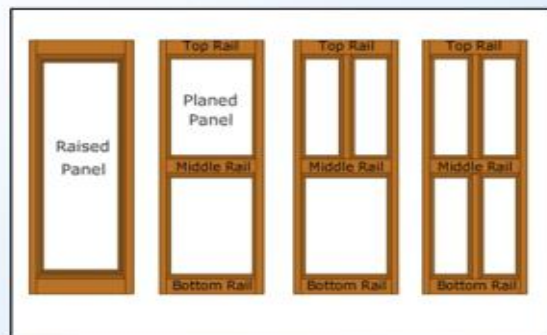
- This type of door has got more strength than the type stated before. The frame work consists of top , middle, and bottom rails which are Morticed and Tenoned into two vertical members called styles or stiles.
- The braces are either housed into the rails at about 4 cm from the styles and are taken in to the corners and Tenoned into the styles. The braces must incline from the upwards. Thickness of frames for shutters varies 4 cm to 5 cm depending upon the size of the door. T- hinges are usually used for hanging the door.

Types of Doors: Panelled and Framed

This object of using a Panelled door is to obtain a structure in which the tendency to shrinkage is reduced . Also , it gives a pleasure appearance to the door. The door may be Single Panelled, 2- Panelled, 4-Panelled, 6-Panelled and so on.



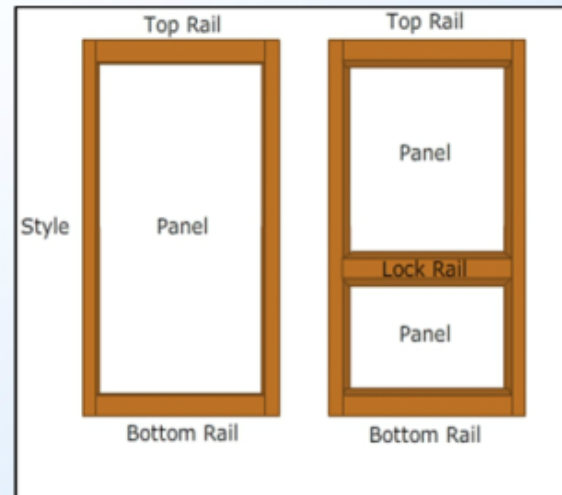
Single Leaf Panelled Doors



Types of Panelled Doors

Types of Doors: Panelled and Framed (Contd.,)

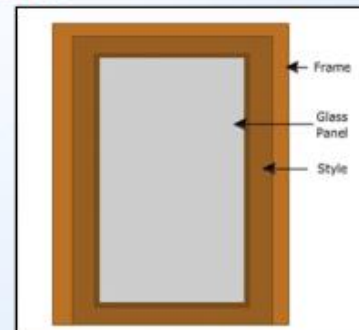
The framing consists of narrow piece, mortice and tenoned to each other and grooved inside of the panels which may be of wood and glass. The top, middle, intermediate and bottom rails are connected to styles. The muntins are joined to the rails. The intermediate rail and middle rails may also be termed as freize rail and lock rail respectively. The thickness of frame for shutters vary from 40 mm to 50 mm depending upon the size of the door, the situation of the door, the thickness of panels and the size of panel mouldings. The top rail and styles are taken from 90 mm to 115 mm wide for doors double up to 1.2 x 2.1 m. The lock rail and bottom rail vary from 150 to 205 mm and 200 to 255 mm respectively, depending upon the size of the door.



Single Leaf Panelled Doors

Types of Doors: Panelled and Glazed

- Panelled and glazed doors are used in residential buildings as well as in public buildings such as colleges, schools, hospitals and offices etc. The upper part of the door is, generally, glazed while the lower portion is panelled.
- The glass panes are set in the rebates of styles and rails by sash bars. Sometimes, in case of partly glazed doors, the styles are diminished at the lock rail to increase the elevational effect of the frame and to allow more area for glass in fixing.
- The diminished styles are called gun stock styles. The panes are secured by nails and putty or by wooden beads mouldings in the sash bars.



Types of Doors: Flush Door

- This type of door is used extensively as it provides clean surface on both sides. This has become popular after the introduction of plywood and veneers. It consists of solid or semi-solid frame skeleton covered on both sides with ply-wood or boards.
- The finished thickness of the door is usually 44 mm. The ply-wood to be used varies from 3 to 6 mm.



Flush Door

Types of Doors: Flush Door (Contd.,)

The flush doors are two types:

The **solid flush door** consists of central core of narrow strips or soft wood which are glued together under pressure. The core is faced with sheets of plywood or laminated boards on both sides. This is the stronger and sound insulating type of door than the other type of flush door.



Solid or Laminated flush Door

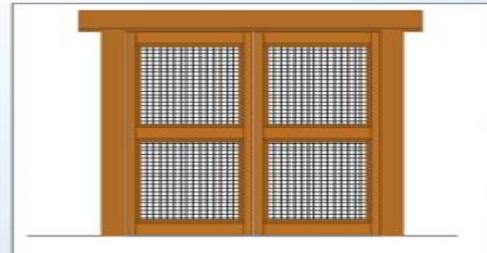
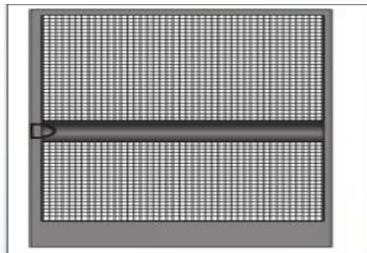


Hollow Core flush Door

The **hollow core flush** door consists of very light members. The styles, top and bottom rails are 38 x 25 mm in size. 1 cm wide vertical and horizontal ribs are fitted into these. Each side is covered with 6 mm thick plywood. This is cheaper type of flush door.

Types of Doors: Wire Gauged Door

The wire gauged shutters enable air to pass into the room and prevent flies and other insects to enter the room. These are made up of vertical and horizontal styles. The wire gauge is fixed into these styles. The size of styles and rails is taken the same as that for the door opposite. The entire area of the wire gauge within a panel must be without any joint. These are hinged on the same door frame or on a separate frame.



Window

- The windows are constructed for providing light and ventilation in the building. It is desirable that windows should be located opposite to each other where ever possible. The height of window from the floor level should be such that one can conveniently look outside. Hence, it is recommended that a window should be placed at a height of 75 cm to 90 cm from the floor level.
- In general, the window should not have the area less than one-tenth of the floor area. But for public places like schools, colleges, hospitals and office etc., it should be taken as one-fifth of the floor area.

Window Frame & Specifications

- The frame of the window is made of two vertical members called posts and two horizontal members, the upper being head while the lower one sill. The window shutter consists of styles, rails and similar members which divide the area enclosed by the styles and rails into smaller parts by sash bars.
- A window may be made open inside or outside the room, in which it is located.
- The sizes of heads and sills generally vary from 75 x 100 mm to 75 to 110 mm both heads and sill are projected on both sides. The projected part is called Horn and should be 125 mm beyond the posts. These horns are built into the walls to secure the window.

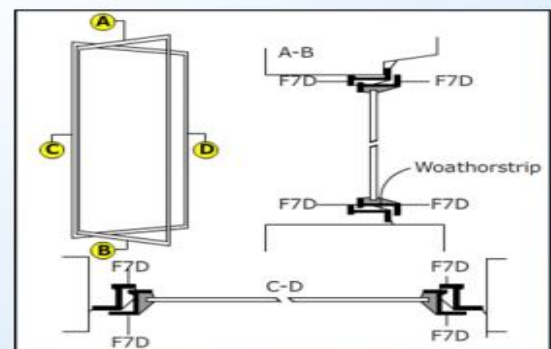
Types of Windows

The type of windows depends upon the material used, method of construction and arrangement of parts. The different types of windows are:

- Steel Window
- Panelled Window
- Panelled and Glazed Window
- Glazed Window
- Bay Window
- Corner Window

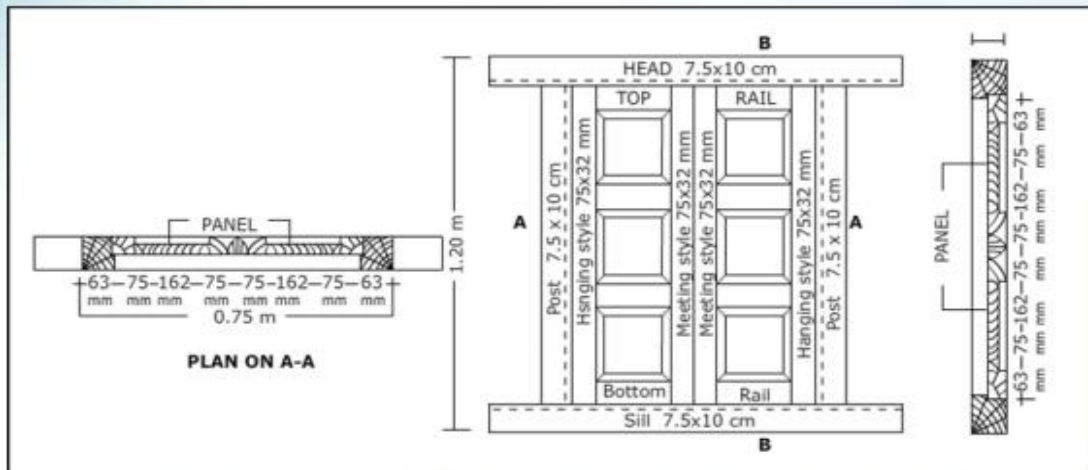
Types of Windows – Steel Window

Steel windows can directly be fixed in the reveals of opening or these may be fixed to wooden or steel frames.



Steel Window

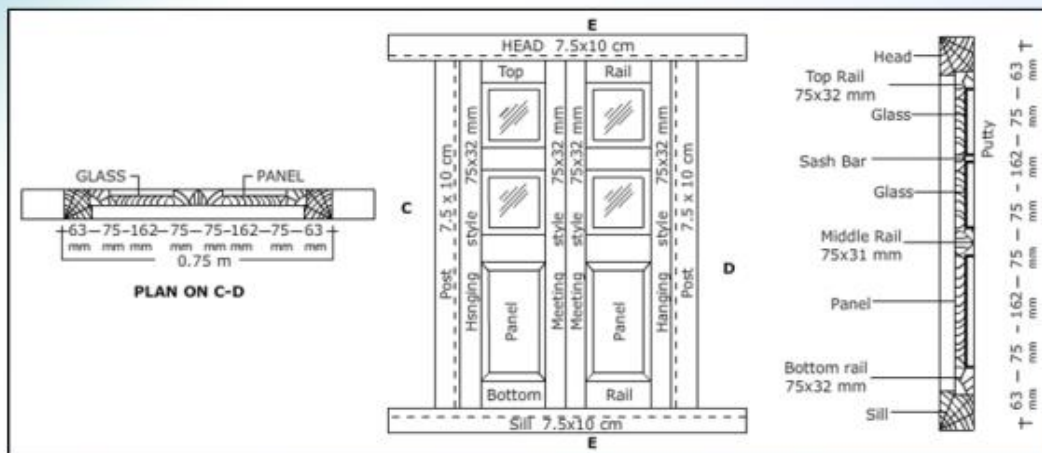
Types of Windows – Panelled Window



Panelled Window

A window can be single or two to six panelled. The sizes of the head, sill and the posts are taken as 75 x 100 mm while the styles and rails are kept 75 mm wide.

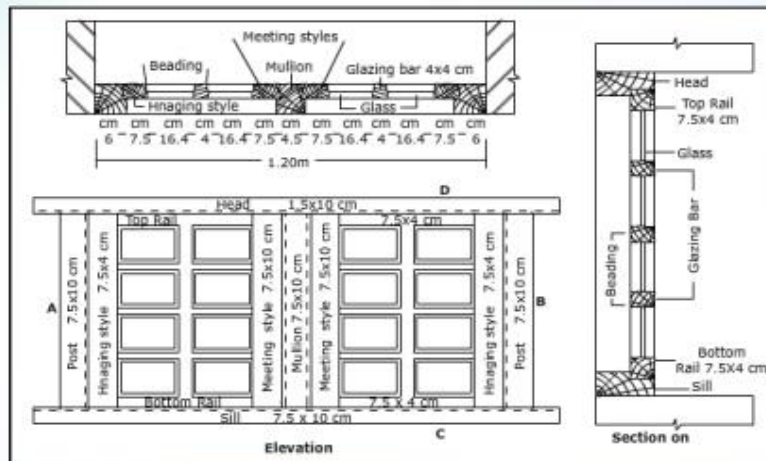
Types of Windows – Panelled and Glazed Window



Panelled Window

The type of window is similar to Panelled and Glazed door. The upper part of the window is made glazed while the lower part is panelled.

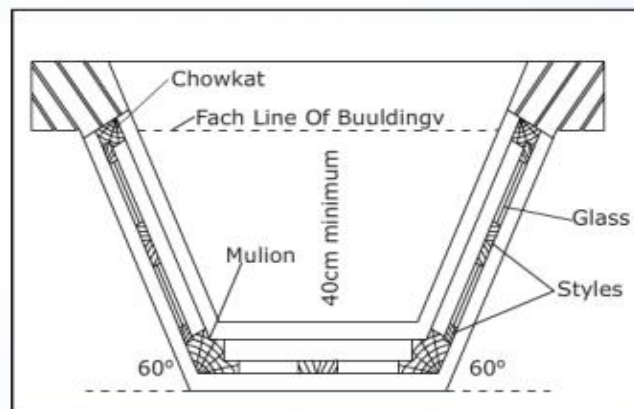
Types of Windows – Glazed Window



Glazed Window

The glass panes are fixed into the rails and styles by means of nails and putty or beads. Sometimes one or two additional vertical members called mullions are provided. Also, a window may be divided by vertical and horizontal bars which are called sash bars.

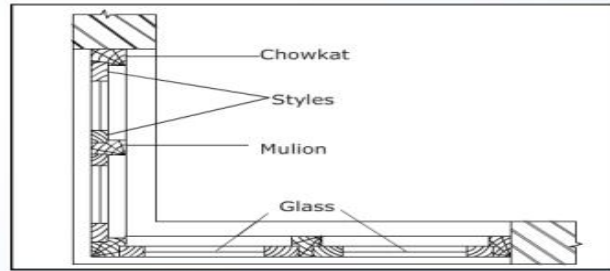
Types of Windows – Bay Window



Bay Window

Any window projecting outside from the walls of a room is termed as Bay window. It can be square or polygon in plan it might increase the architectural beauty of the building.

Types of Windows – Corner Window



Corner Window

As the name indicates, this type of window is essentially provided in the corner of the room so that light and air can enter the room from two directions or sides, of the same.

Ventilators

- These are openings in the walls near the roof for the purpose of light and exit of foul gases. Sometimes, ventilators are only meant for admitting light.
- Ventilators are provided normally 15 to 30 cm below the ceiling but in case of low ceiling rooms, the ventilators are provided even be provided right at the roof level.
- Under normal circumstances, ventilators admit light as well as air: Ventilators with all fixed glazing are not desirable.
- In each room a minimum of one ventilator must be provided. Normally the ventilators of provided over doors and windows openings and of the same width as that of door or window.

Types of Ventilators

Based on the movability, ventilators are two types.

Swing Ventilators

As the name indicates, the shutters of the ventilators can be swing when required.

Fixed Ventilators

The ventilators where the shutters cannot be moved which are fixed.



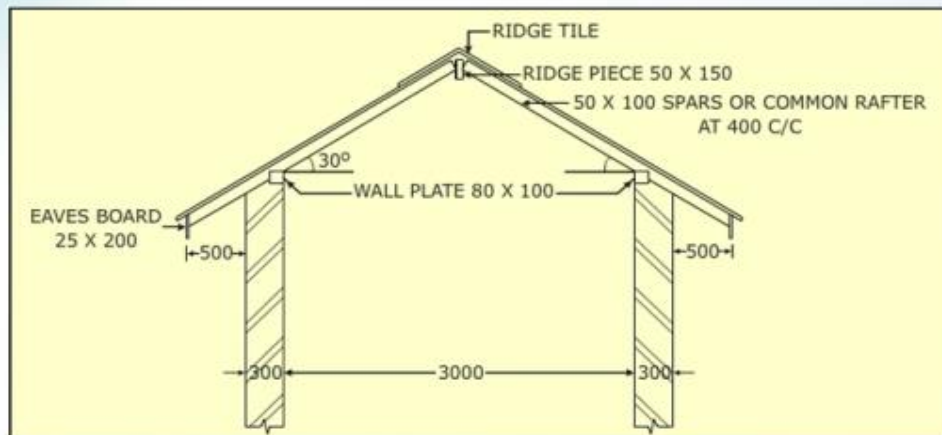
Roof - Introduction

The **roof** is an exterior surface and its supporting structures on the top of a building.

Based on the elevation, roof are of various types:

1. Couple Roof
2. Closed Couple Roof
3. Collar Roof
4. King Post Turns
5. Queen Post Turss

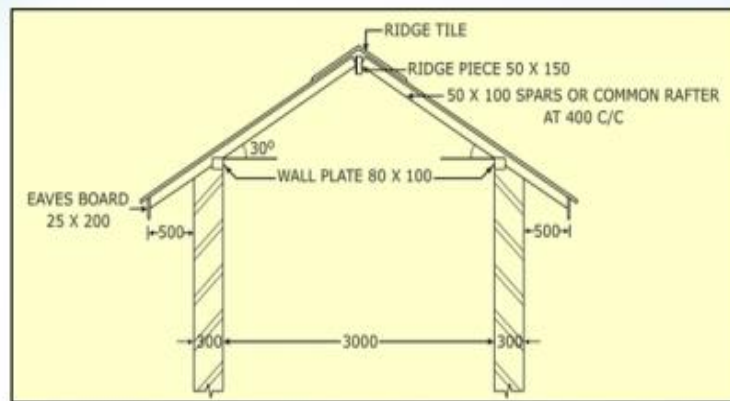
Types of Roof – Couple Roof



Couple Roof

Couple Roof is formed by a pair of inclined rafters with their upper ends nailed to a common ridge piece and their lower ends, notched or nailed to the wooden wall plates embedded in masonry on the top of the walls.

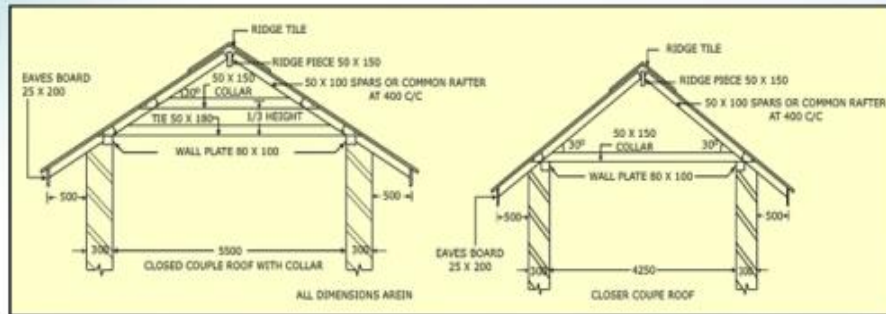
Types of Roof – Couple Roof



Couple Roof

- The rafters are spaced at suitable intervals along the length of the room and the battens nailed on their top parallel to ridge beam. Roof covering materials are laid on the prepared frame.
- This type of roof has the tendency to spread out at the feet of the rafters for bigger spans and heavy loads (at wall plate level) and thrust out the wall supporting the wall plates. Due to this, the couple roof is economically used when the span is limited to 3.6 metres.

Types of Roof – Closed Couple Roof



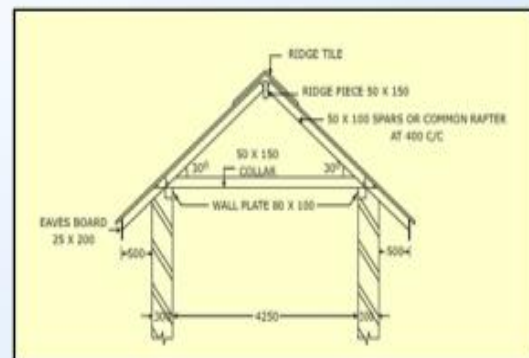
Closed Couple Roof

- This is a modification over the couple roof. As the span increases, the length and weight of the rafter will subsequently increase and there is to slide down and spread at their feet pushing roof wall laterally. To prevent this, the feet of rafters are jointed by a tie beam. The tie beam may be a piece of a wood or a steel rod.
- The connection between the tie beam and feet of rafters is usually obtained by dovetail halved joint, the ties being spiked to the rafters. Under normal loading conditions, this roof can be used for span upto 5 m.

[Click here to view animation](#)

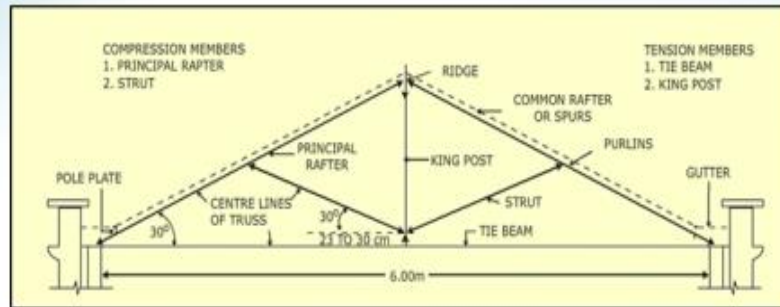
Types of Roof – Collar Roof

- With excessive loading conditions or increased spans, the rafter of the couple closed roof tends to sag in the middle. The simplest solution to this problem is to replace the tie beam with a collar beam which is fixed midway between rafters. Thus, a new type of roof is developed called collar roof.
- The length of the collar beam is less than tie beam, hence sagging is minimised. Collar beam is provided in the lower 1/3 of rise or else it is ineffective.
- Collar roof is considered suitable for spans varying from 4 m to 5.5 m. Collar beam roof is also adopted to economise the space and to increase the head room.



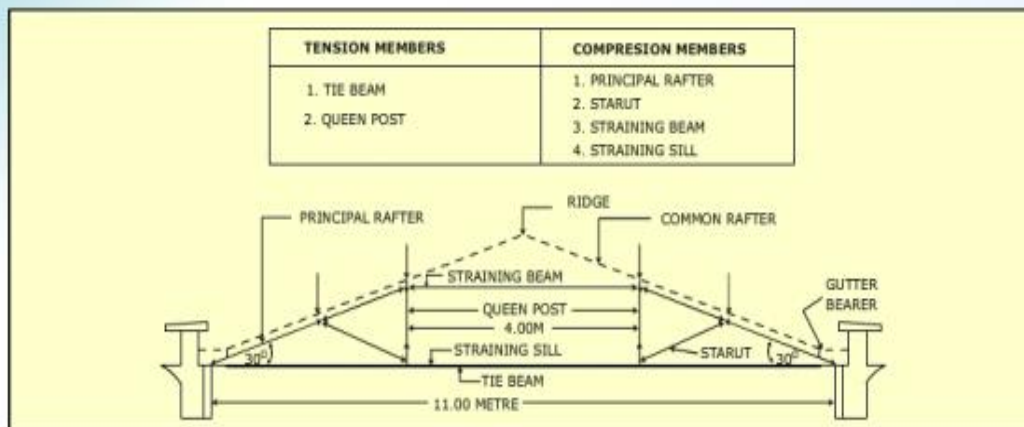
Closed Couple Roof

Types of Roof – King Post Turns



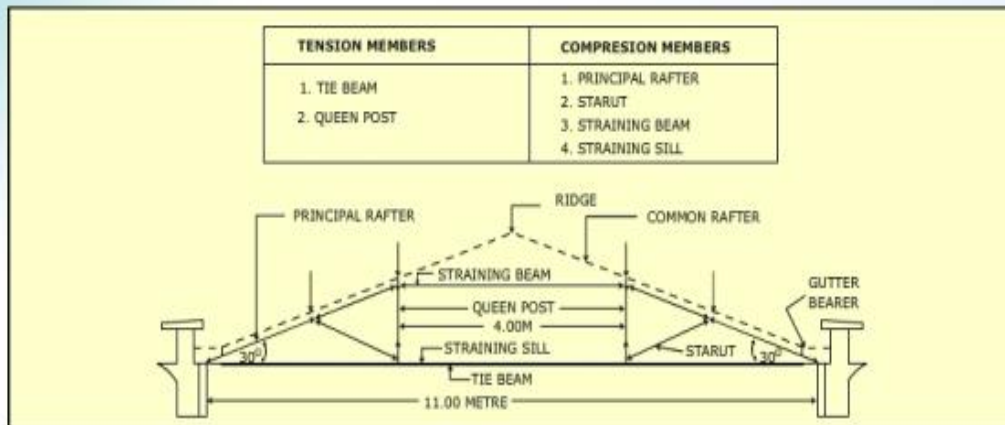
- A king post truss roof is suitable for spans varying from 5 m to 9 m. A king post truss roof consists of two longer inclined members known as principal rafters, a horizontal member tie beam, the central vertical member known as king post and the two shorter inclined members are struts.
- The principal rafter supports the frame work of the roof. Tie beam receives the ends of the principal rafters. The ends of tie beam are always placed on bed plates. The struts support centres of principal rafters. The other members used are common rafters, cleat, purlins, pole plates and ridge piece for roof covering.

Types of Roof – King Post Turns



- A queen post truss consists of two principal rafters, two queen posts, one straining beam, two inclined struts and a straining sill etc. This type of truss is suitable for spans more than 9 m and less than 14 m. The queen post receives the struts and it itself is strutted apart by straining beam, a horizontal member. The queen posts are vertical tension members.

Types of Roof – King Post Turns



- The thrusts coming over the feet of the queen posts tend to move these to the inward direction. This thrust is resisted by making a tenon joint between feet the tie beam, feet of queen post and straining sill. The straining sill which is fixed between the queen posts prevents the inward movement of the queen posts.

Sloped and Flat Roofed Buildings

Planning - Definitions

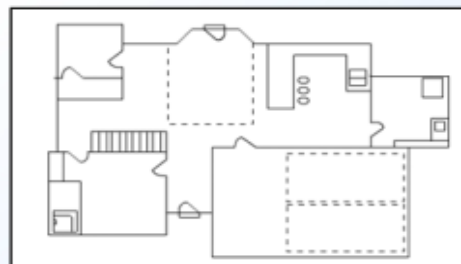
Definition-1:

A plan of a building is the general alignment or locations of different rooms or apartments belonging to a building.

It gives the idea of walls thickness, location of cup-boards, sinks, fire-places, water closet, and internal dimensions of the rooms.

Definition-2:

A plan of a building is arrangement (grouping, positioning and orientation) of different rooms on a horizontal plane i.e., on a drawing sheet.



Planning

Definition-3:

A plan of a building is to illustrate various view such as elevations, sections and cross-section.

Definition-4:

A projection of a portion of a building on a horizontal plane is known as **PLAN**.

A building is imagined to be cut by a horizontal plane slightly above a window sill level. The upper portion is cut above the horizontal plane. In this portion the building can be from the top.

Planning

Planning is the process of:

- Collecting information about a proposed building – its purpose and general scope of its components
- Selecting a suitable site or planning a building according to the site available
- Placing the plan elements with proper correlation giving consideration to the levels, aspect, prospect, orientation, convenience, comfort, and other planning principles
- Adopting proper proportion and shape of units of building from practical and aesthetic points of view



Drawing

Definition

The drawing is the language of the Engineers and Architects.

The language of drawing is expressed in lines and figures. Hence drawing must be drawn carefully and correctly.

Components

The drawings required in connection with any building in addition to site plan are:

- The Plan
- The Elevation and
- The Section

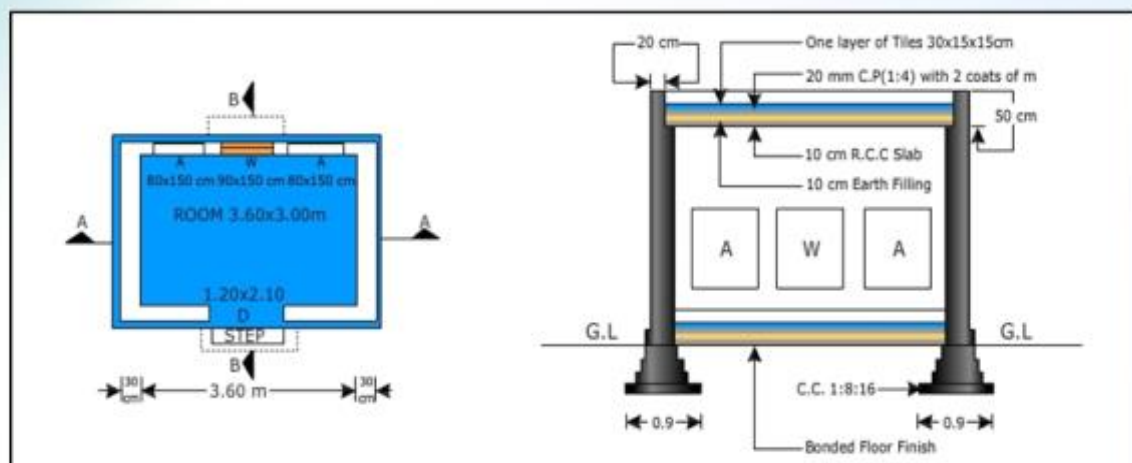
For the actual construction of buildings detailed drawings are required.

Purpose

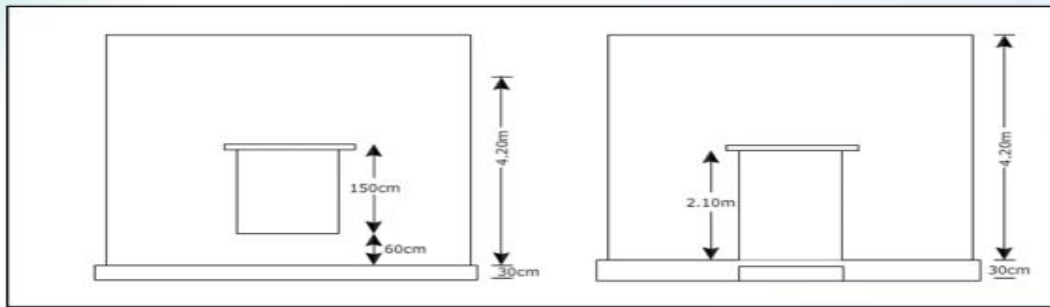
In building drawing, plan, elevation and section given by an architect convey clear idea to a builder.

The drawings are generally accompanied by specifications, detailed description of materials and workmanship.

Flat Roof Building: Plan, Elevation & Cross-Section

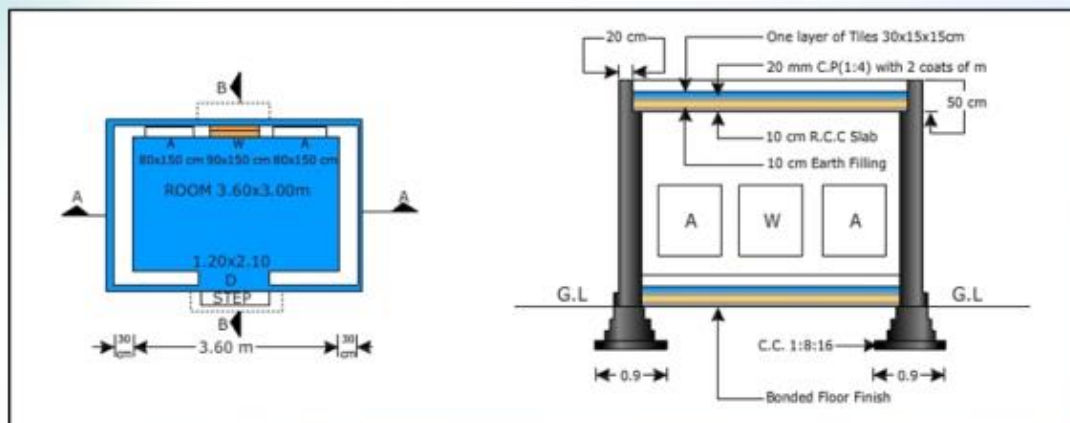


Flat Roof Building: Plan, Elevation & Cross-Section (Contd.,)



Elevations

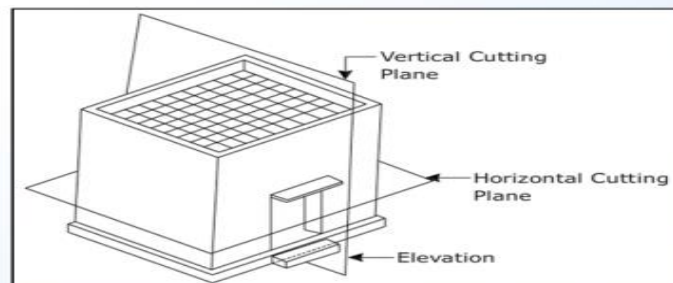
Flat Roof Building: Plan, Elevation & Cross-Section (Contd.,)



Plan and Section

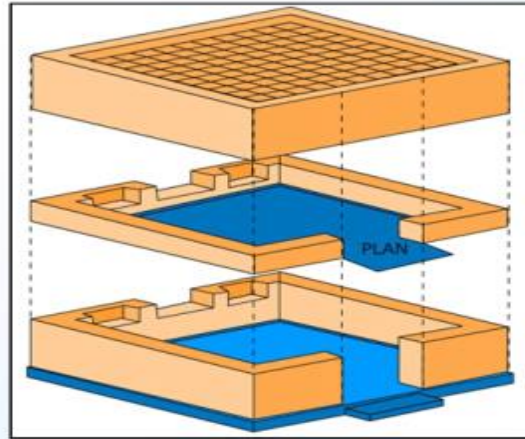
Flat Roof Building: Vertical and Horizontal Cutting Planes

The line diagram represents the vertical and horizontal planes and front elevation of a flat-roofed building.



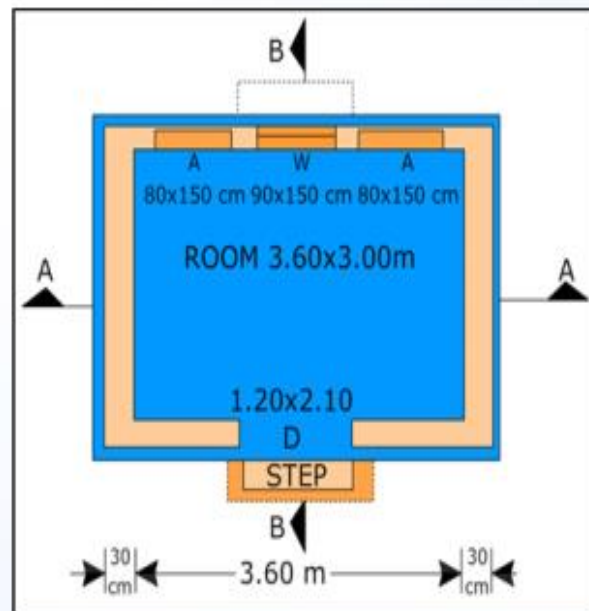
Flat Roof Building: Method of Project Planning

The line diagram represents project planning method of a flat-roofed building.



Flat Roof Building: Plan

The line diagram represents the plan of a flat-roofed building.



Elevation - Introduction

Introduction

An architectural beauty of any building depends upon the relative portions of the different parts to each other and to the entire face of the structure.

The elevations should be drawn to a scale. Number of elevations are drawn and compared to one another, and only the best elevation is adopted.

The elevation should be favored by the location of doors, windows, roof-line, design and location of balcony.

Definition

Elevation provides graphical information about the face of a building or interior features.

It is the appearance of a building above ground level in a vertical or horizontal plane.

Elevation - Views

Elevation Views

The elevations can be scaled or drawn from the following views:

- Front
- Back/Rare
- Right
- Left

Drawing Elevation

For drawing elevation of a building, stand in front of it and whatever portion of the building is visible above ground level, take its first angle projection on a vertical plane behind the building. It will be the Elevation.

Cross-Section & Section

The **cross-sections** are taken to furnish more details for the work to be executed.

The cross-section gives the height of the building, doors, windows, cup-boards and their location.

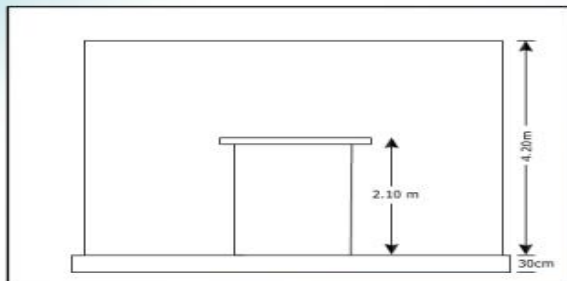
The cross-section also gives the height of the pillars, ceiling and roof are also marked.

The foundations below the ground level which cannot be seen outward are also drawn on the cross-section.

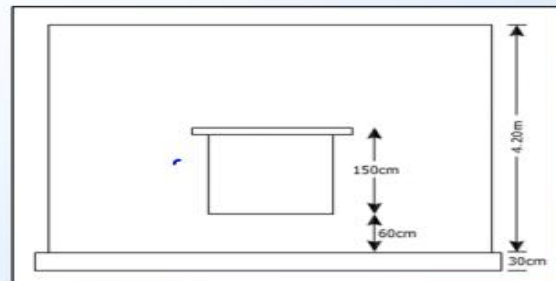
The **section** is the full view of a building in vertical plane from foundation level to top of parapet wall. It reveals all details of construction.

Flat Roof Building – Front and Back Elevation

The line diagram represents the Front and Back elevations of a flat-roof building.

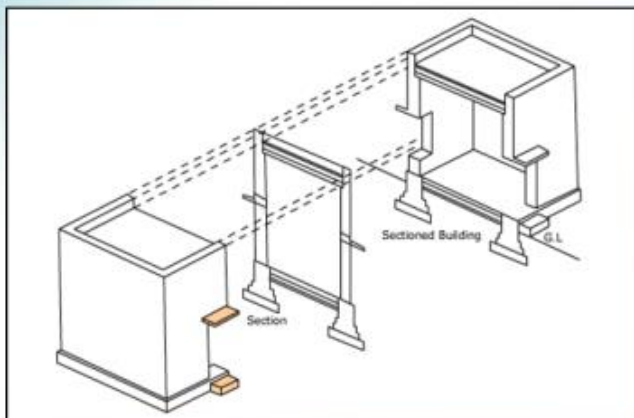


Front Elevations



Back/Rear Elevations

Cross-Section & Section

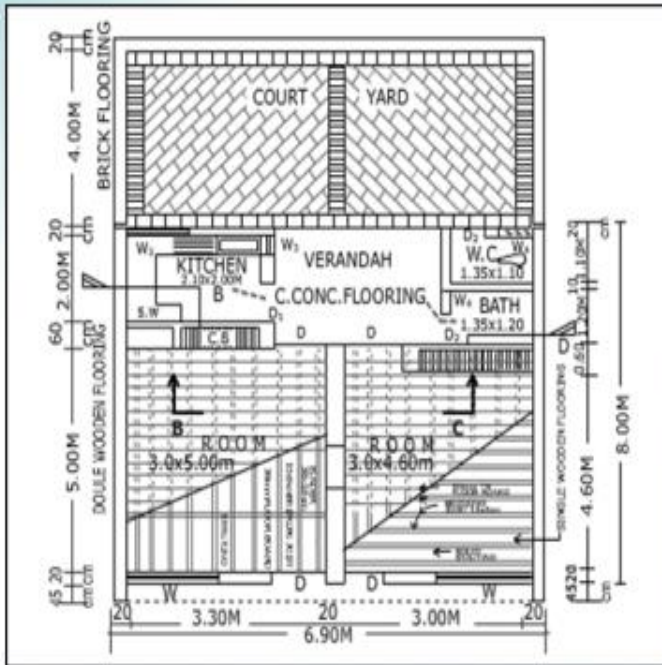


Method of Project Section

The line diagram shows the vertical plane of a building plan.

In the vertical plane of a building plan, the part of the building before the arrow is removed as shown in the image.

Sloped-Roof Building: Plan, Elevation and Section at ABCD



Plan

The line diagram shows drawing plan, elevation and section at ABCD of a 2-Roomed house with sloped roof.

Sloped-Roof Building: Front Elevation

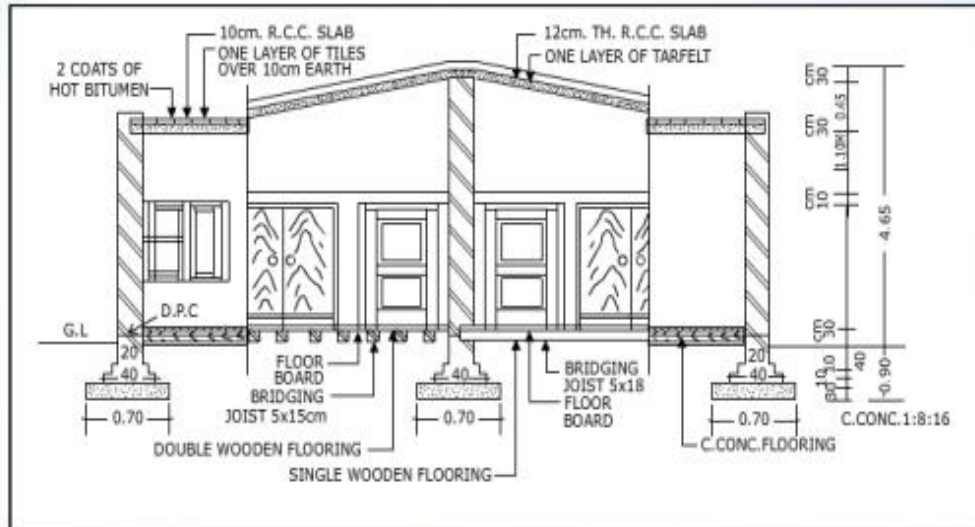


Front Elevation

The line diagram represents front elevation of a sloped-roof building.

Sloped-Roof Building: Section at ABCD

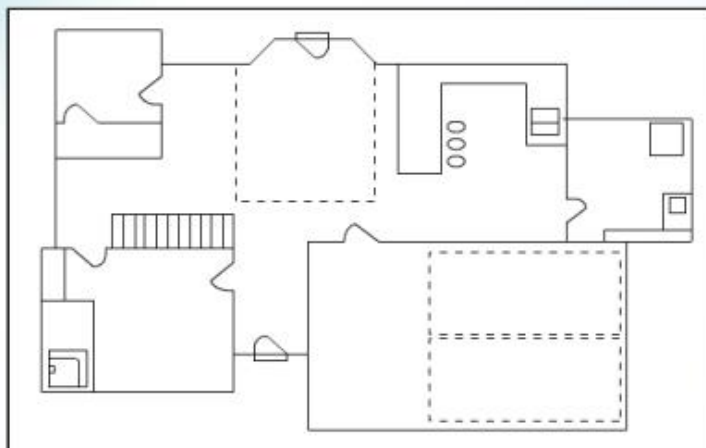
The line diagram represents **Section at ABCD** of a sloped-roof building.



Section at ABCD

Sloped-Roof Building: Plan

The line diagram represents **Plan** with **References** of a sloped-roof building.



Plan

Reference	
D1	1.20 m x 2.10 m
D2	1.10 m x 2.10 m
D3	0.50 m x 2.10 m
D4	0.75 m x 2.10 m
W1	1.20 m x 1.50 m
W2	0.75 m x 1.50 m
CW1	0.75 m x 0.45 m

Sloped-Roof Building: Side Elevation



The line diagram represents side elevation of a sloped-roof building.

Elevation

Sloped-Roof Building: Cross Section



The line diagram represents **Section at ABC** of a sloped-roof building.

Section on ABC