Building Construction Technololgy II

(Stairways)

Department of Architectural Engineering/2nd stage

Dr. Zaid Al Hamdany

GLOSSARY OF TERMS RELATED TO STAIRS

1. STEP

This is a portion of stair which permits ascending or descending from one floor to another. It is composed of a tread and a riser. A stair is composed of a set of steps.

2. TREAD

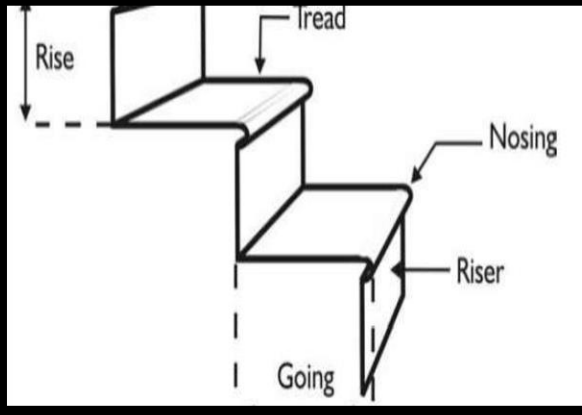
It is the upper horizontal portion of a step upon which the foot is placed while ascending or descending a stairway.

3. RISER

It is the vertical portion of a step providing a support to the tread.

4. RISE

It is the vertical distance between two successive tread face.



5. FLIGHT

- It is a series of steps without any platform or landing or break in their direction.

6. LANDING

- This is a platform provided between two flights. A landing extending to full width of staircase is known as half spaced landing and the space extending only half across a staircase is called a quarter space landing. A landing facilitates change of direction and provides an opportunity for taking rest during the use of the stair.

7. GOING

- It is the horizontal distance between two successive riser faces.

8. NOSING

- This is the outer projecting edge of a tread. This is generally made rounded to give more pleasing appearance and makes the staircase easy to navigate.

9. SCOTIA

- It is a moulding provided under the nosing to improve the elevation of the step, and to provide strength to nosing.

10. SOFFIT

- It is the underside of a stair.

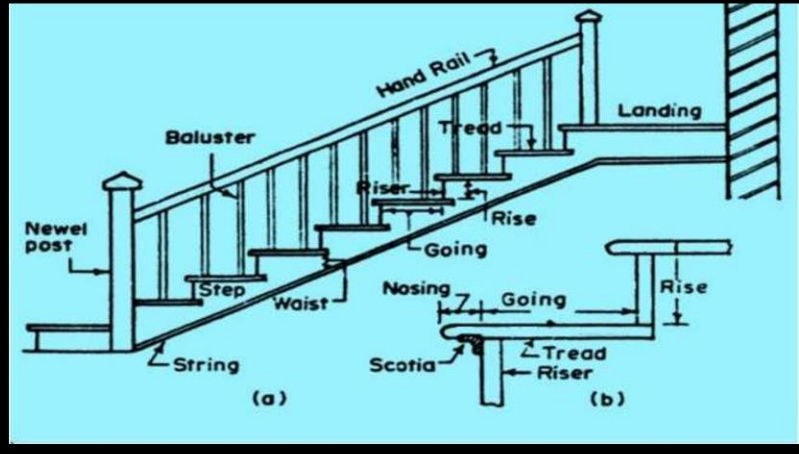
11. LINE OF NOSING

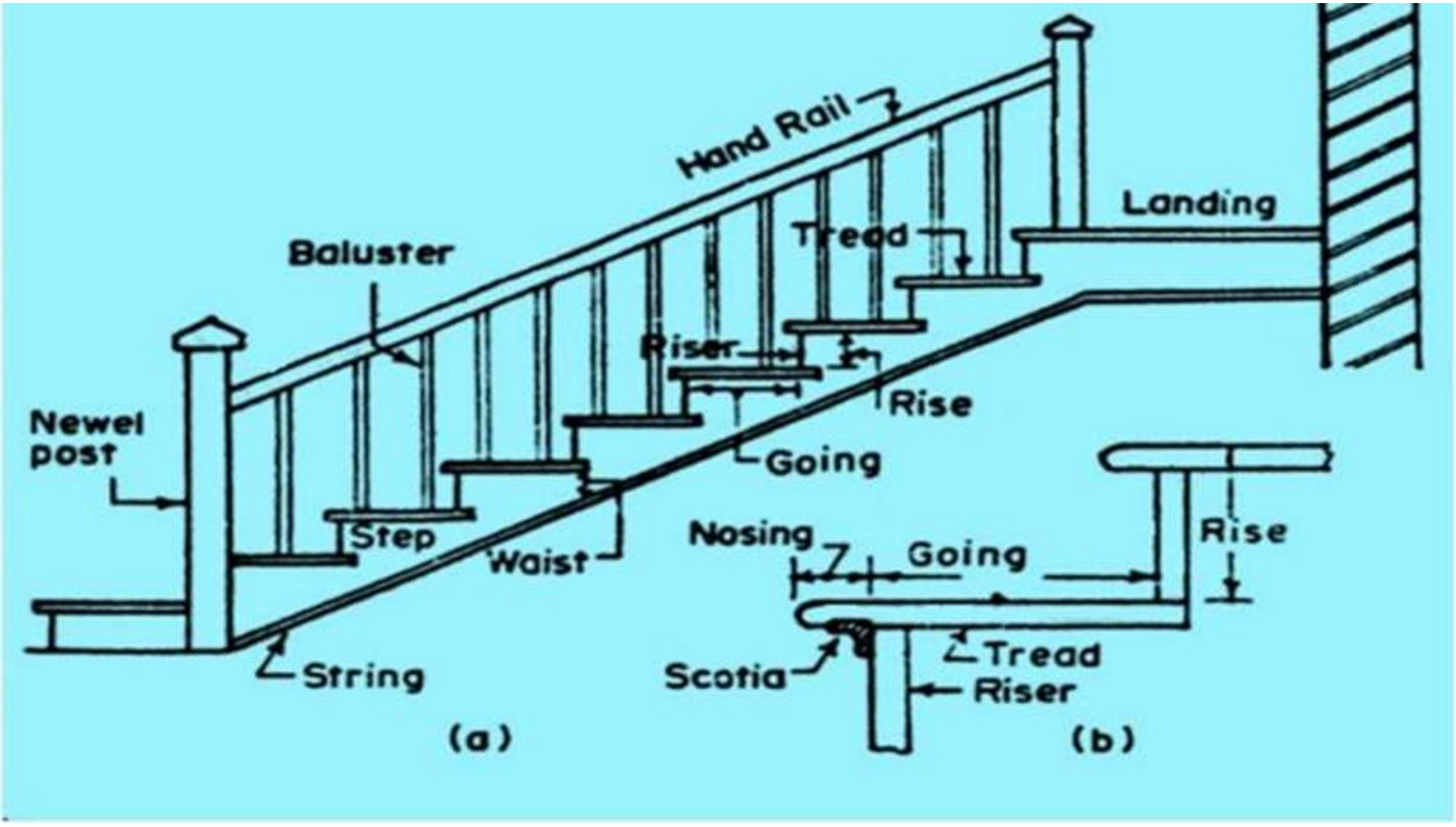
- It is an imaginary line parallel to the strings and tangential to the nosing.

It is useful in the construction of hand rails, giving the line with which the under surface of the hand rail should coincide.

12. Slope/pitch

It is the angle between horizontal and string.




Hand Rail
Landing
Baluster
Tread
Riser
Rise
Newel post
Going
Step
Waist
String
(a)
Nosing
Going
Rise
Tread
Scotia
Riser
(b)

REQUIREMENT OF GOOD STAIRS

1. Location –

a) It should be so located as to provide easy access to the occupants of the building.

b) It should be so located that it is well lighted and ventilated directly from the exterior.

c) It should be located as to have approaches convenient and spacious.

2. Width – it should be wide enough to carry the user without much crowd/inconvenience. Width of stair depend upon to its location on the building and type of building.

- In domestic building, 90cm wide stair is sufficient while in the public building 1.5 - 1.8m width is required.

3. Length of flight – from confo4rt point of view, the number of steps are not more than 12 and not less than 3.

4. Material of construction – the material used for construction of stair should be such to provide –

a) Sufficient strength

b) Fire resistance

5. Head room – the clear distance between the thread and soffit of the flight immediately above it should be not less than 2.1-2.3m, so that even a tall person can use the stair with some luggage on its head.

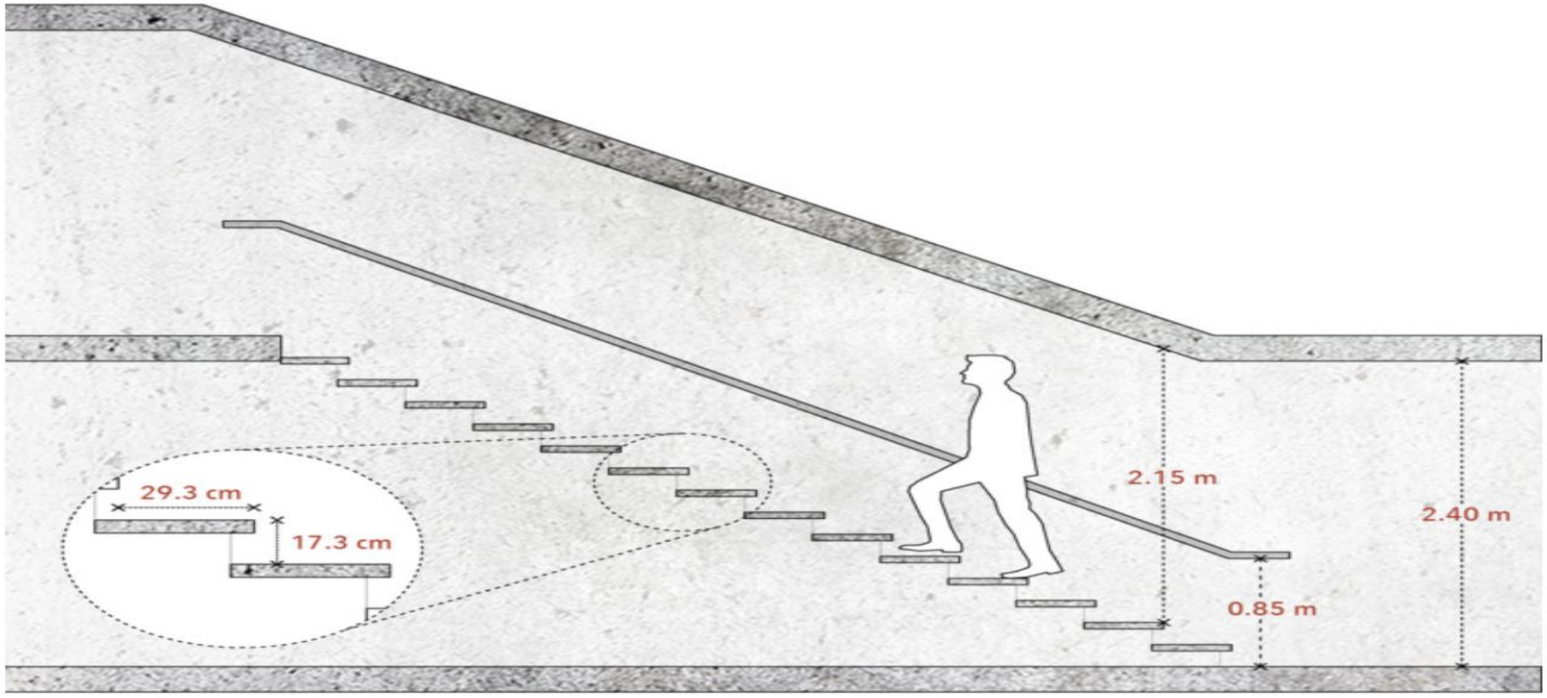
6. Balustrade – open well stair should always be provided with balustrade, to provide safety to the users. Wide stair should have hand rail to both the side.

7. Step dimension – the rise and going should be of such dimension as to provide comfort to the user. Their proportion should also be such as to provide desirable pitch of the stair.

Part	dimension
Going	25 – 30 cm
Rise	10 (for hospital)-15cm

Going should be not less than 25cm, though 30cm going is quite comfortable. The rise should be between 10cm(for hospital) to 15cm.

The width of landing should be less than the width of stair.



Sample calculation of a staircase that should be 2.60 meters high

1. Calculate the number of steps that will be needed

Considering an ideal riser of 18 cm, the height of the space is divided by the height of each step. The result should always be rounded up:

260/18 = 14.44 = 15 steps

2. Calculate the height of each riser

The height of the space is divided by the number of steps that we have just obtained:

260/15 = 17.33 cm height for each riser

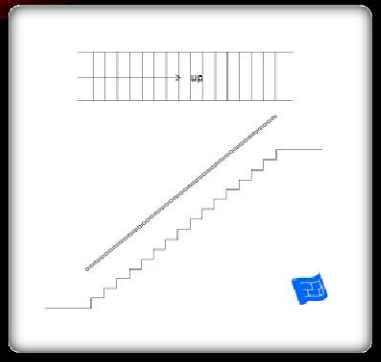
3. Calculate the width of the tread

Apply the Blondel formula:

(2 x 17.33 cm) + (1 x tread) = 64

Each tread will measure 29.34 cm

*** The resulting staircase will have 15 steps of 29.34 cm of tread and 17.33 cm of riser**



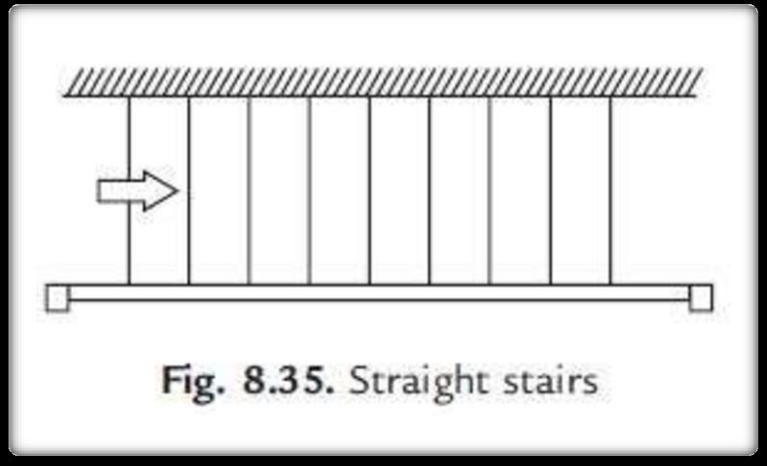


Fig. 8.35. Straight stairs

TYPES OF STAIRS

1. Straight stairs – In this, the stair runs between the two floors.

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

2. Turning stairs : it consists 0f two types –

1. Quarter turn stairs – A quarter turn stair 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 winder.

2. Half turn stairs –

Half turn stair is the one which has it direction reversed, or changes for 180°. Such stairs are quite common. These may be of three types :

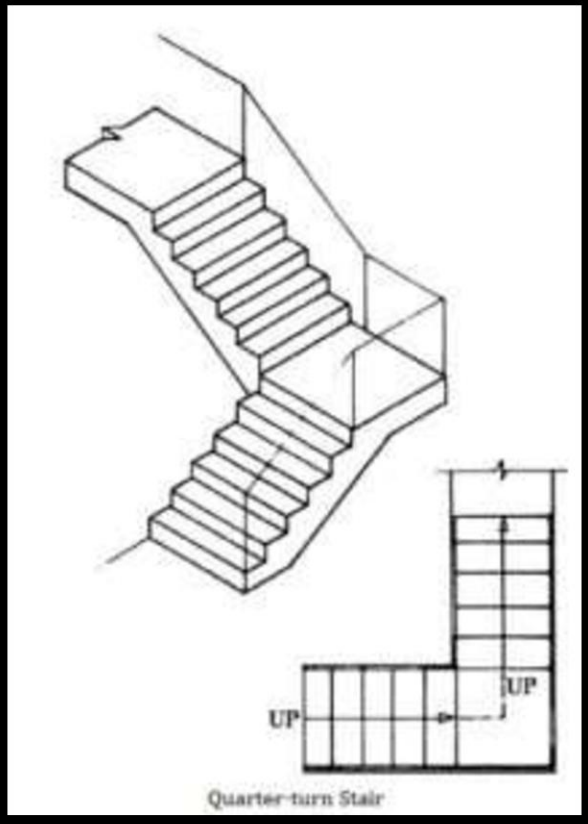
a) Dog-legged/newel half turn stairs

b) Open newel half turn stairs.

c) Geometric half turn stairs.

3. Bifurcated stairs

4. Continuous stairs



Quarter-turn Stair

a) Dog-legged stairs – This name is given because of its appearance in sectional elevation. It comes under categories of newel stairs in which newel posts are provided at the beginning and end of each flight. There is no space between the outer strings of the two flights.

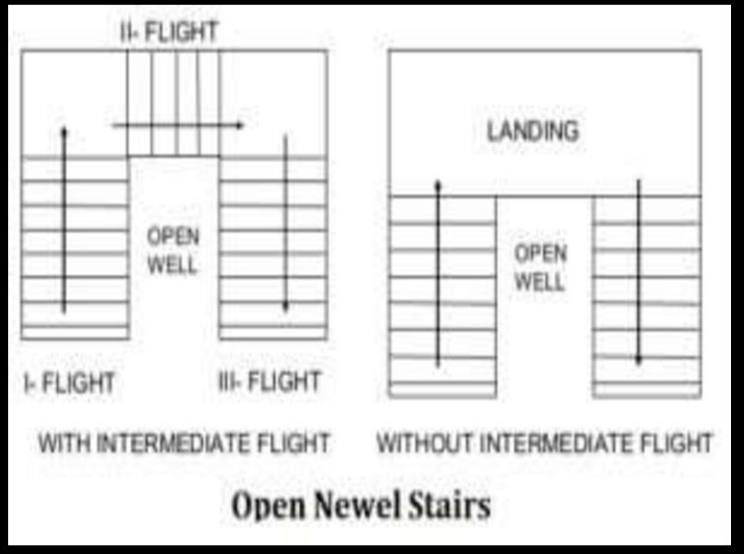
These may be of two forms :

i. With half space landing

ii. With quarter space landing and without winder

b) Open newel half turn stairs

Open well/open newel half turn stair has a space/well between the outer strings. This is only aspect in which it differs from the dog-legged stair. The additional width is required between the two flight; the space between the two strings may vary from 15cm – 100cm. When the space left is more, a small flight containing two or four steps may be introduced at the turn, between the two quarter space landing, otherwise, for a small width well, a half space landing may be provided.



3. Bifurcated stairs : The stair has a wider flight at the bottom, which bifurcates into two narrower flights, one turning to the left and the other to the right, at the landing.

- It is commonly used in public buildings at their entrance hall.

It may be either of newel type with a newel post or of geometric type.

4. Continuous stairs : continuous stairs are those which do neither have any landing nor any intermediate newel post.

Types –

a) Circular stairs
b) Spiral stairs (here we are not going to discuss about helical)
c) Helical stairs

Circular stairs and spiral stairs –

- Such a stair is usually made either of R.C.C or metal , and is employed at location where there are space limitations .
- These are also used as emergency stairs, and are provided at back side of building.
- All steps are winders. The stair therefore are not comfortable .

STAIRS OF DIFFERENT MATERIAL

Stairs are also classified on bases of material used –

1. Timber
2. Stones
3. Bricks
4. Steel
5. R.C.C

Timber stairs

- It is light in weight and easy to construct, but they have poor fire resistance.
- They are used only for small rise residential building. They are unsuitable for high rise residential building and for public buildings.
- The timber used for construction should be free from fungal decay and insect attack, and should be well-treated before use.
- In timber stairs the strings are support for the stairs and acts as inclined beams spanning between the floor and landing.

stone stairs

- Stone is another commonly used material for building a staircase.
- Stone offers colour and texture in variety
- . Marble and granite are commonly used stones for a staircase.
- For homes with marble flowing, the marble staircase is a preferred choice and obvious choice.
- Stone is a better option for stairs in entryway or garden area. Stone materials add elegance to your home design and can be carved into different shapes to form a staircase.

Brick stairs

- Brick stairs are not common, expect at the entrance. However, brick stairs of single flight are made in village houses.
- The stair consist of either solid wall, or also, arched opening may be left for obtaining storage space.
- The brick steps need frequent maintenance. Hence they may be faced with stone slabs.

steel stairs

- Stairs of mild steel/cast iron are used only as emergency stairs.
- They are not common in residential and public buildings, though they are not strong and fire resistant. This is because they are not good looking and they make a lot of noise when used by users.
- They are not are commonly used in factories godowns, workshops, etc.
- In its simplest form, a metal stairs consists of rolled steel stringers, to which angle irons are welded /riveted and steel plates are used as threads.
- Another form of metal stairs commonly used are the spiral stairs.

R.C.C stairs

- Concrete is the commonly used material to construct a stairway.
- A plus point of using it is that it conveniently takes the shape you desire for your stairs.
- Curved and spiral staircases are the usual examples of staircase designs that can be easily made from concrete.
- The only disadvantage of a concrete structure is that it does not look visually appealing.