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Building Constructi on



Stair

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- ❑ Introduction
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- ❑ Elevators
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INTRODUCTION

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□ Access in buildings can be classified into categories:

- ✓ Moving
- ✓ Stationary

I. Moving

➤ An elevator, escalator, a staircase or a belt that moves by using different kinds of ***electrical or hydraulic driving motors***. For example:

- - An elevator or lift - Escalator
- - Conveyor or - The case of handicaps there are moving chairs

II. Stationary

➤ Most widely used access in buildings. There is ***no any motor that drive the system***, rather it is fixed.

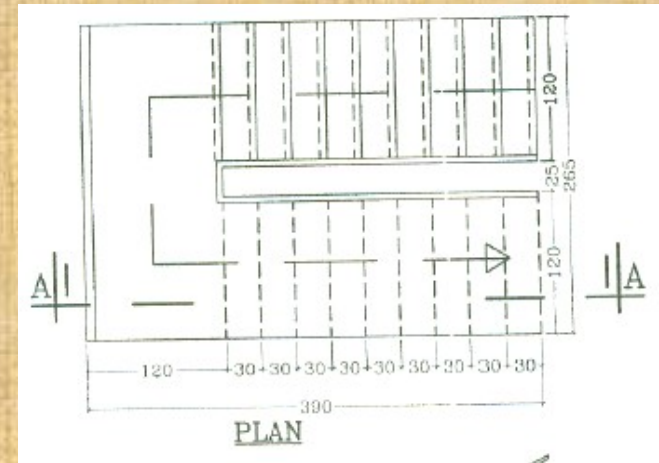
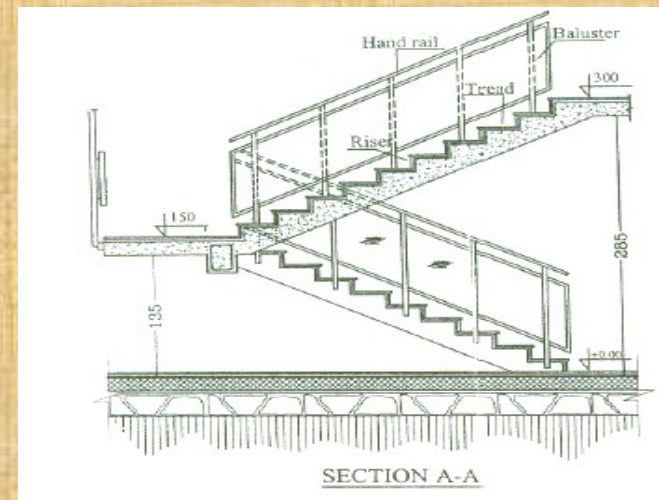
- ✓ Stairs,
- ✓ Different kinds of ladders,

✓ Ramps, Corridors

INTRODUCTION

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- ❑ Stairs are set of steps leading from one floor to another and are provided in building to afford a means of communication between the various floors.
- ❑ Steps arranged in series and placed in an enclosure is called Stair Case.
- ❑ Stairs should be designed properly to provide proper:
 - ✓ Ventilation
 - ✓ Light (Natural)
 - ✓ Location: Near Main Entrance for Public Buildings and Centrally for easy access and privacy in Residential Buildings.

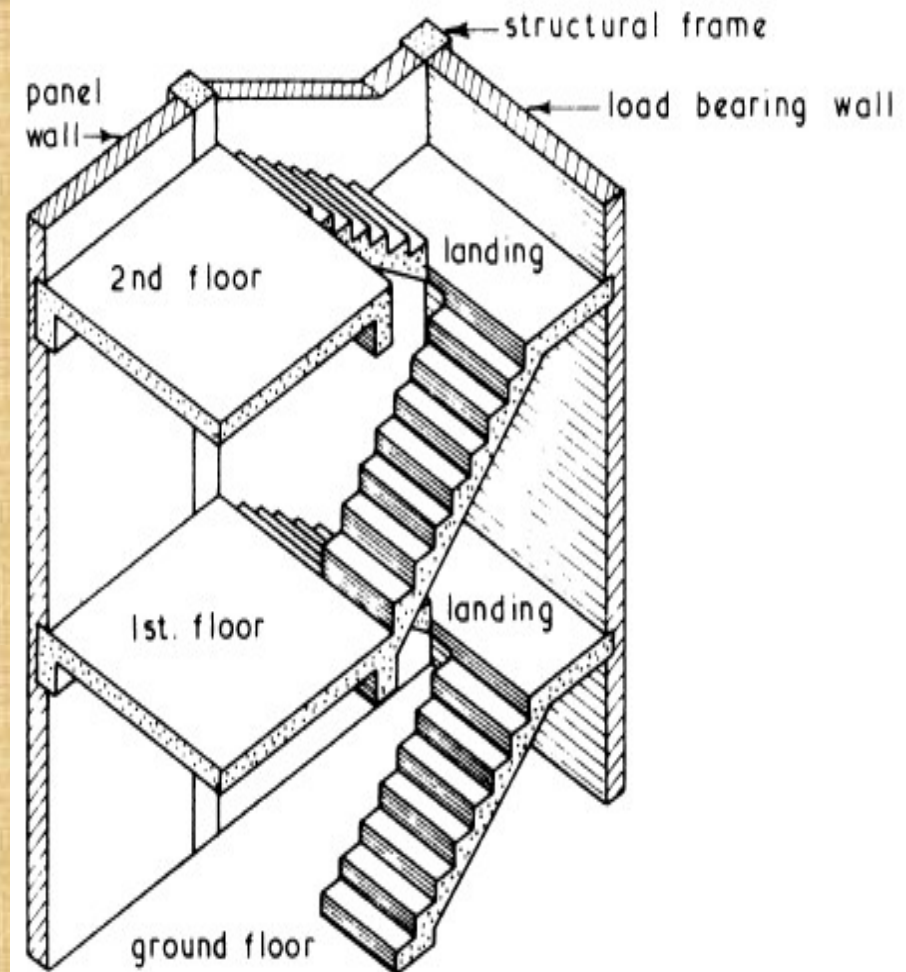


INTRODUCTION

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PRIMARY FUNCTION OF STAIRS

1. Provide a **means of circulation** between floor levels.
2. Establish a **safe means of travel** between floor levels.
3. Provide an **easy means of travel** between floor levels.
4. Provide a means of **conveying fittings and furniture** between floor levels.



TECHNICAL TERMINOLOGIES

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- ❑ **Step:** is a portion of stair which permits ascent or descent.
 - It is comprised of a tread and a riser. A stair is composed of a set of steps.
- ❑ **Tread:** is the horizontal member of stair.
 - The tread of public buildings must be wide enough to provide safe footing.
- ❑ **Going:** is the horizontal distance b/n the nosing or front edges of two consecutive steps.
 - It is usually 30cm for public buildings so that it is wide enough to provide safe footings.
- ❑ **Riser:** is the vertical member of a stair.
- ❑ **Rise:** Is the vertical distance b/n the upper surface of two consecutive steps.
 - The rise of public building is about 15cm while a higher value can be used for private buildings.

TECHNICAL TERMINOLOGIES

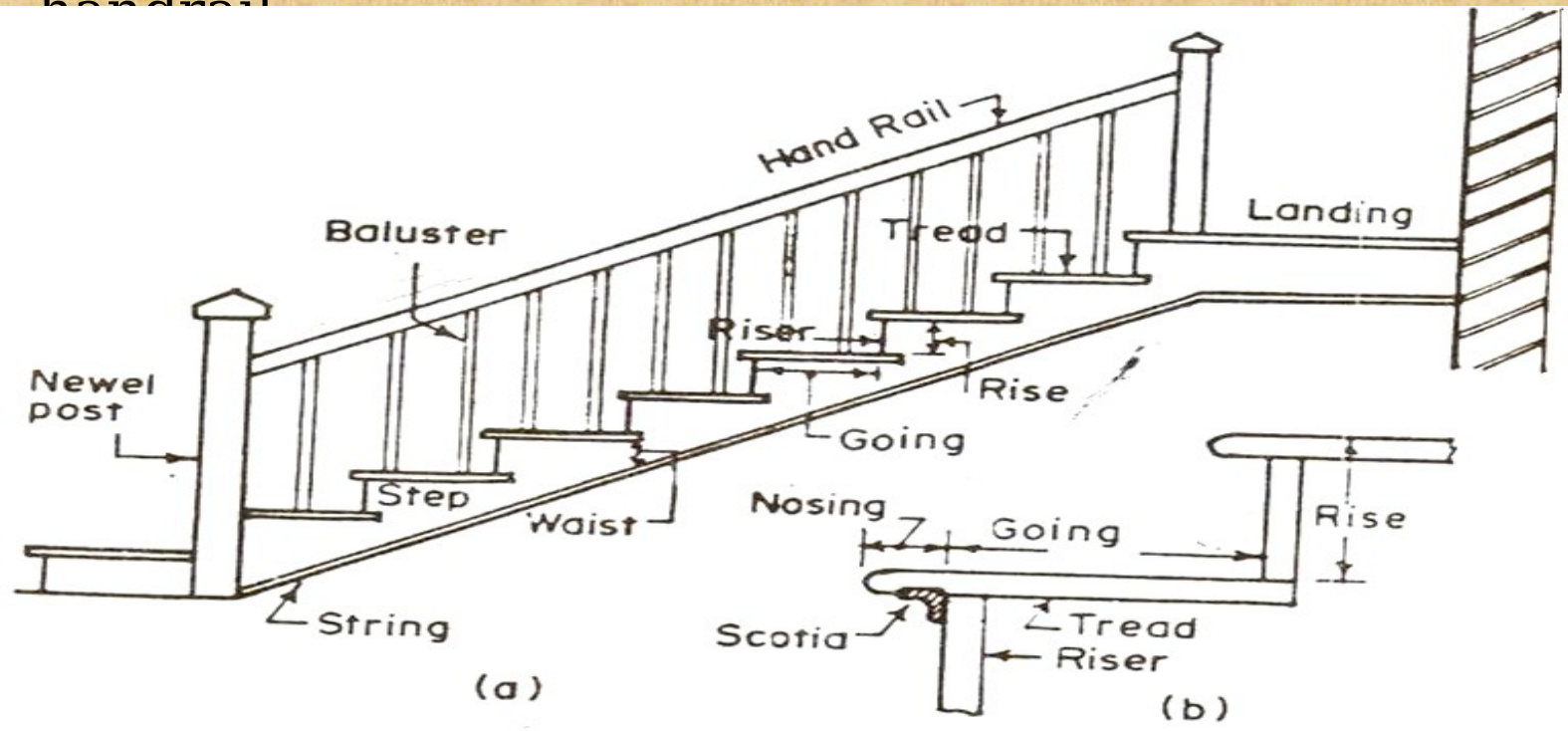
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- ❑ **Nosing**: it is the projecting part of the tread beyond the face of the riser.
 - It is usually rounded off from the architectural point of view.
- ❑ **Flight**: is a continuous set of steps b/n floors and/or landing.
- ❑ **Landing**: is a platform b/n two flights.
- ❑ **Baluster**: is the vertical member which supports the hand rail.
 - The combined framework of hand rail and baluster is known as balustrade.
- ❑ **String or stringer**: is the structural member which supports the steps and act as inclined beams.
- ❑ **Hand rail**: is a rounded or molded member of wood or metal fixed on the top of balusters.
- ❑ **Head room**: is the minimum clear vertical distance b/n the tread and overhead structure.
- ❑ **Soffit**: It is the under side of the stair.

TECHNICAL TERMINOLOGIES

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- ❑ **Run:** it is the total length of stairs in a horizontal plane, including landings.
- ❑ **Newel post:** Is the vertical member which is placed at the ends of flight to connect the end strings and handrail.



CLASSIFICATION OF STAIRS

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- ❑ Stairs can be classified into two broad heads:

STAIRS

STRAIGHT STAIRS

TURNING STAIRS

QUARTER TURN
STAIR

HALF TURN STAIR

THREE - QUARTER
TURN STAIRS

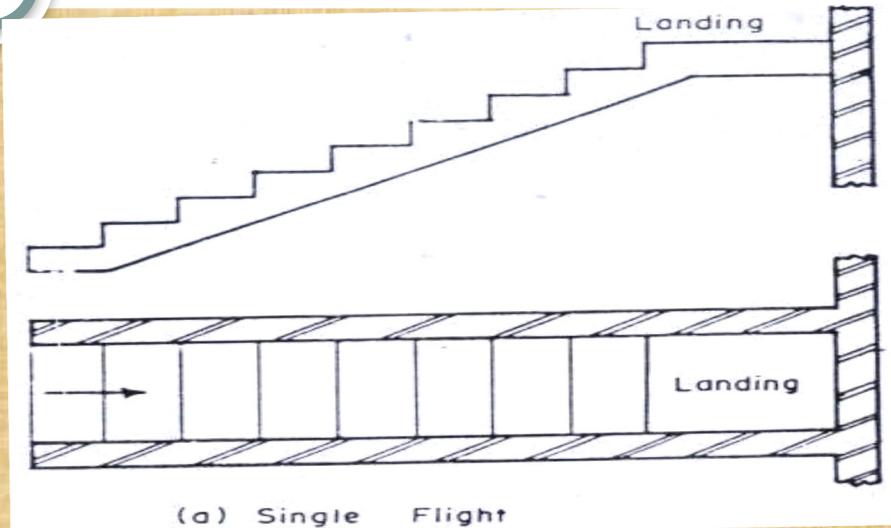
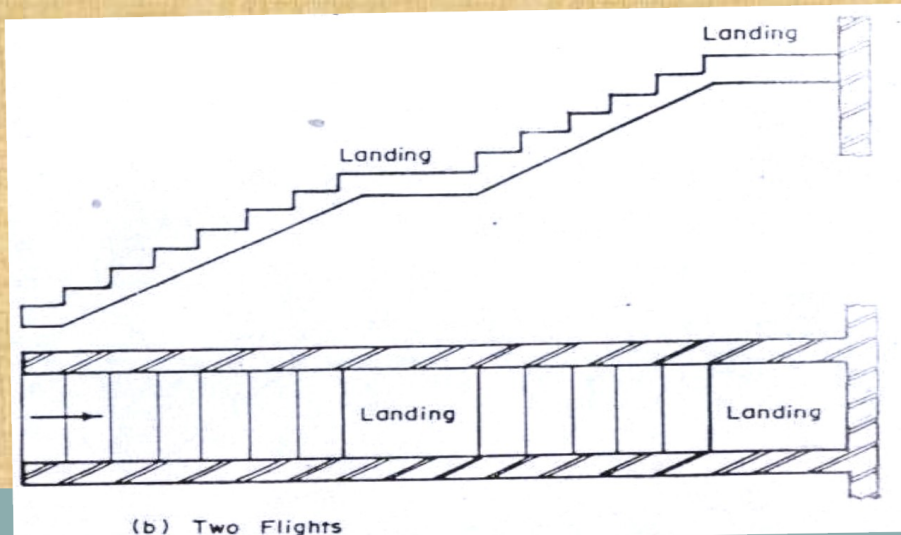
BIFURCATING
STAIRS

CLASSIFICATION OF STAIRS

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1. **Straight stairs:** this stairs runs straight b/n the two floors.

- ✓ It is used for small houses where there are restrictions in available width.
- ✓ The stair may consist of either one single flight or more than one flight (usually two) with a landing.



CLASSIFICATION OF STAIRS

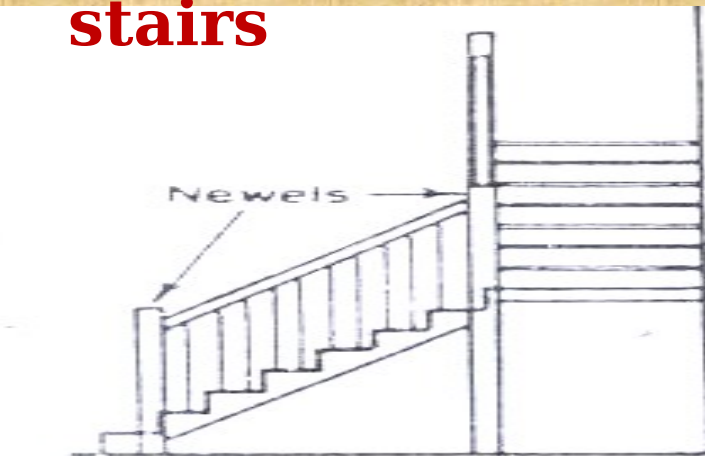
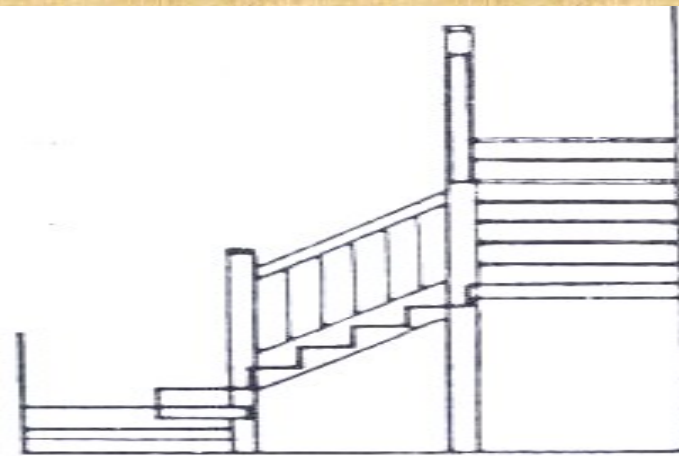
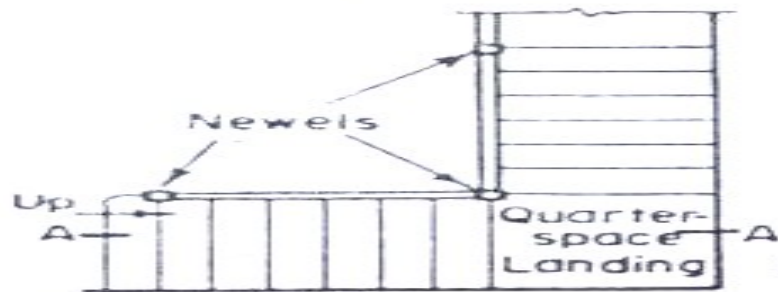
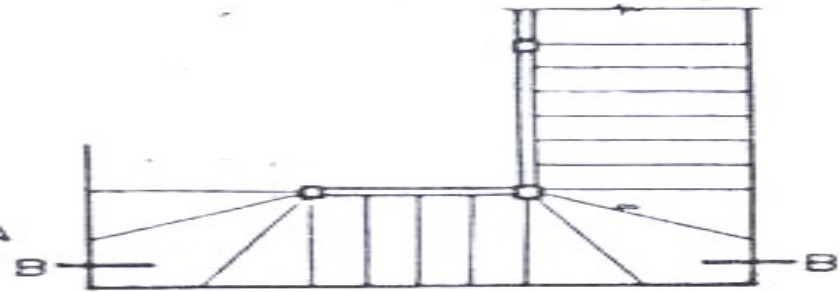
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2. **Quarter turn stairs:** is the one which changes its direction either to the left or to the right.
- The turn being affected either by introducing a quarter space landing or by providing winders.
 - Quarter turn stairs are of two types:
 - A. Newel quarter turn stairs
 - B. Geometrical quarter turn stairs.
- A. **Newel quarter turn stairs**
- ❑ These stairs have the conspicuous newel posts at the beginning and end of each flight.
 - ❑ At the quarter turn, there may either be quarter space landing or there may be winders.

CLASSIFICATION OF STAIRS

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A. Newel quarter turn stairs



Plan
(a) With Quarter-space Landing

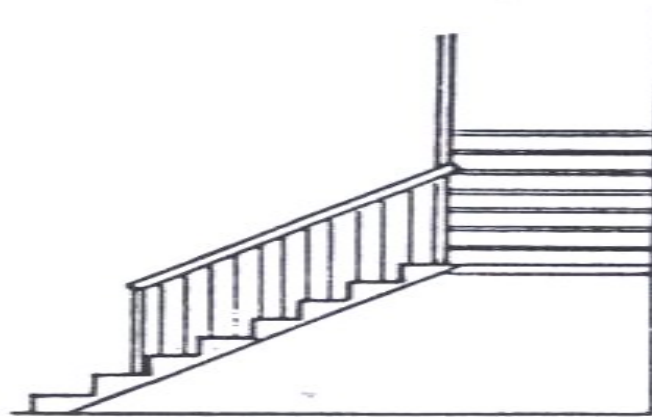
Plan
(b) With Winders

CLASSIFICATION OF STAIRS

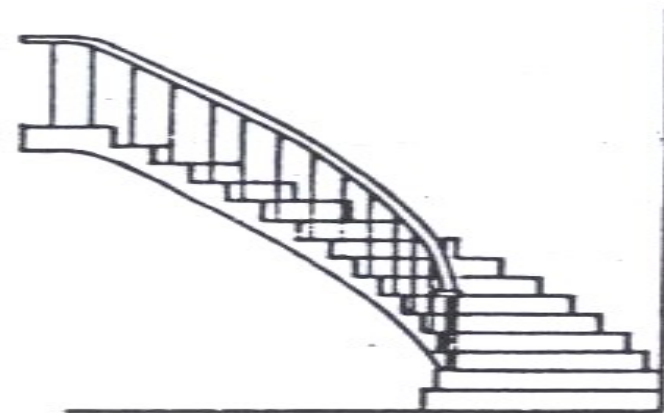
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B. Geometrical quarter turn stairs

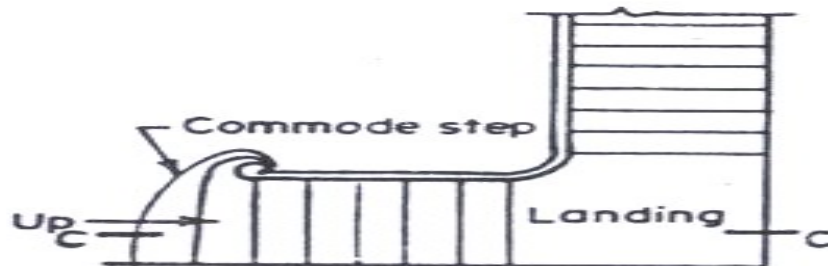
- The stringer as well as the hand rail is continuous, with no newel post at the landing.



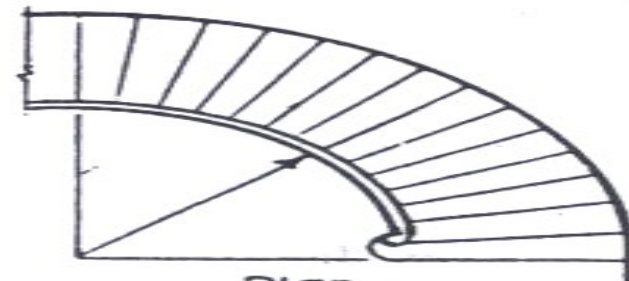
Section C.C.



Elevation



(a) With Landing



(b) Continuous

CLASSIFICATION OF STAIRS

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3. **Half turn stairs**: is the one which has its direction reversed or changed for 180° .

- Such stairs are quite common.
- Half turn stairs are of three types:
 - A. Dog-legged or newel half turn stairs.
 - B. Open newel half turn stairs.
 - C. Geometrical half turn stairs.

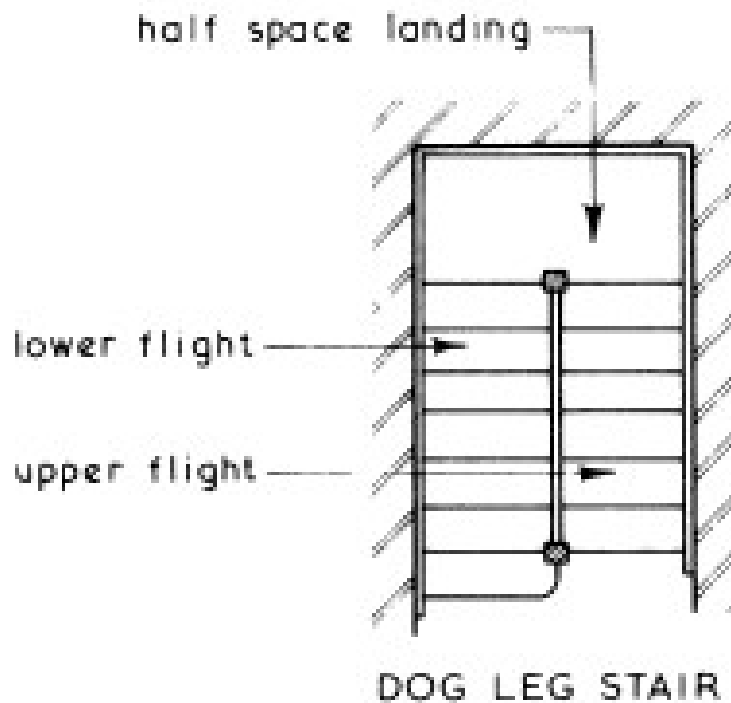
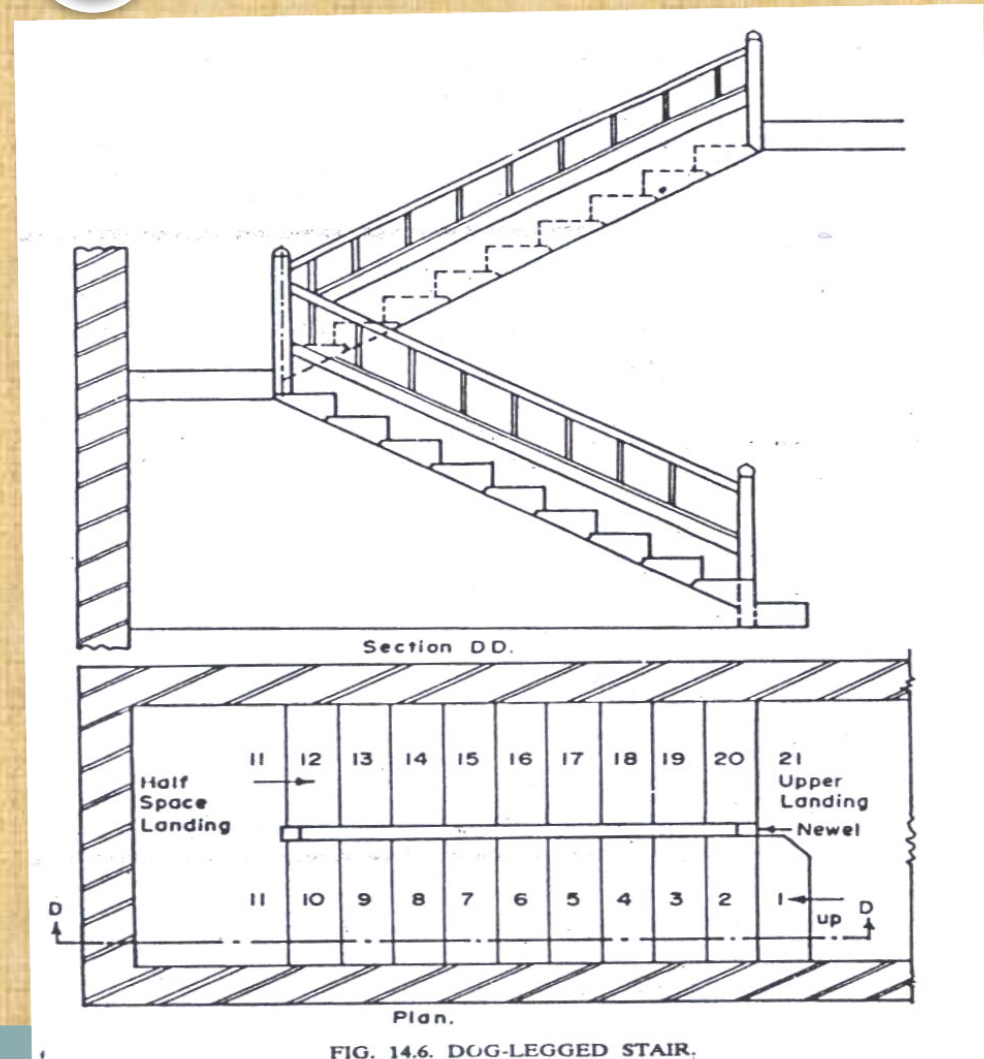
A. **Dog-legged stairs**

- ❑ The name is given because of its appearance in sectional elevation.
- ❑ It comes under the category of newel stairs in which newel posts are provided at the beginning and end of each flight.
- ❑ These may be of two types:
 - With half space landing
 - With quarter space landing and winders

CLASSIFICATION OF STAIRS

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Dog-legged stairs

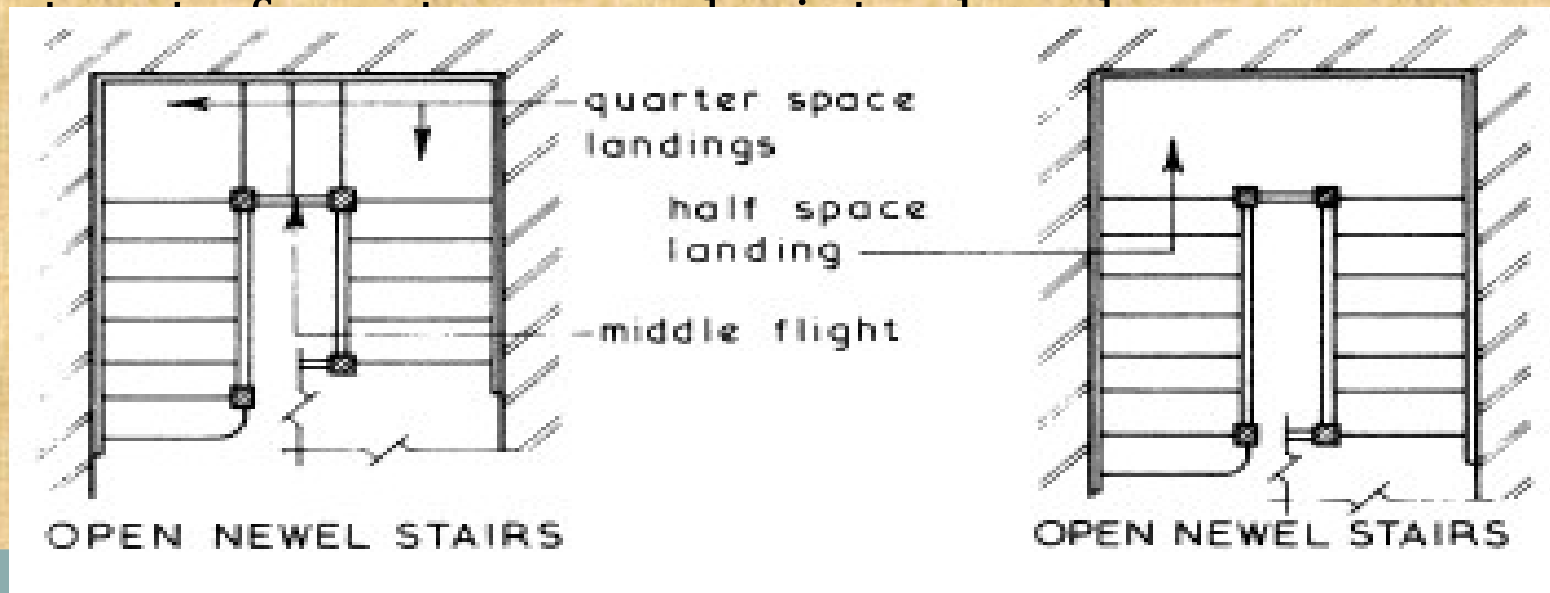


CLASSIFICATION OF STAIRS

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B. Open newel half turn stair

- Has a space or well between the outer strings. This is the only aspect in which it differs from the dog legged stairs.
- Additional width is required b/n the two flights. When the space provided is more, a small flight containing

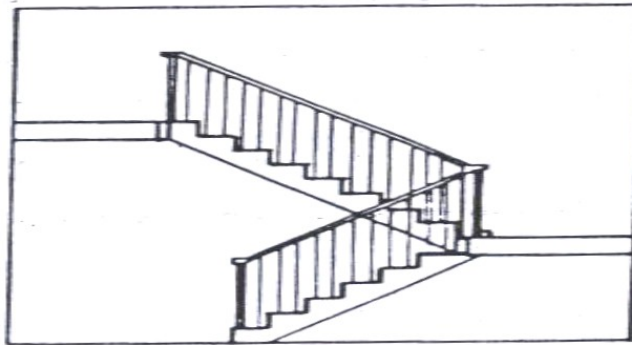


CLASSIFICATION OF STAIRS

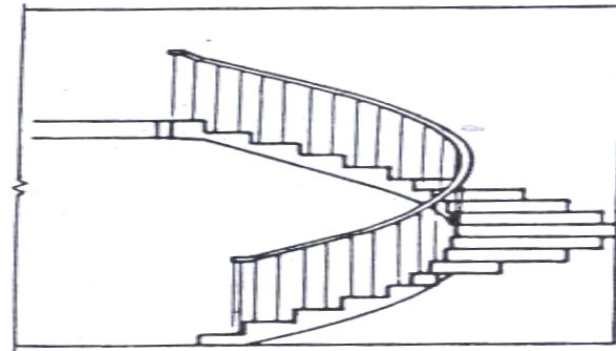
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C. Geometrical half turn stairs

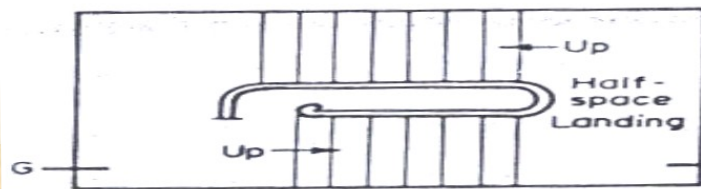
- ❑ The essential feature of such stairs are that the stringers and the hand rails are continuous, without any intervening newel post.
- ❑ This may be either with half space landing or without.



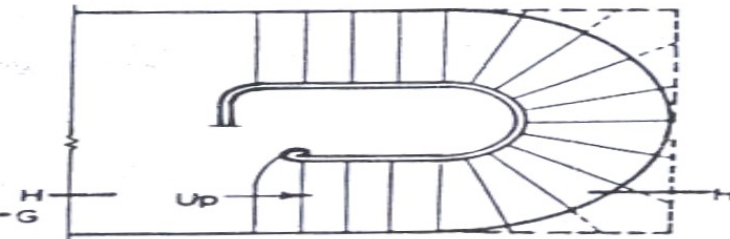
Section G.G.



Section H.H.



(a) With Landing



(b) Continuous

CLASSIFICATION OF STAIRS

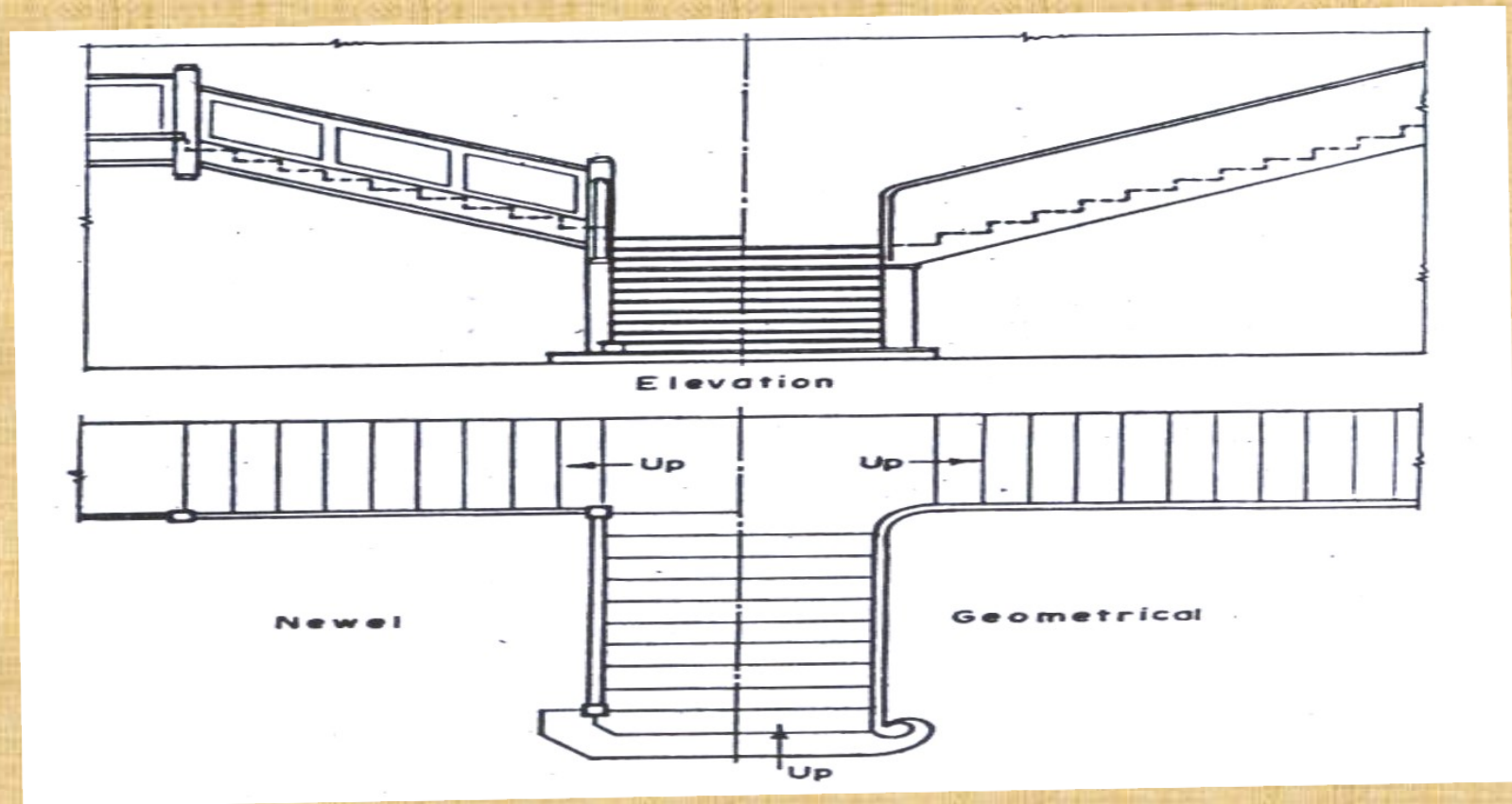
18

4. **Three quarter turn stairs:** has its direction changed three times with its upper flight crossing the bottom one.
 - It may either be newel type or open newel type
 - Such type of stair is used when the length of the stair room is limited and when the vertical distance b/n the two floors is quite large .
5. **Bifurcated stairs:** The stair has a wider flight at the bottom, which bifurcates into two narrow flights one turning to the left and the other to the right, at the landing.
 - It may be either of newel type with a newel post or of geometrical type
 - This type of stair is commonly used in public buildings at their entrance hall.

CLASSIFICATION OF STAIRS

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Bifurcated stairs:



CLASSIFICATION OF STAIRS

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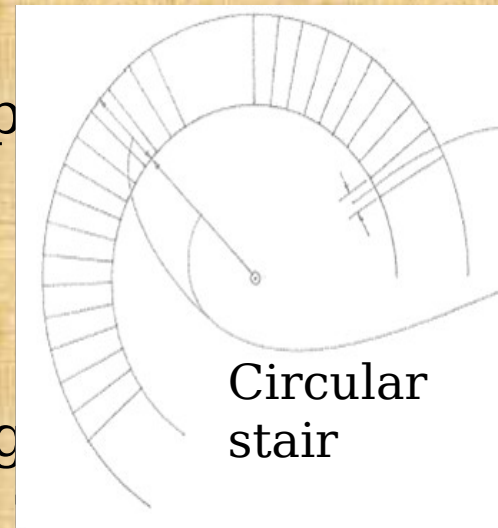
6. **Continuous stairs:** Type of stairs which do neither have any landing nor any intermediate newel post. They are geometrical in shape.

- Continuous stairs may be of three types
 - Circular stairs,
 - Spiral stairs, and
 - Helical stairs.

A. **Circular stairs:** has circular plan configuration.

B. **Spiral stairs:** all the steps are winders. Therefore they are not comfortable.

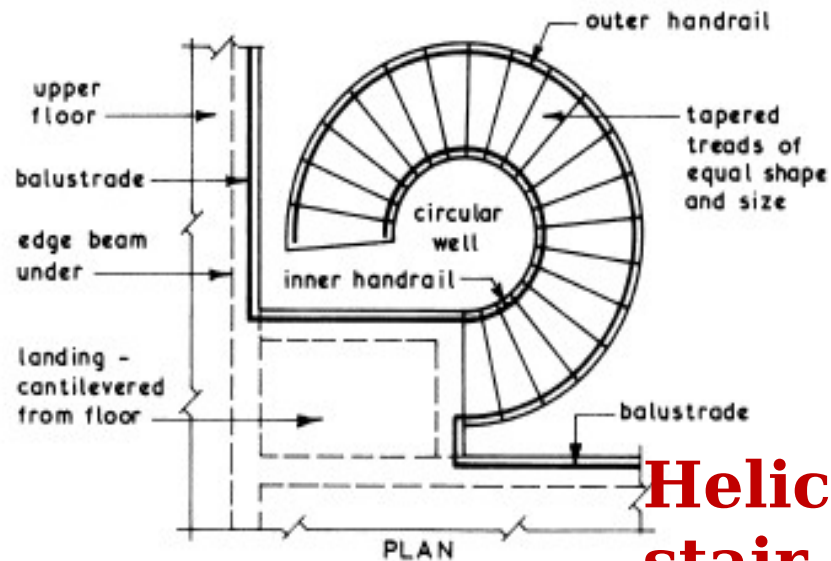
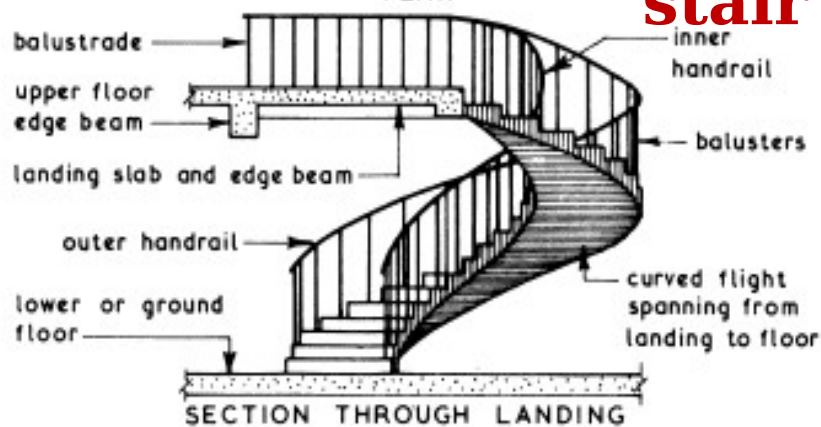
A. **Helical stairs:** It is made of R.C.C. in which a large portion of steel is required to resist bending, shear and torsion.



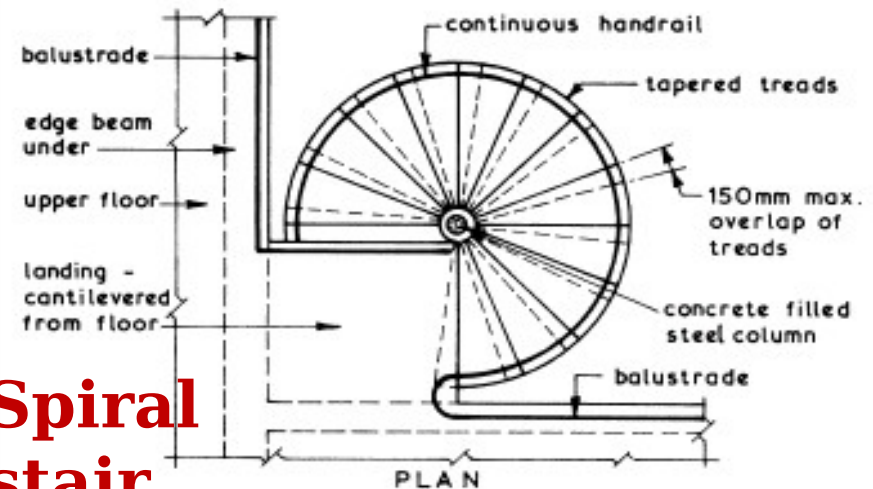
CLASSIFICATION OF STAIRS

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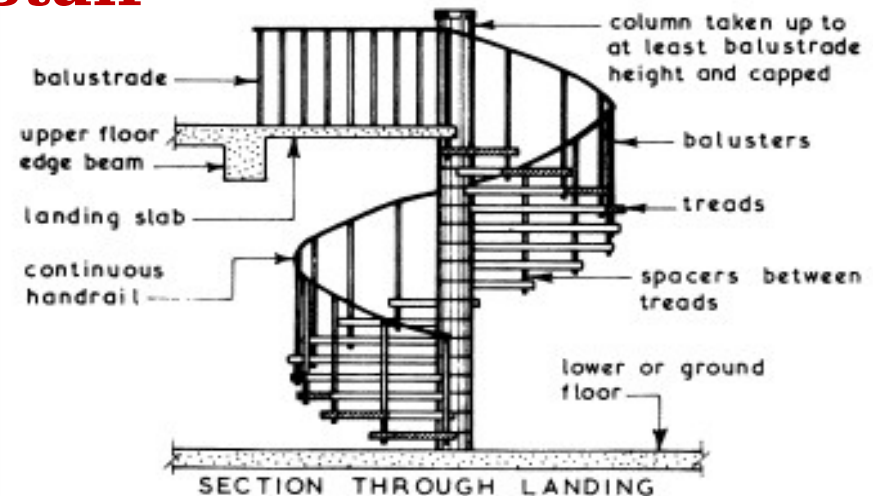
Typical Example of a Helical Stair -



Typical Example -



Spiral stair



MATERIALS USED FOR STAIR CONSTRUCTION

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- ❑ The selection of materials for the construction of stairs depend up on
 - The availability of materials and ease of transportation
 - Funds
 - Desired life of building
 - Aesthetical importance
 - Freedom of design
 - Expected fire resisting quality
- ❑ Thus, stairs may be made either of
 - ✓ Timber
 - ✓ Bricks
 - ✓ Stones
 - ✓ Metal
 - ✓ Reinforced concrete
 - ✓ Precast concrete

ESSENTIAL REQUIREMENTS OF A GOOD STAIR

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- Stairs should be designed so as to provide *easy*, *quickness* and *safety* mode of communication b/n the floors. The following are the general requirements which a stair should fulfill.

Location:

- i. It should be so located as to provide easy access to the occupants of the building.
- ii. It should be so located that it is well lighted and ventilated directly from the exterior.
- iii. It should be so located as to have approaches well-situated and open.

ESSENTIAL REQUIREMENTS OF A GOOD STAIR

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Width of stair:

- It should be wide enough to carry the user with out much crowd or inconvenience.
- Width of stairs depends up to its location in the building and the type of the building itself.
- If a domestic building, a 90cm wide stair is sufficient while in public building, 1.5-1.8m width may be required.

Length of flight:

- From comfort point of view, the number of steps are not more than 12 and not less than 3.

ESSENTIAL REQUIREMENTS OF A GOOD STAIR

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Pitch of stair:

- Its ascent should be relatively easy.
- Stairs for public building should have a pitch of 38° and for private buildings the pitch should not be more than 42° .

Head room:

- The clear distance b/n the tread and soffit of the flight immediately above it should not be less than 2.1-2.3m

Balustrade:

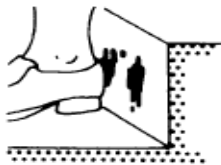
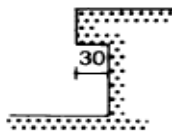
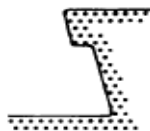
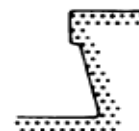
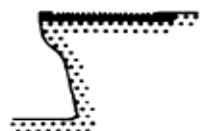
- Open well stairs should always be provided with balustrade, to provide safety to the users.
- Wider stairs should have hand rail to both the sides.

ESSENTIAL REQUIREMENTS OF A GOOD STAIR

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Step dimensions:

- The rise and going should be of such dimension as to provide comfort to the users.
- Their proportion should also be such as to provide desirable pitch of the stair.
- The going should not be less than 25cm, though the 30cm is quite comfortable.
- The rise should be b/n 10cm (for hospitals, etc) to 15cm.
- The width of landing should not be less than the

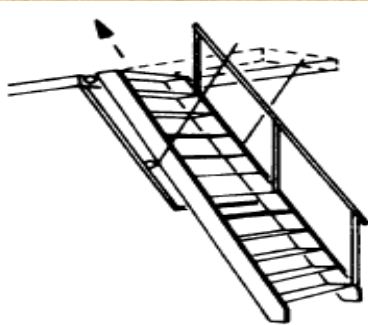


① Step profiles

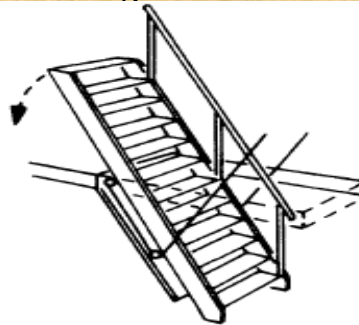
LADDERS

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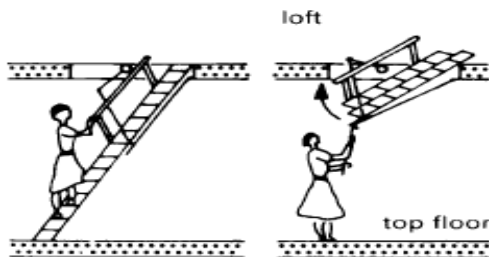
- Ladders are used primarily in industrial construction and in utility and service areas.



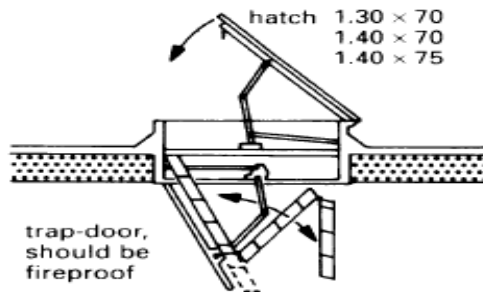
⑤ Space-saving retractable stairs, in one, two or three sections → ⑦



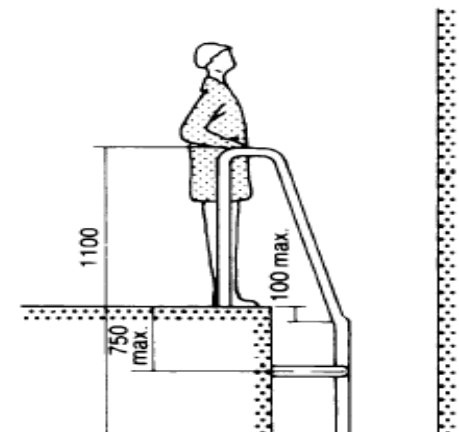
⑥ Space-saving loft ladder (scissor frame) for rooms 2.0-3.8m high



⑦ Space-saving, telescopic aluminium or wooden ladders for lofts → ⑤ + ⑥



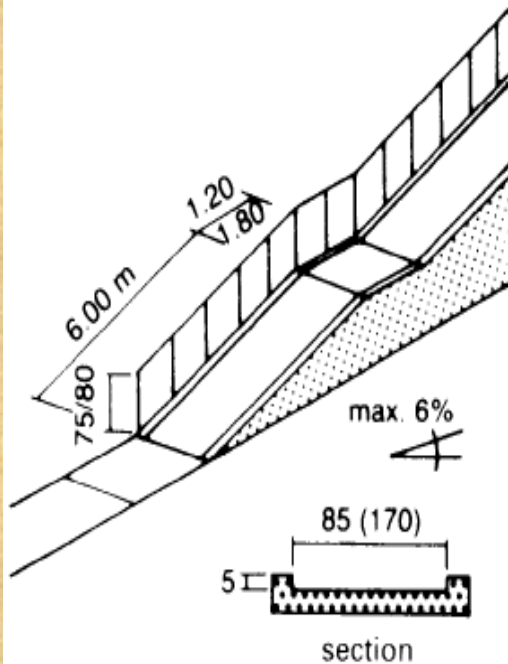
⑧ Flat roof exit with loft steps



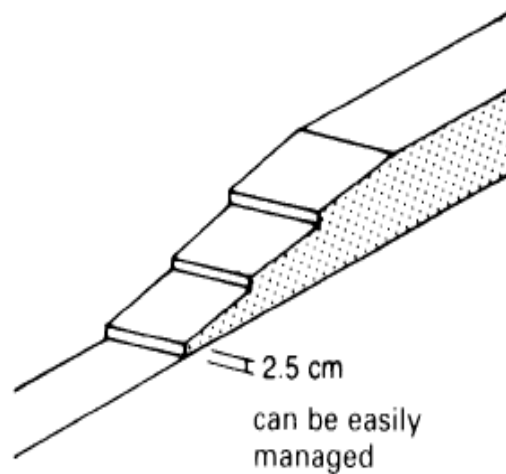
RAMPS

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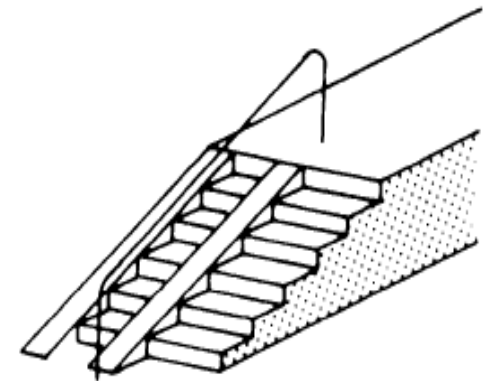
- Ramps shall be provided to allow wheel chair access and luggage path in hotels, for stretchers in hospitals for loading and unloading in warehouses



1 Ramp



2 Stepped ramps

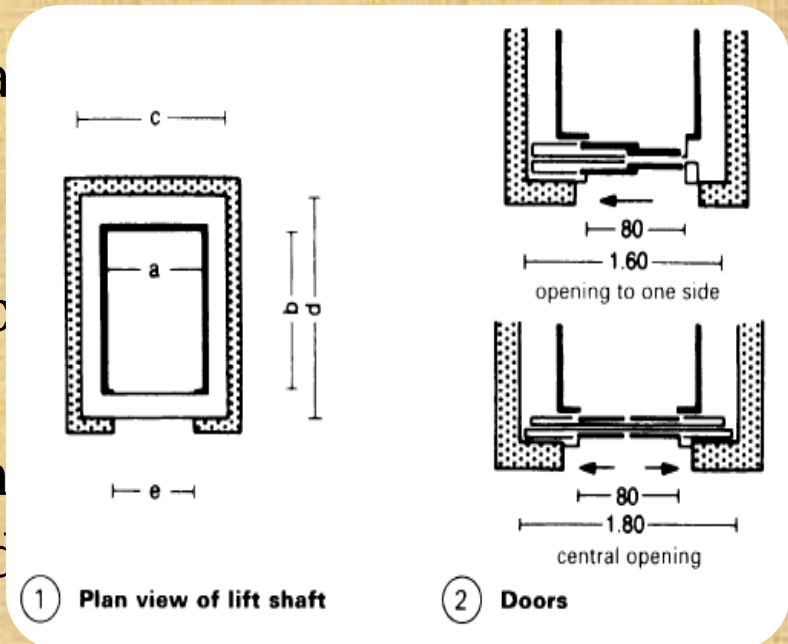


3 Stair ramp

ELEVATORS

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- ❑ Elevators travel vertically to carry passengers, equipments and goods from one level of the building to another.
- ❑ The two most common types are electric and hydraulic elevator.
- ❑ The type, size, number, speed and number of elevators are determined by:
 - Type of occupancy
 - Amount and tempo of traffic to be carried
 - Total vertical distance of travel
 - Round-trip time and speed of travel



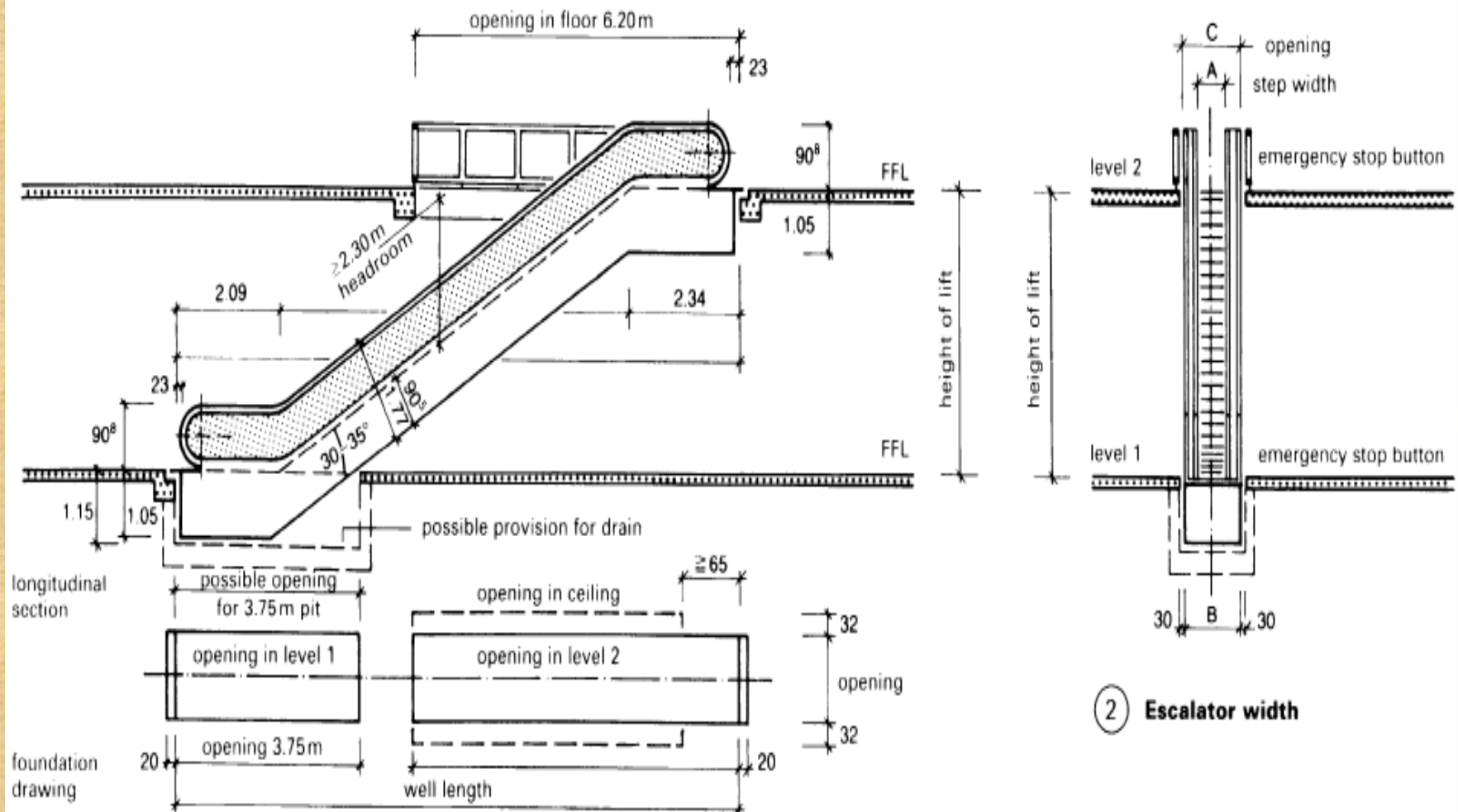
ESCALATORS

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- ❑ Escalators are power driven stairways consisting of steps attached to continuously circulating belt.
- ❑ They can move a large number of people efficiently and comfortably b/n a limited number of floors.
- ❑ Since escalator move at a constant speed, there is a practically no waiting period.
- ❑ Escalators are usually used in public areas like airport, shopping malls, etc.
- ❑ Escalators are typically used in pairs with one going up and other going down.

ESCALATORS

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Quiz

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1. Define door & window?
2. Define door frame & door shutter?
3. Define stair?
4. Define ramp?
5. Write the classification of stair?