

DOORS AND WINDOWS

The function of a door is to give access to building and to different parts of the building and to deny the access whenever necessary. Number of doors should be minimum possible. The size of the door should be of such dimension as will facilitate the movement of the largest object likely to use the doors.

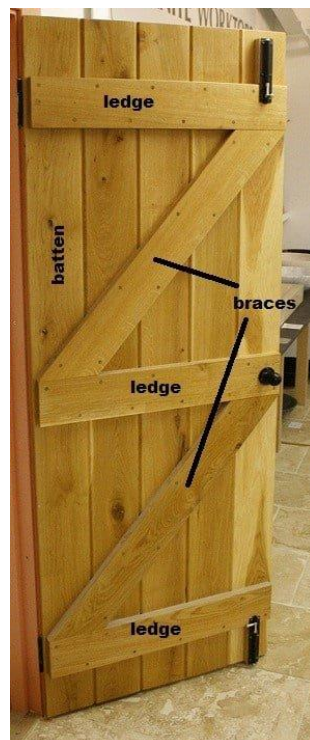
In case of the residential buildings, the size of the door should not be less than 0.9 m × 2.0 m. Larger doors may be provided at main entrance to the building to enhance the aesthetic view. Minimum sized doors are used for bath rooms and water closets. The size recommended is 0.75 m × 1.9 m. As a thumb rule height of door should be 1 m more than its width.

Windows are provided to give light and ventilation. They are located at a height of 0.75 m to 0.90 m from the floor level. In hot and humid regions, the window area should be 15 to 20 per cent of the floor area. It is preferable to have at least two openings in two different walls. Another thumb rule used to determine the size of the window opening is for every 30 m³ inside volume there should be at least 1 m² window opening.

Types of Doors

Various types of doors are in use which may be classified on the basis of arrangement of shutters, method of constructions, principles of working operations and materials used. Commonly used doors are briefly explained below:

Battened and Lugged Doors: Battens are 100 mm to 150 mm wide and 20 mm thick wooden boards. Their length is that of door opening. The battens are connected by horizontal planks, known as ledges of size 100 to 200 mm wide and 30 mm thick. Usually three ledges are used one at top, one at bottom and the third one at mid-height. This is the simplest form of door and the cheapest also. Battens are secured by tongued and grooved joint.



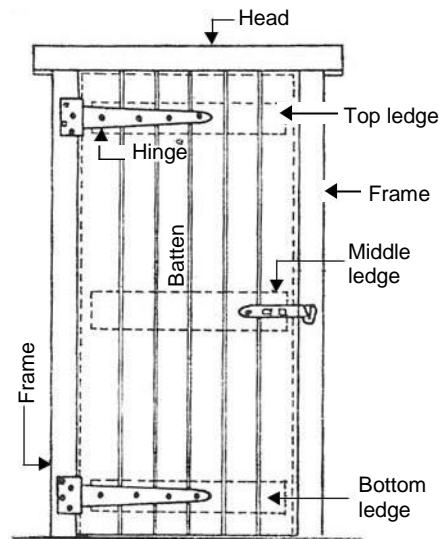


Fig. 8.21. Batted and ledged door

Batted, Ledged and Braced Doors: If doors are wide apart from using battens and ledges diagonal members, known as braces, are provided to strengthen the door. Figure 8.22 shows a typical batted, ledged and braced door.

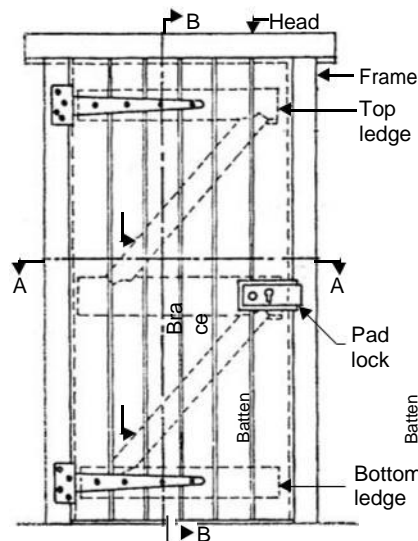


Fig. 8.22. Batted, ledged and braced door

Some times above two types of shutters are provided within wooden frame work and in those cases they may be called as *batted, ledges and framed doors*.

Framed and Panelled Doors: This type of door consists of vertical members, called styles and horizontal members called rails. The styles and rails are suitably grooved to receive panels. The panels may be of wood, A.C. sheet, glasses etc. The panels may be flat or of raised type to get good appearance. These are very commonly used doors. They may be of single shutter or of double shutter. Figure 8.23 show few types of panelled doors. If glass panels are used they may be called as glazed doors.

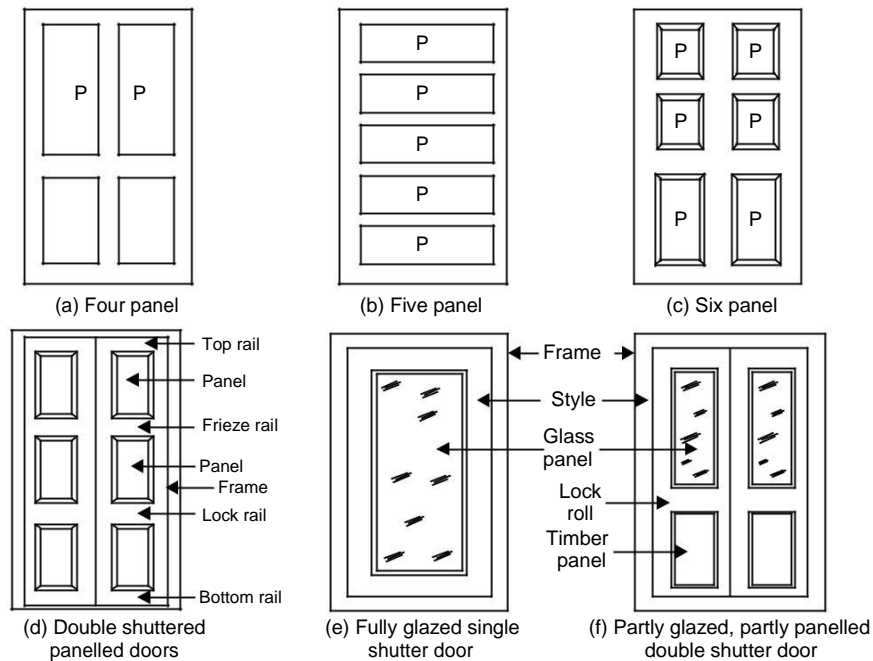


Fig. 8.23. Panelled and glazed doors

Flush Doors: The shutters of these doors are made of plywood or block boards. They are of uniform thickness. These shutters are available with different attractive veneer finishes. The time consumed in making such doors at site is quite less. These doors are suitable for interior portion of a building. Nowadays flush doors are commonly used in residential and office buildings. Figure 8.24 shows typical flush door.

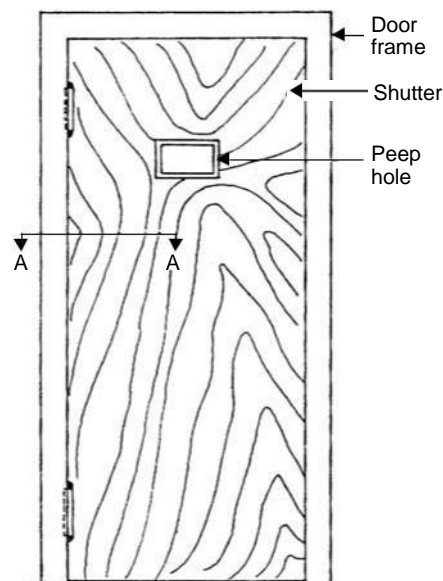


Fig. 8.24. Flush door

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Louvered Doors: Whenever privacy as well as ventilation is required such doors can be used. Louvers are the glass, wooden or A.C. sheet strips fixed in the frame of shutter such that they prevent vision but permit free passage of air. The doors may be fully or partially louvered. Such doors are commonly used for public bathrooms and latrines. [Fig. 25]

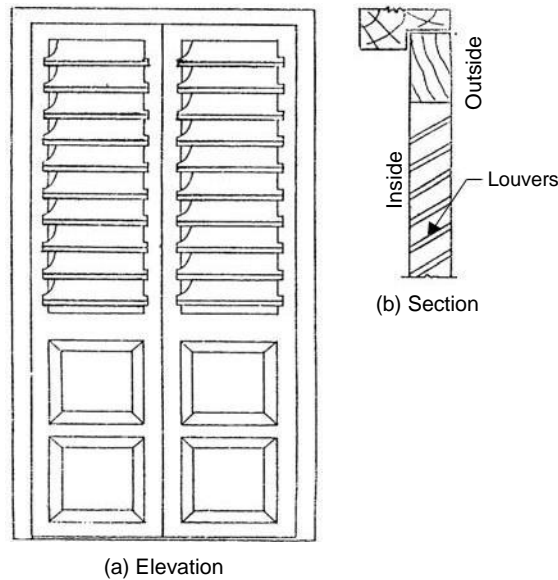


Fig. 8.25. Louvered door

Revolving Doors: It consists of a centrally placed pivot to which four radiating shutters are attached. The central pivot is supported on ball bearing at the bottom and has a bush bearing at the top. The shutters may be partly or fully made up of glass. A circular space of entrance is provided within which shutters rotate. As shutters rotate they give entrance on one side and exit on other side. These doors are preferred in public buildings like stores, banks, hotels, theatres where continuous use of doors is necessary. They are very much required in entrance to air conditioned public buildings. Figure 8.26 shows a typical revolving door.

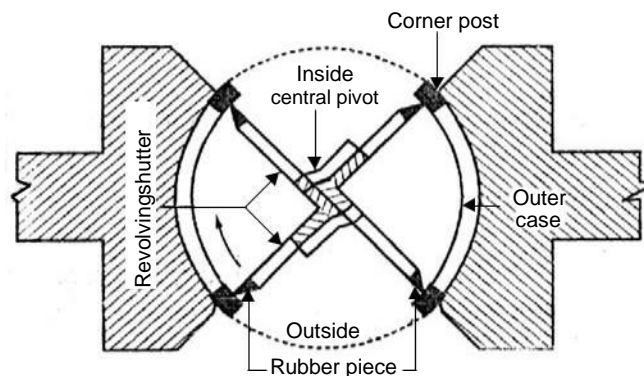


Fig. 8.26. Revolving door

Swing Doors: Swing door has its shutter attached to the frame by means of double action springs. Hence shutter can move both inward and outward. They may be single shuttered or double shuttered. Such doors are preferred in offices and banks. Since these doors can open on both sides it is desirable to provide glass panels or peep holes to enable user to see the persons from other side. [Fig. 8.27]

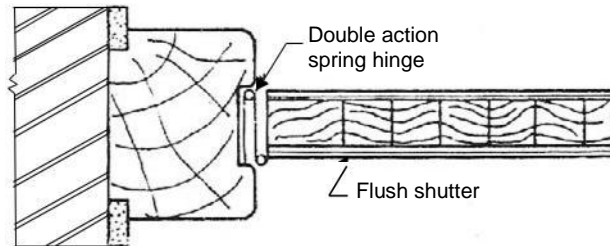


Fig. 8.27. Plan of swing door

Sliding Doors: In this type of doors, shutter slides on the sides. For this purpose runners and guide rails are provided. Sliding shutters may be one, two or even three. Such doors are used in banks, offices etc. The arrangement of such shutters in plan is shown in Fig. 8.28

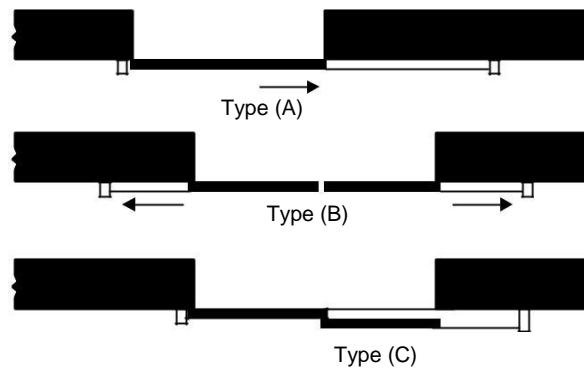


Fig. 8.28. Plan of sliding door

Collapsible Doors: Steel channels 16 to 20 mm wide are used as verticals. They are placed with 12 to 20 mm gap. Steel flats 16 mm to 20 mm wide and 5 mm thick are hinged to them

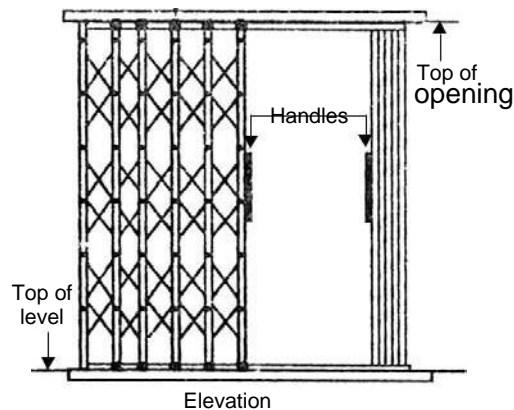


Fig. 8.29. Collapsible steel door

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as shown in Fig. 8.29. The rollers are provided at their top as well as at bottom so that shutter can be pulled or pushed side ways with slight force. There may be single or double shutters. Usually these doors are used for additional safety. They are commonly used for front doors, bank locker rooms, school and college entrance doors.

Rolling Shutters: Figure 8.30 show a typical rolling shutter door. It consists of a frame, a drum and a shutter made of thin steel plates. The width of the door may vary from 2 to 3 m. The shutter moves on steel guides provided on sides and can easily roll up. For this counterbalancing is made with helical springs on the drum. The shutter can be easily pulled down. This type of doors are commonly used as additional doors to shops, offices, banks, factory, buildings from the point of safety.

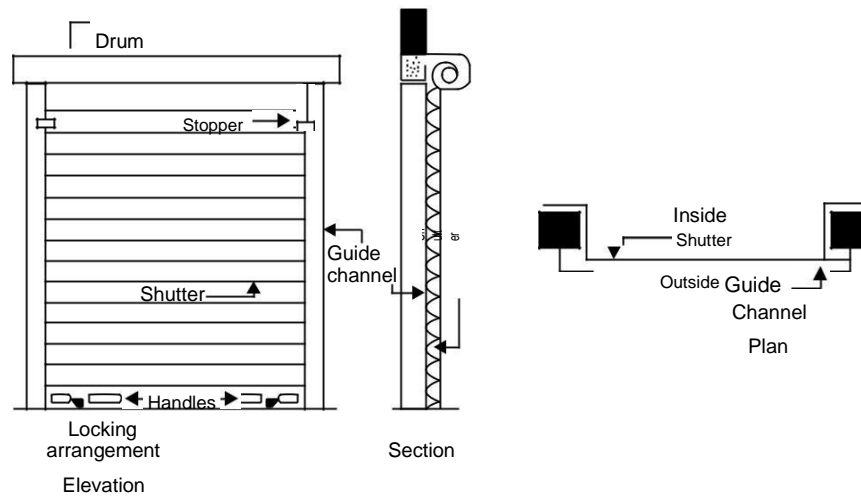


Fig. 8.30. Rolling shutter

Table 8.7 gives the differences between collapsible and revolving doors.

Table 8.7. Difference between collapsible and revolving doors

S. No.	Collapsible Doors	Revolving Doors
1.	These doors do not provide privacy inside a room.	Provide privacy inside a room.
2.	These doors operate side ways.	These doors revolve
3.	These doors provide exit and entry from same side.	These doors provide exit from one side and entry from the other side
4.	These doors are not suitable for entry to air conditioned halls.	These doors are suitable for A.C. halls.
5.	These doors do not close automatically when not in use.	These doors close openings automatically when not in use.

Types of Windows

Various windows used may be classified on the basis of materials used, types of shutters, types of openings of shutters and the position of windows.

Timber, steel and aluminium are commonly used to make window frames. Timber may get termite attacks, steel may rust but aluminium do not have any such defects. However they are costly.

Shutters of windows may be panelled, glazed or louvered. Louvered windows are generally used for bathrooms and toilets where vision is not to be allowed but ventilation is required. Lower parts panelled and upper parts glazed windows are commonly used. Instead of panelled one may think of using translucent glasses. Figure 8.31 show a louvered windows.

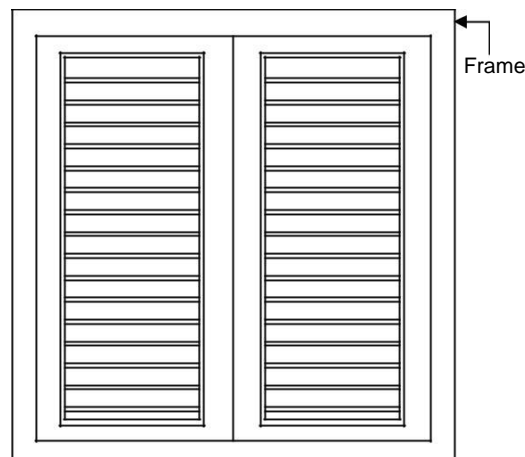


Fig. 8.31. Louvered window

Window shutters may be fixed, centrally pivoted, sliding type or double hung. Figure 8.32 shows a typical double hung window.

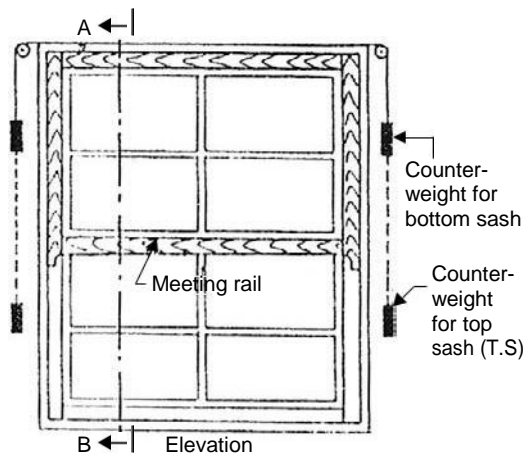


Fig. 8.32. Double hung window

Depending upon the position of windows, they may be classified as:

- (a) Casement windows
- (b) Bay windows
- (c) Corner windows

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- (d) Clear storey windows
- (e) Gable windows
- (f) Sky light windows
- (g) Dormer windows
- (h) Ventilators

Casement windows are common type of windows, provided in the outer walls. They are provided over 50 to 75 mm sill concrete at a height of 750 to 900 mm from floor level.

Bay windows are provided on the projected portion of walls.

Corner windows are provided in the corner of a room. They need heavy lintels. Corner post of window should be strong enough to take load due to deflection of lintel and impact load from the shutters.

Clear storey windows are provided when the height of the room is much more than adjacent room/varandah. It is provided between the gap of low height room and the top of room with greater height.

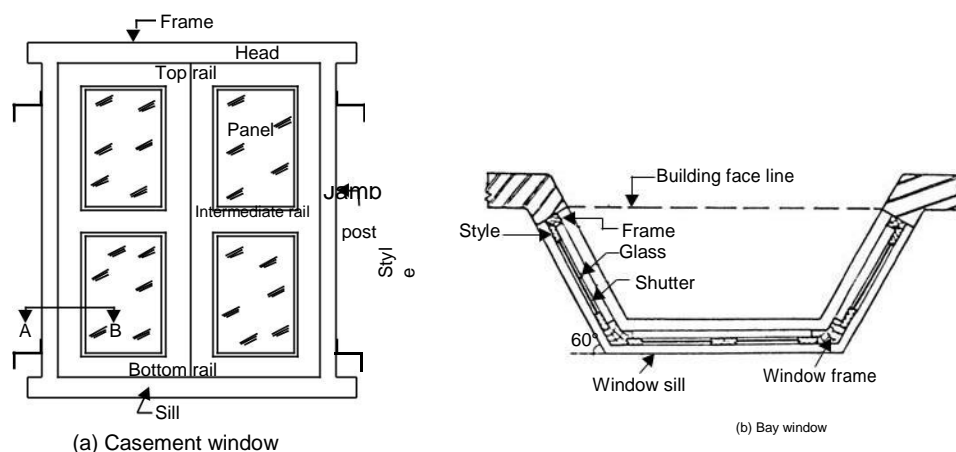
Gable windows are provided in the gable portion of the building. They are required in the stair cases or in the halls with gable walls.

Sky light windows are provided on a sloping roof. It projects above the top sloping surface. The common rafters are to be trimmed suitably.

Dormer windows are vertical windows on the sloping roof.

Ventilators are provided close to roof level or over the door frames. They help in pushing out exhaust air. They may be provided with two split and separated glasses or with hung shutters.

Various type of windows based on their positions are shown in Fig. 8.33



SUPER STRUCTURES

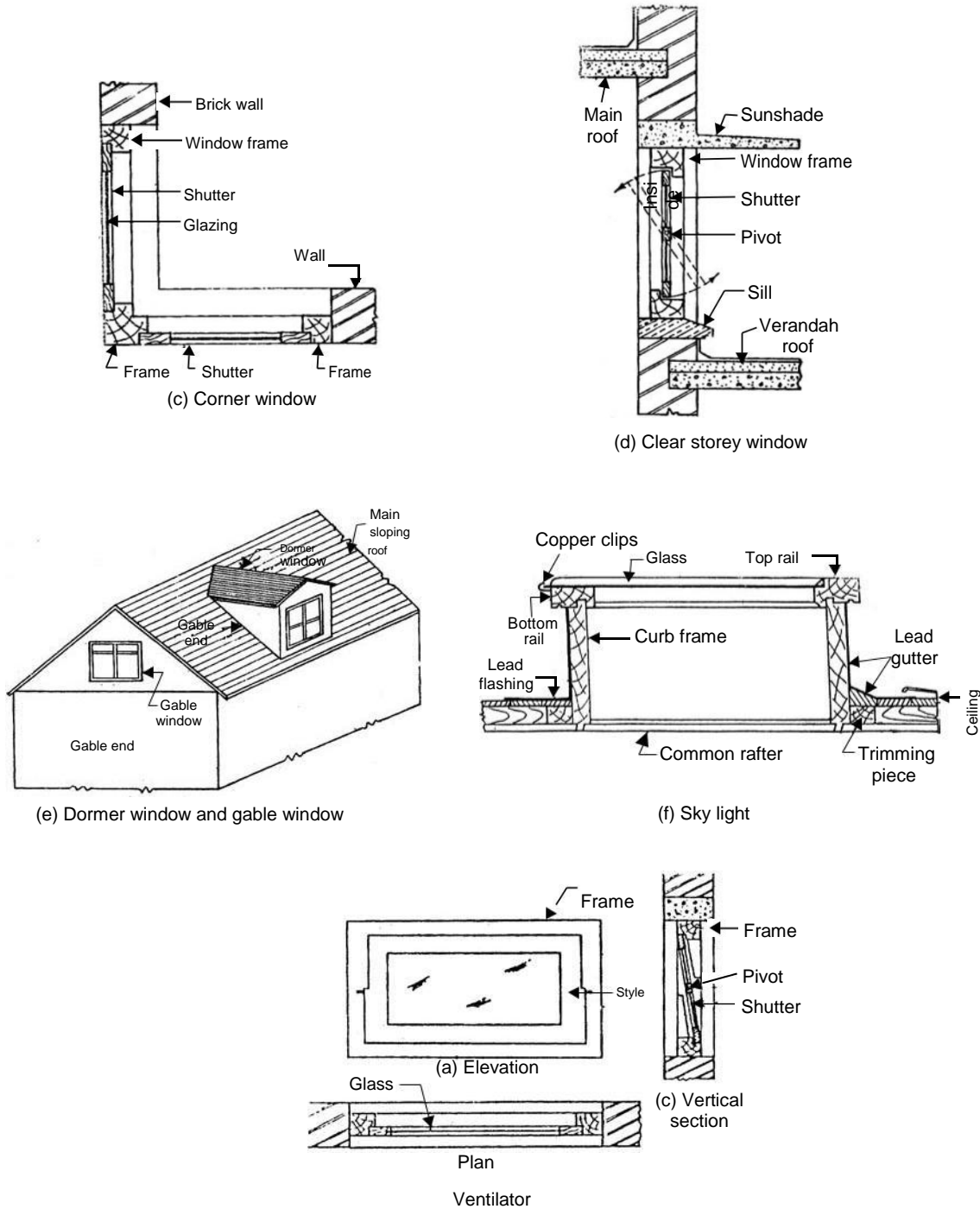


Fig. 8.33. Types of window on their position

LINTELS

Lintel is a horizontal flexural member which spans over the openings in the walls for doors, windows, ventilators, cupboards etc. The load of masonry above the opening is transferred to the wall by flexural action of the lintel so that frames of doors, windows etc are not unduly loaded. The end bearings for the lintel should be at least 200 mm. The width of lintels is same as that of wall.

Lintels of various materials are used. They are:

- (a) Wood
- (b) Stone
- (c) Brick
- (d) R.C.C. and
- (e) Steel.

(a) **Wood Lintel:** It may be a single piece or may be assembled by joining 2 to 3 pieces. Sometimes the wooden lintels are strengthened by steel plates at top and bottom. Such lintels are called as flitched beams.

(b) **Stone Lintels:** Wherever stones are available stone beams are used as lintels. As stone is weak in tension they can be used only for small spans. Their depth is kept about $\frac{1}{10}$ th span.

Stones are cut to the width of wall and dressed before using as lintels.

(c) **Brick Lintels:** Well burnt, good quality lintels are laid on ends or edges to form lintels as shown in Fig. 8.34. It needs temporary form work at the time of construction. The lintel is to be cured for 7–14 days before form work is removed. Such lintels are useful to span small openings.

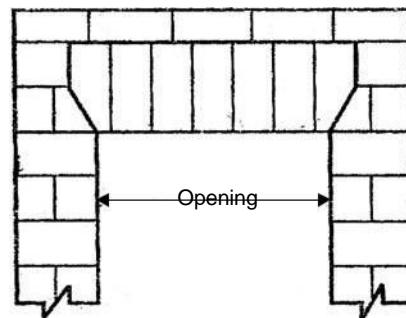


Fig. 8.34. Brick lintel

(d) **R.C.C. Lintels:** It is possible to provide R.C.C. lintels of any span required in the building. They can be isolated or continuous over the openings. They are provided with suitable reinforcement—main reinforcements being on lower side in the opening. Nowadays these lintels are used very commonly in buildings.

- (e) **Steel Lintels:** Steel angles or rolled steel I-sections are used as lintels. Tube separators may be provided to maintain the spacing between the sections. If the sections are opened to atmospheric action, regular painting is necessary. Many times they are encased in concrete to avoid maintenance problem. These lintels can be used for large openings.

STAIRS

Stairs give access from floor to floor. The space/room housing stairs is called staircase. Stairs consists of a number of steps arranged in a single flight or more number of flights.

The requirement of good stairs are

- (a) **Width:** 0.9 m in residential buildings and 1.5 m to 2.5 m in public buildings.
- (b) **Number of Steps in a Flight:** Maximum number of steps in a flight should be limited to 12 to 14, while minimum is 3.
- (c) **Rise:** Rise provided should be uniform. It is normally 150 mm to 175 mm in residential buildings while it is kept between 120 mm to 150 mm in public buildings. However in commercial buildings more rise is provided from the consideration of economic floor area.
- (d) **Tread:** Horizontal projection of a step in a stair case is called tread. It is also known as going. In residential buildings tread provided is 250 mm while in public buildings it is 270 mm to 300 mm.

The following empirical formula is used to decide rise and tread:

$$2R + T > 550 \text{ mm but } < 700 \text{ to } 600 \text{ mm}$$

where R is rise in mm and T is tread in mm.

- (e) **Head Room:** Head room available in the stair case should not be less than 2.1 m.
- (f) **Hand Rails:** Hand rails should be provided at a convenient height of a normal person which is from 850 mm to 900 mm.

Types of Stairs

The stairs may be built with wood, concrete masonry or with cast iron. Wooden stairs are not safe, because of the danger of fire. However they are used in unimportant buildings to access to small areas in the upper floors. Cast iron or steel stairs in the spiral forms were used commonly to reduce stair case area. In many residential buildings masonry stairs are also used. Reinforced concrete stairs are very commonly used in all types of buildings.

Based on the shapes stairs may be classified as:

- (a) Straight stairs
- (b) Dog legged stairs
- (c) Well or open-newel stairs
- (d) Geometrical stairs
- (e) Spiral stairs

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(f) Turning stairs.

(a) **Straight Stairs:** If the space available for stair case is narrow and long, straight stairs may be provided. Such stairs are commonly used to give access to porch or as emergency exits to cinema halls. In this type all steps are in one direction. They may be provided in single flight or in two flights with landing between the two flights [Fig. 8.35].

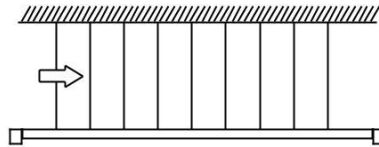


Fig. 8.35. Straight stairs

(b) **Dog Legged Stairs:** It consists of two straight flights with 180° turn between the two. They are very commonly used to give access from floor to floor. Figure 8.36 shows the arrangement of steps in such stairs.

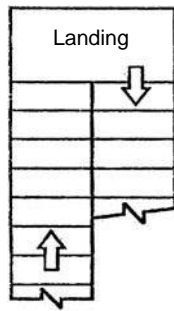


Fig. 8.36. Dog legged stair

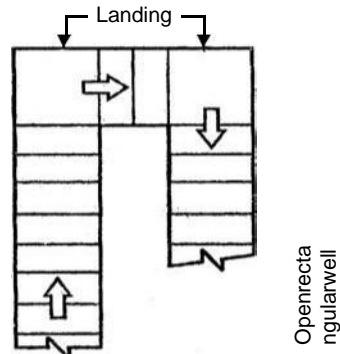


Fig. 8.37. Open well (newel) stair

(c) **Well or Open-newel Stairs:** It differs from dog legged stairs such that in this case there is 0.15 m to 1.0 m gap between the two adjacent flights. Figure 8.37 shows a typical open-newel stair.

(d) **Geometrical Stair:** This type of stair is similar to the open newel stair except that well formed between the two adjacent flights is curved. The hand rail provided is continuous. [Ref. Fig. 8.38]

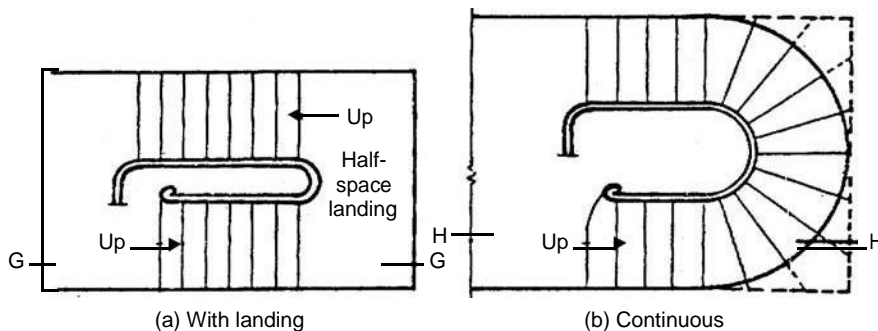


Fig. 8.38. Geometric stairs

- (e) **Spiral Stairs:** These stairs are commonly used as emergency exits. It consists of a central post supporting a series of steps arranged in the form of a spiral. At the end of steps continuous hand rail is provided. Such stairs are provided where space available for stairs is very much limited. Figure 8.39 shows a typical spiral stair. Cast iron, steel or R.C.C. is used for building these stairs.

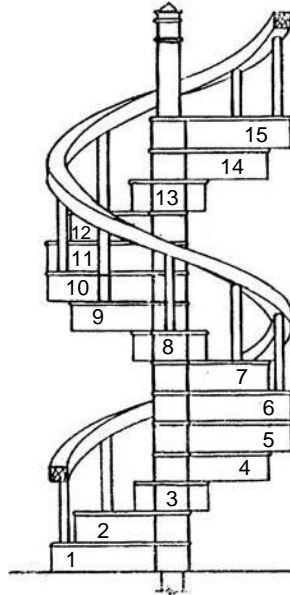


Fig. 8.39. Spiral stairs

- (f) **Turning Stairs:** Apart from dog legged and open newel type turns, stairs may turn in various forms. They depend upon the available space for stairs. Quarter turned, half turned with few steps in between and bifurcated stairs are some of such turned stairs. Figure 8.40 shows a bifurcated stair.

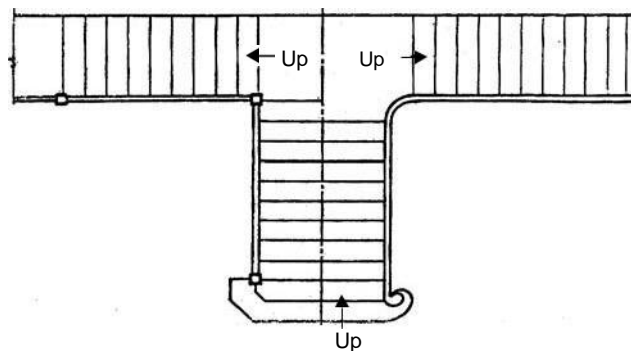


Fig. 8.40. Bifurcated stairs