SNS COLLEGE OF TECHNOLOGY

AN AUTONOMOUS INSTITUTION

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COIMBATORE

DEPARTMENT OF CIVIL ENGINEERING

23GET102 – BASIC CIVIL AND MECHANICAL ENGINEERING

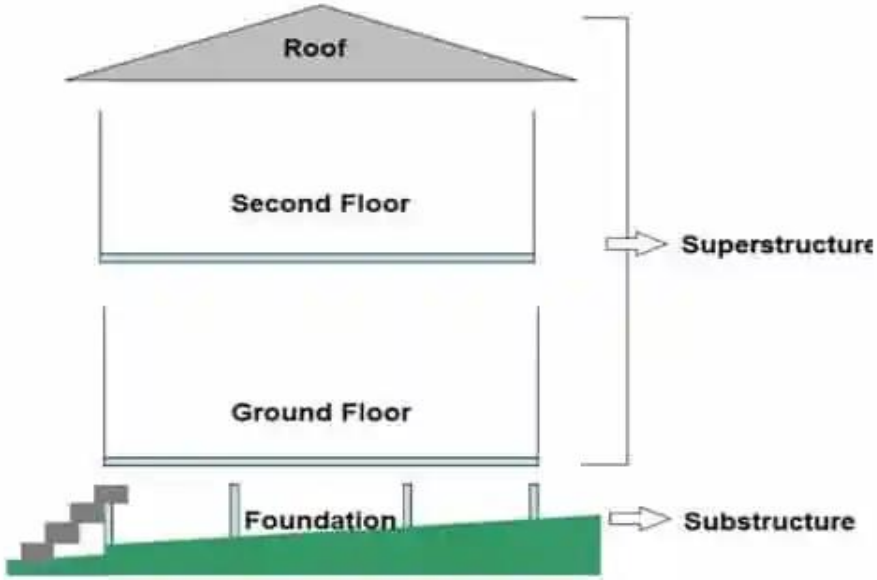
I YEAR / I SEMESTER

Unit 2 : BUILDING COMPONENTS

Topic : SUB STRUCTURE-TYPES OF FOUNDATION

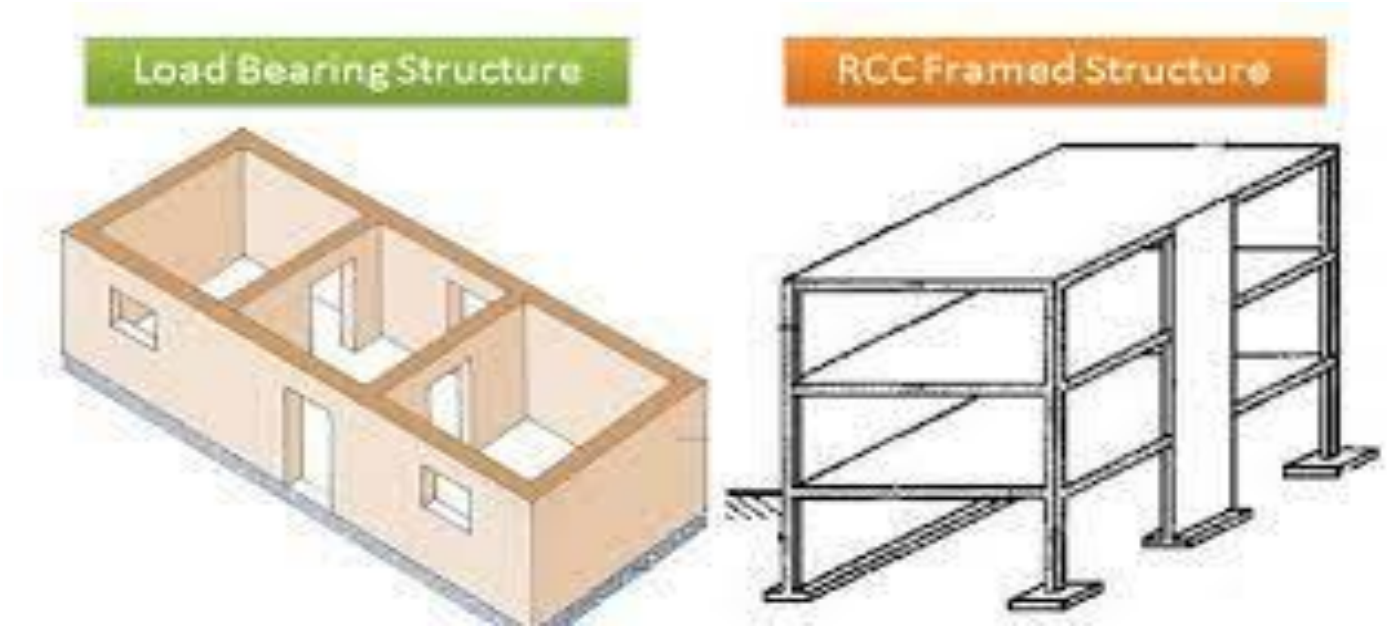
Super Structure

The superstructure of a building is where people will spend most of their time. This area includes the first and second floors inside a home and any number of floors in larger buildings. The superstructure includes beams, columns, finishes, windows, doors, the roof, floors, and anything else.



TYPES OF STRUCTURES

- **Load Bearing Structures**
- **Framed Structures.**



LOAD BEARING STRUCTURES

In this type of structure the load on the structure is transferred vertically downward through walls. Loads from roof and floors gets transferred to wall and then wall has to transfer these loads as well as self-weight. Such constructions are used in residential buildings where dimension of rooms is less. Residential buildings up to ground 2 floors can be built economically with such structures.

- ✓ Cost is less.
- ✓ Suitable up to three stories.
- ✓ Walls are thicker and hence floor area is reduced.
- ✓ Slow construction.
- ✓ Not possible to alter the position of walls, after the construction.
- ✓ Resistance to earthquake is poor.

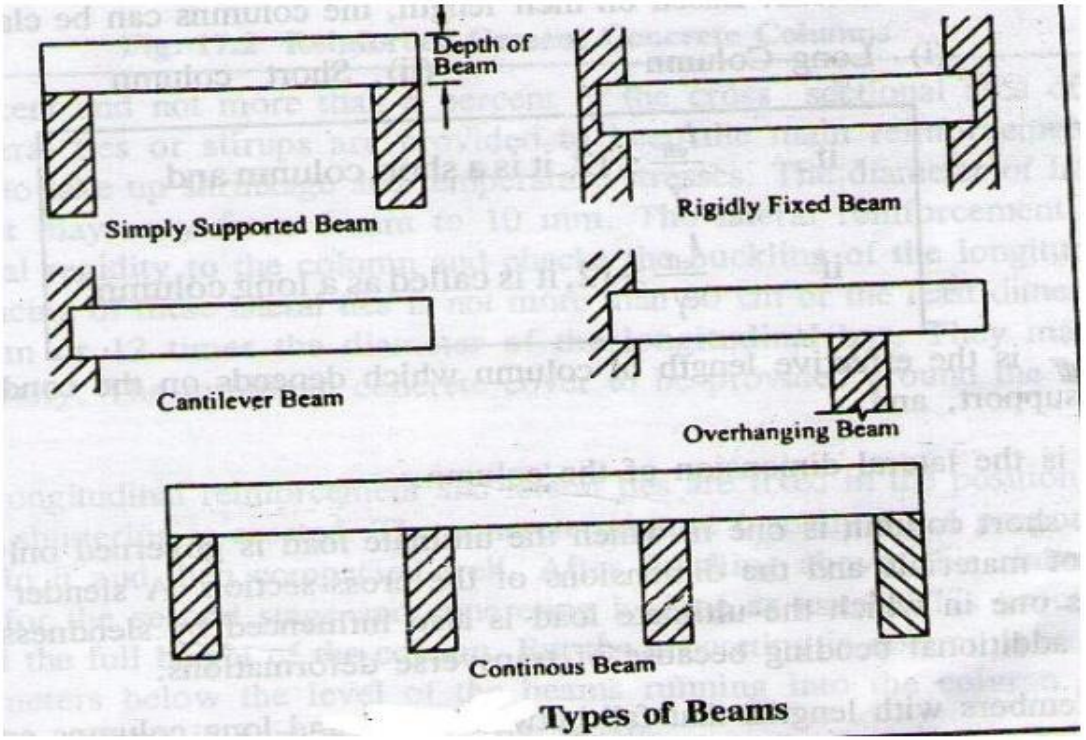
FRAMED STRUCTURES:

In this type of structures a frame work of columns, beams and floors are built first. Then walls are built to portion the living area. The walls are subjected to self-weight only. This type of super structures are required when number of stories in a building is more and also when larger areas are to be covered free from walls.

- Cost is more.
- Suitable for any number of stories.
- Walls are thinner and hence more floor area available for use.
- Speedy construction.
- Position of walls may be changed, whenever necessary.
- Resistance to earthquake forces is good.

BEAMS

Beams are structural Members that can carry transverse loads, that in turn produces bending moments and shear.



CLASSIFICATION OF BEAMS

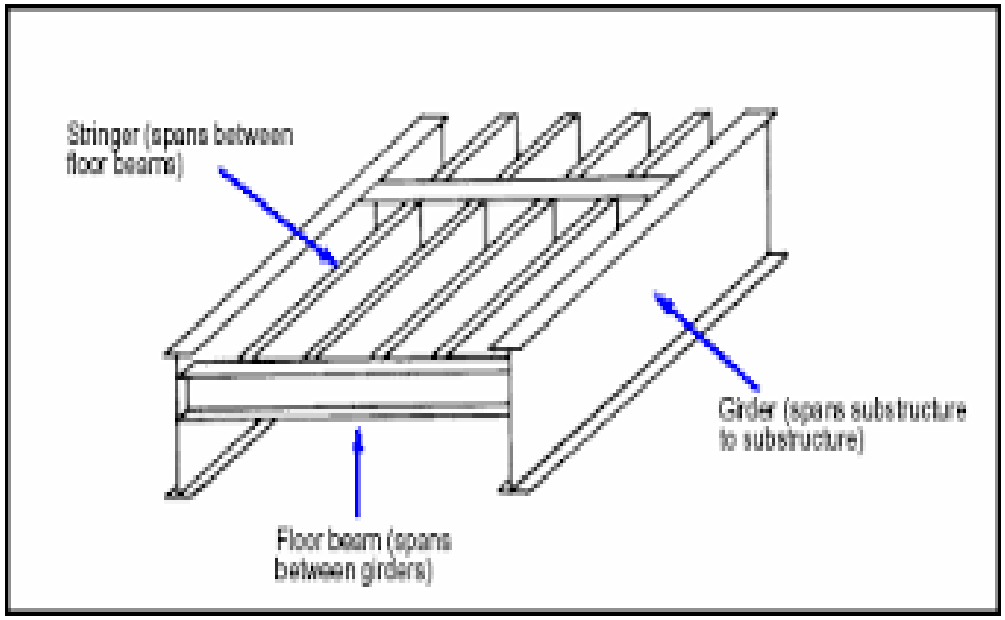
- Based on Application
- Based on Supports
- Based on Reinforcement arrangement

Based on Application:

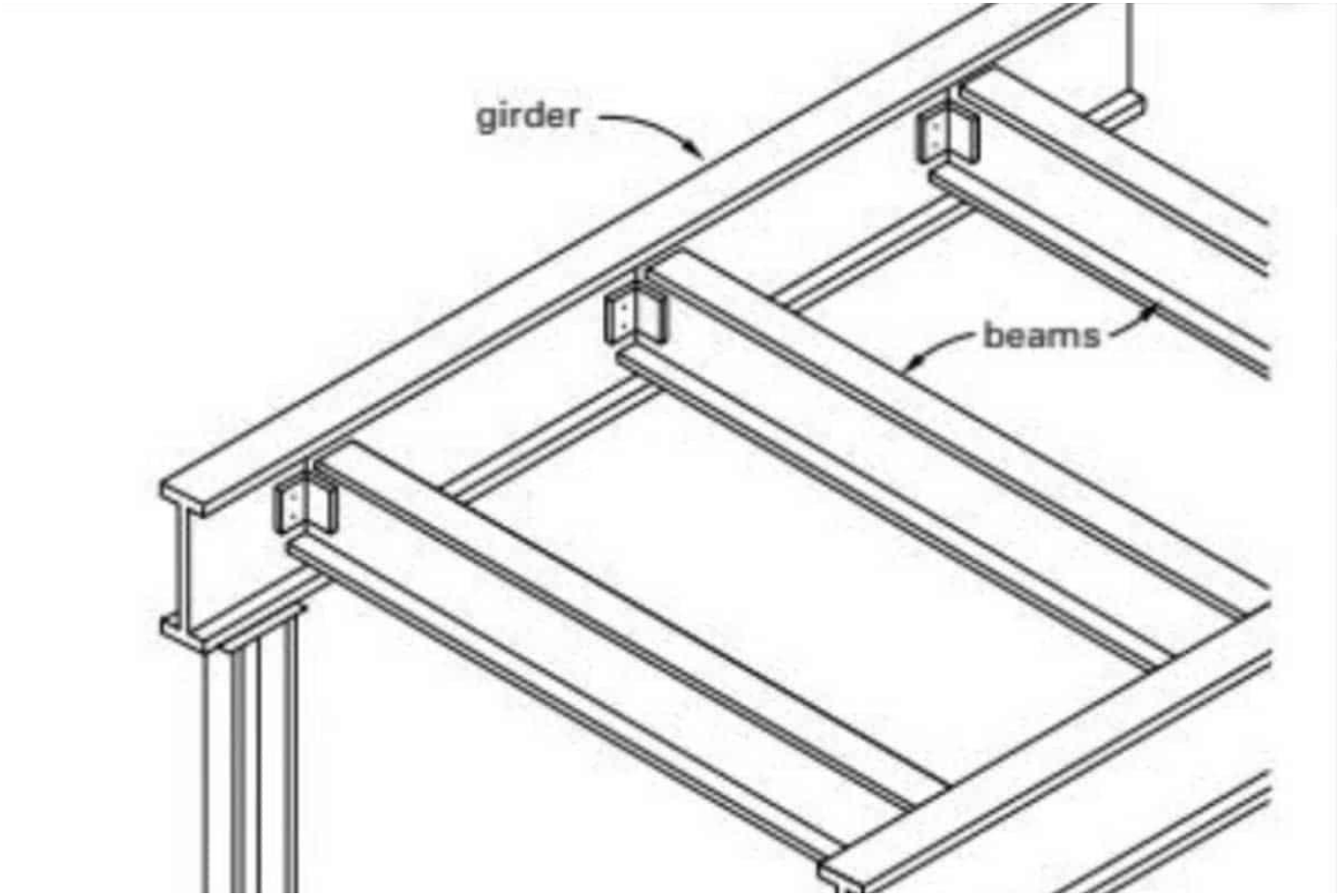
- Girder
- Joists
- Lintel
- Spandrels
- Stringers

GIRDER

It is the main horizontal support of a structure which supports smaller beams.

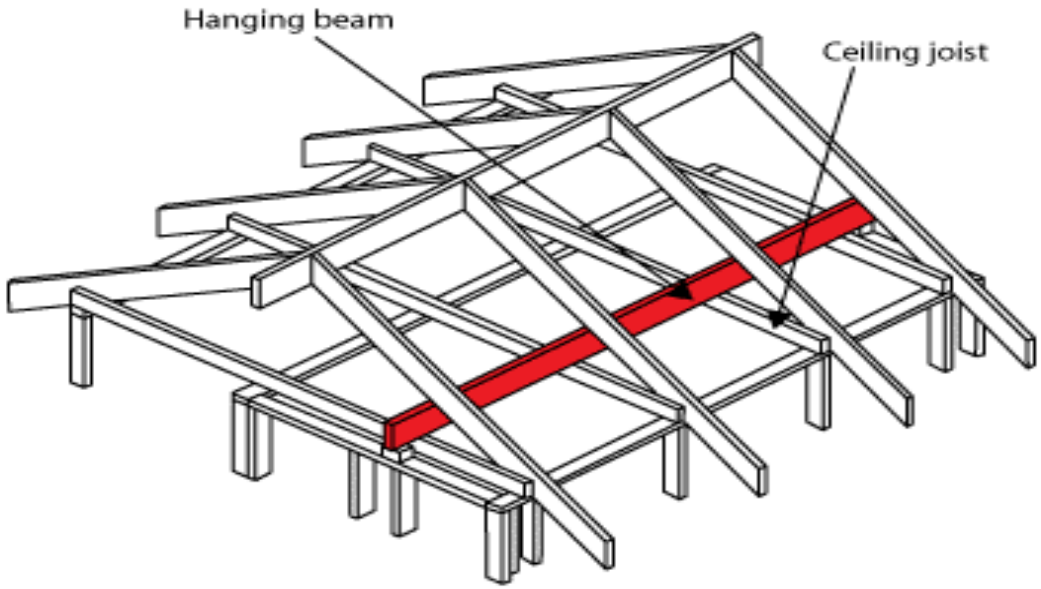


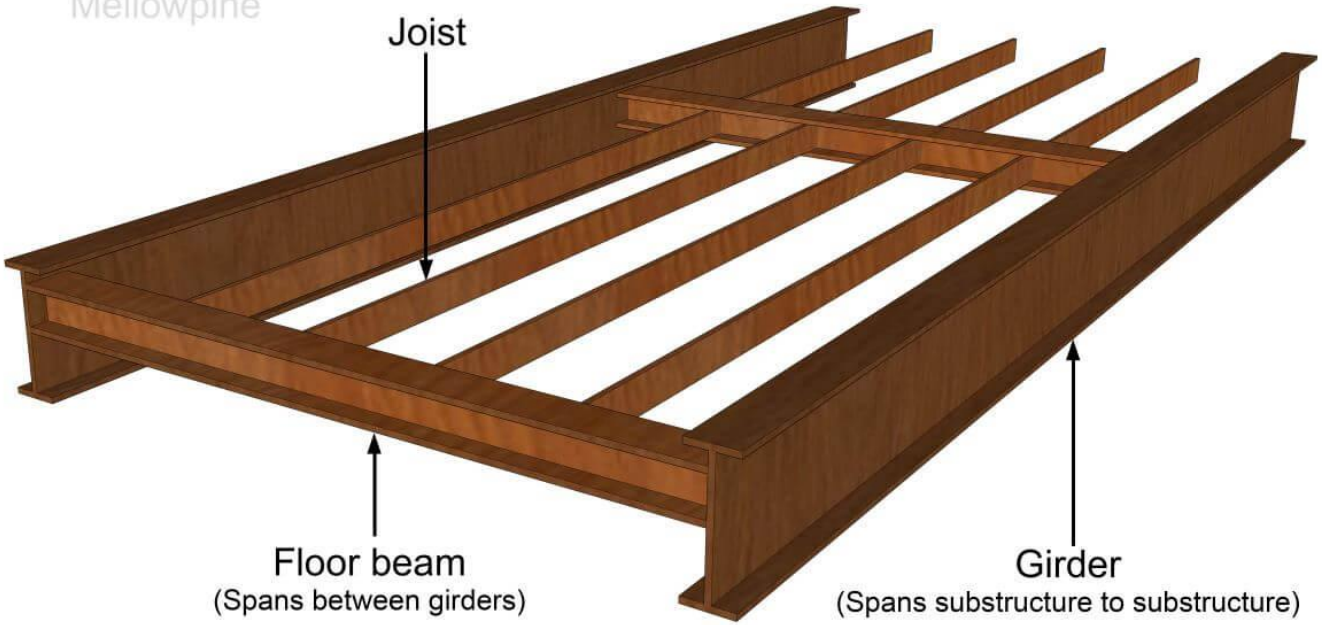
GIRDER



JOIST

A joist is a horizontal member that generally runs across a building and is supported by a beam.



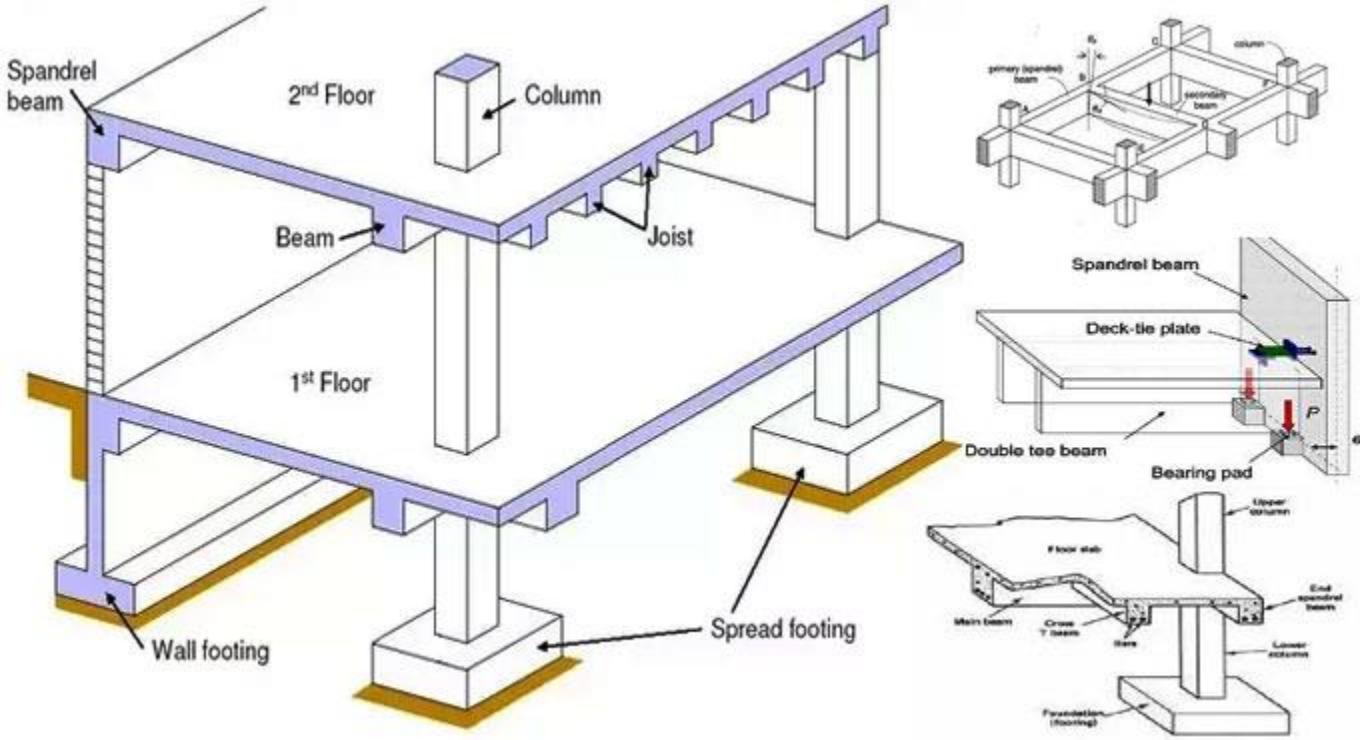

Mellowpine
Joist
Floor beam
(Spans between girders)
Girder
(Spans substructure to substructure)

LINTEL

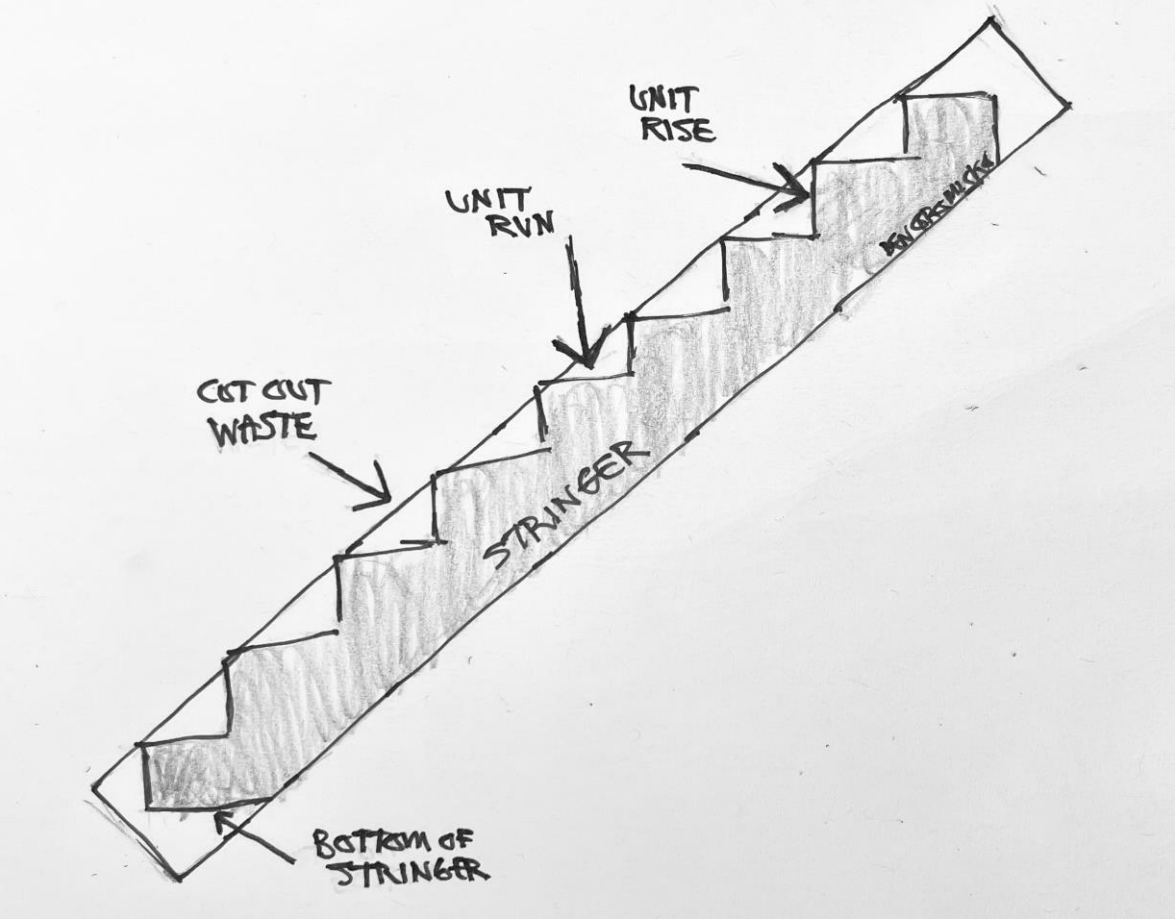
A lintel or lintol is a type of beam (a horizontal structural element) that spans openings such as portals, doors, windows and fireplaces.

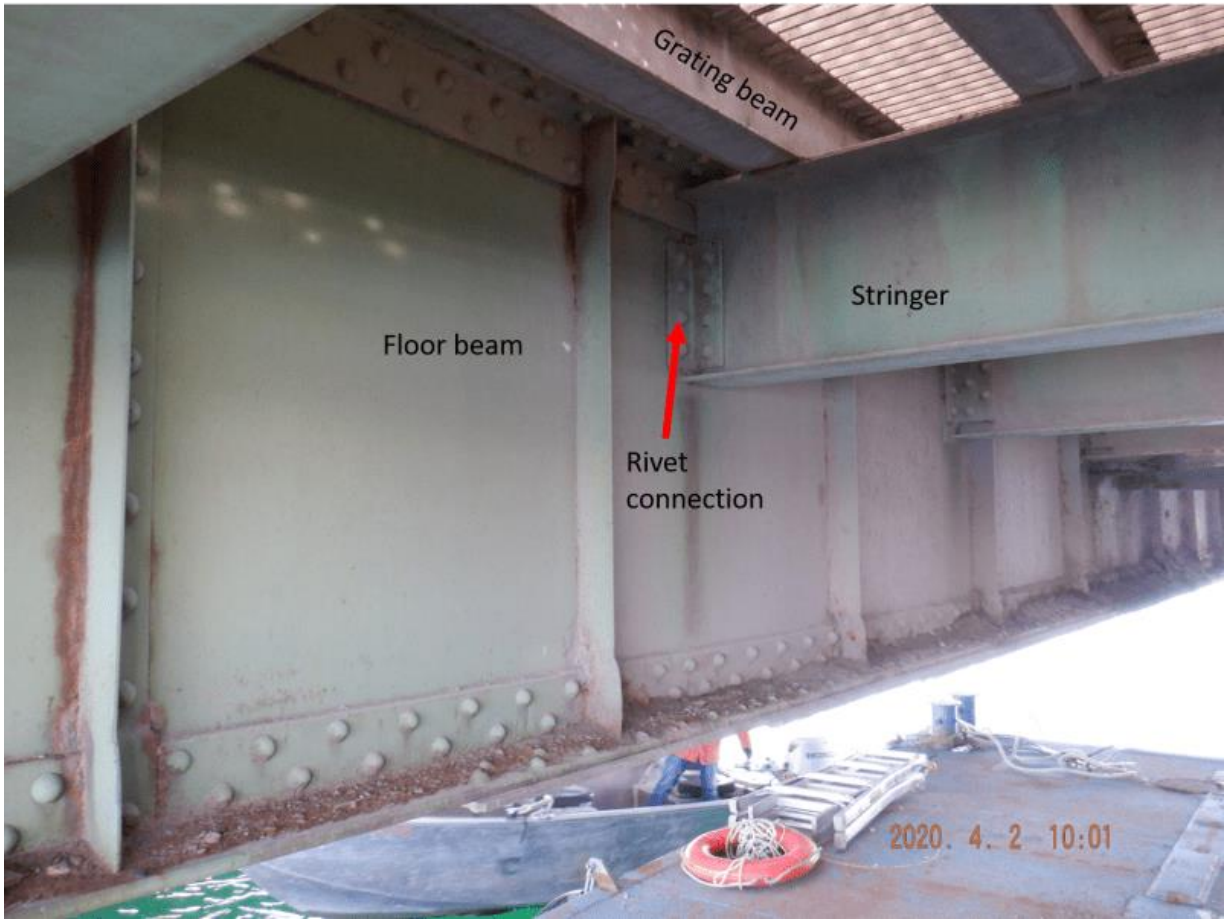
SPANDRELS

In steel or concrete structures, the spandrel beam is the exterior beam that stretches horizontally from one column to another column.



STRINGER


UNIT RISE
UNIT RUN
CUT OUT WASTE
STRINGER
BOTTOM OF STRINGER


Grating beam
Stringer
Floor beam
Rivet
connection
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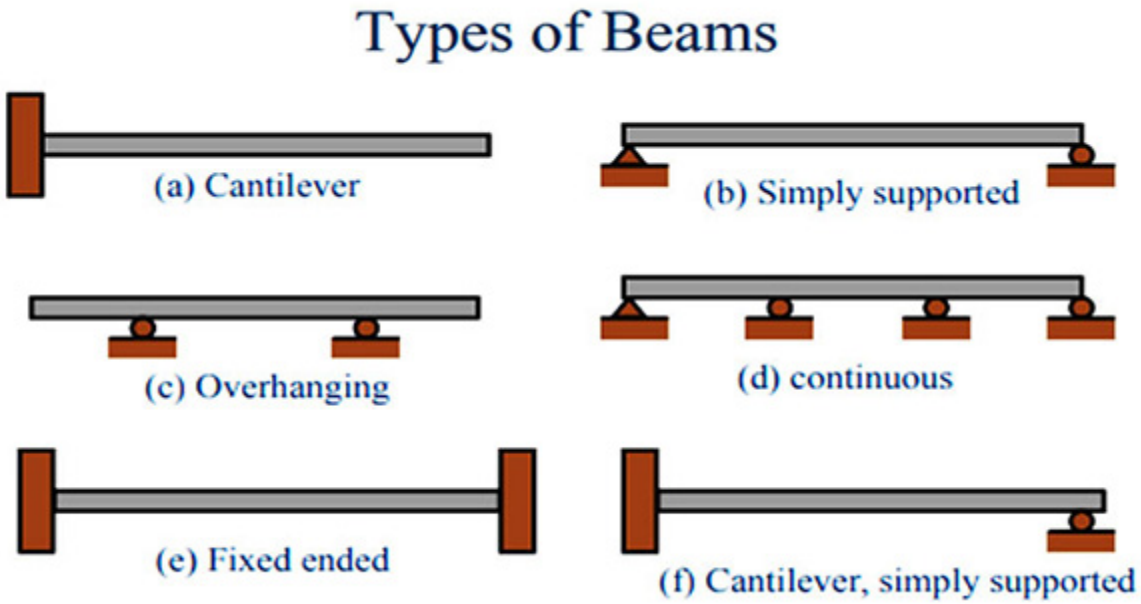
CLASSIFICATION OF BEAMS

Based on Supports:

- Simply Supported Beam
- Cantilever Beam
- Fixed Beam
- Continuous beam
- Overhanging Beam

SIMPLY SUPPORTED BEAM

A simply supported beam is one that rests on two supports and is free to move horizontally



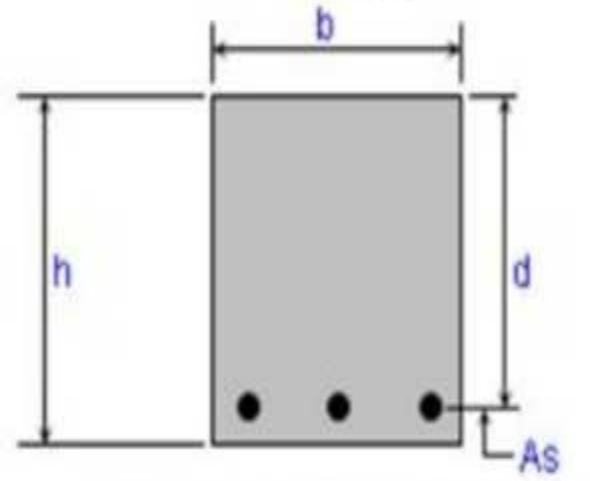
CLASSIFICATION OF BEAMS

Based on reinforcement arrangement:

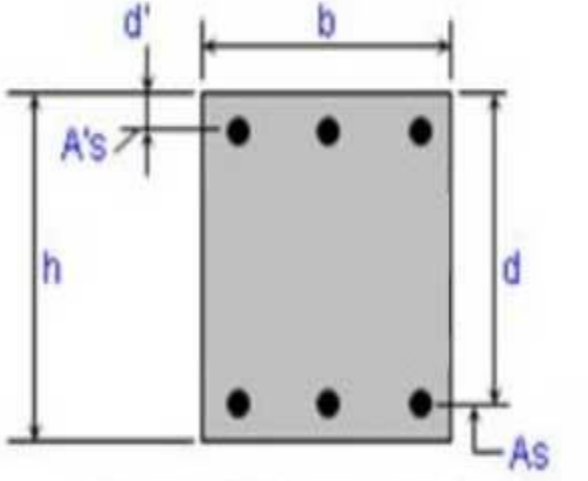
Single reinforced beams(SRB)- Main reinforcement(10 to 40mm) is placed only at the bottom of the beam

Double reinforced beams (DRB)- Main reinforcement is provided at the top and bottom

Singly reinforced and Doubly Reinforced Beam



Singly Reinforced Section



Doubly Reinforced Section

COLUMN

Columns are basically rigid vertical structural members designed primarily to support axial compressive loads coming from beams and slabs and then transfer it to ground through footing.

CLASSIFICATION OF COLUMN

Columns can be classified based on different criteria as follows:

1)On basis of its cross section

- Square Column
- Rectangular Column
- Circular Column
- Tee Column
- L Column
- Cruciform (Swastik) Column

2) On basis of its length and behavior

- Long Column
- Short Column

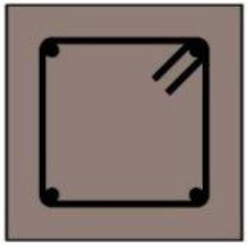
3)On basis of its loading

- Axially Loaded Column
- Axially Loaded and uni-axial bending
- Axially Loaded and bi-axial bending

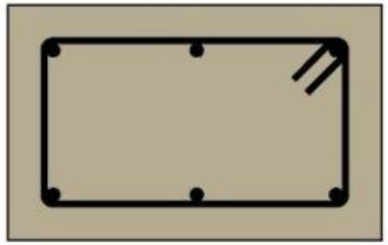
4) On basis of its longitudinal reinforcement

- Tied Column
- Spiral Column
- Composite Column

ON BASIS OF ITS CROSS SECTION

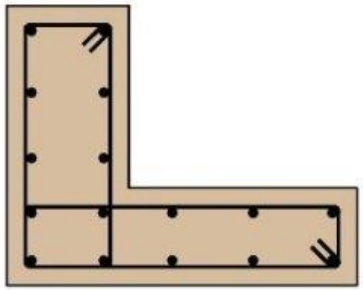


Square- Section

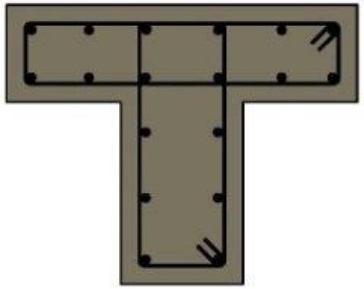


Rectangular- Section

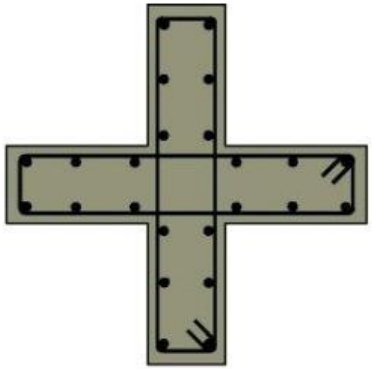
Circular- Section



L- Section



T- Section



+ -Section

ON BASIS OF ITS LENGTH AND BEHAVIOR

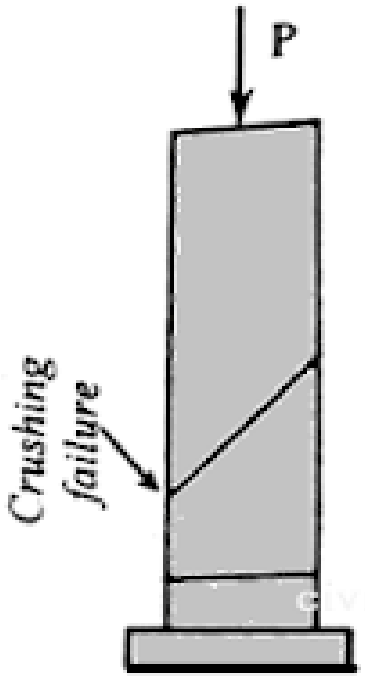
Difference between Short Column and Long Column

Short Column

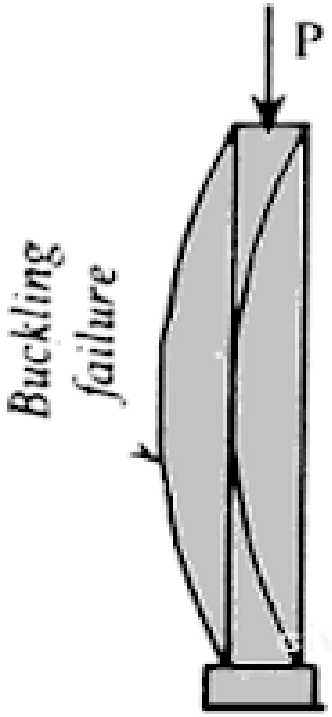
*Length/Least Dimension < 12
*Fails by Crushing
*Slenderness Ratio < 45
*Subjected to Compressive stress
*Radius of Gyration is more
*More Load Capacity

Long Column

** Length/Least Dimension > 12
** Fails by Buckling
** Slenderness Ratio > 45
** Subjected to Buckling stress
** Radius of Gyration is less
** Less Load Capacity



Short Column

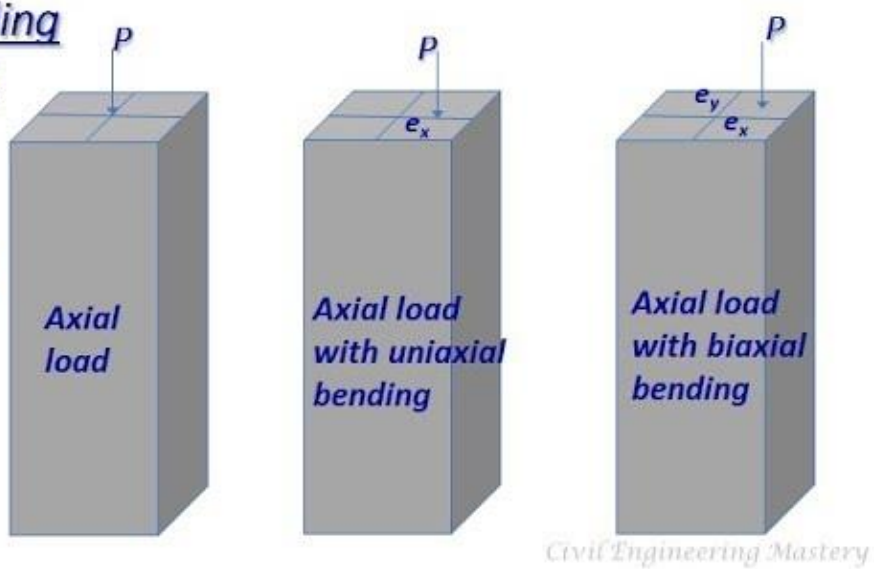


Long or slender Column

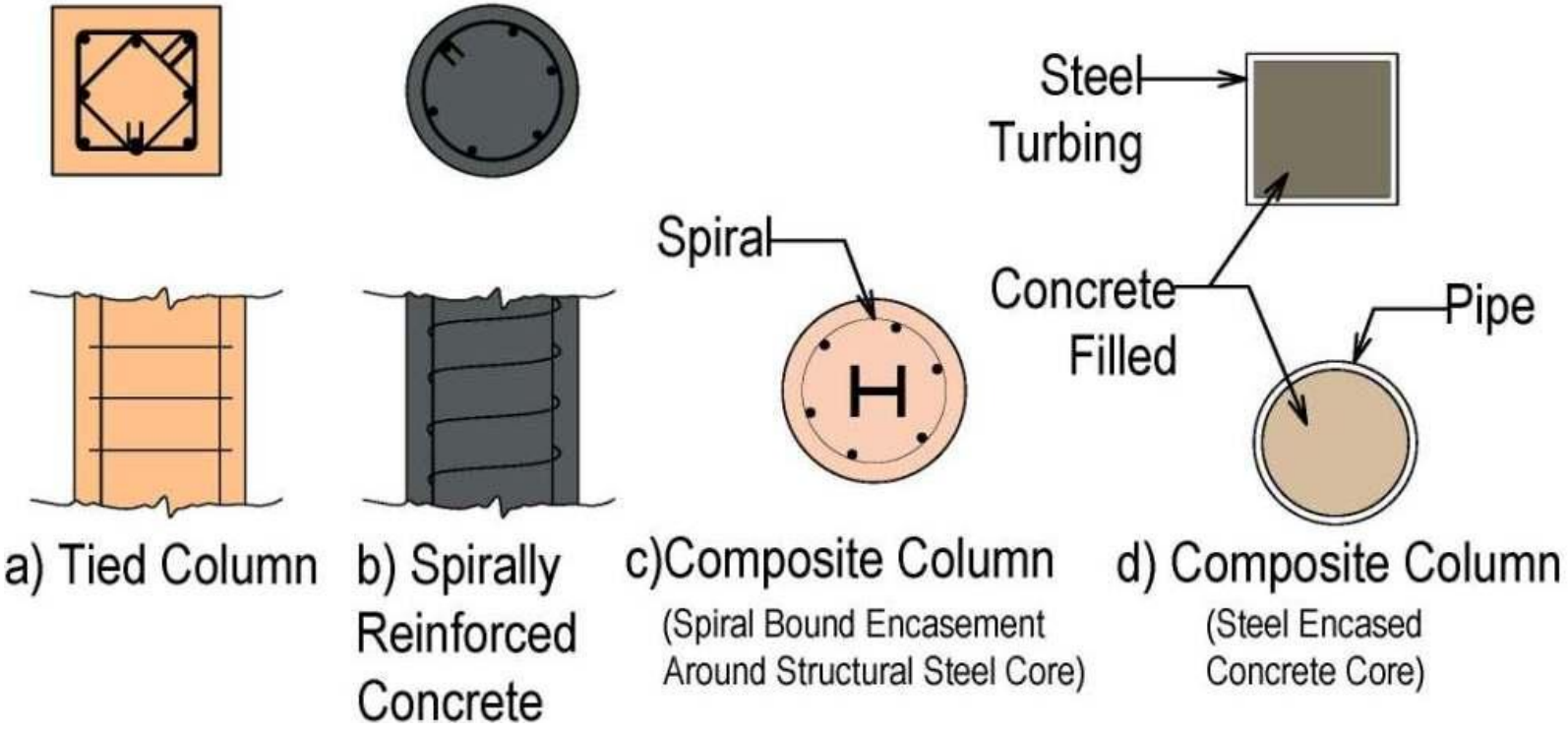
Difference Between long Column and Short Column

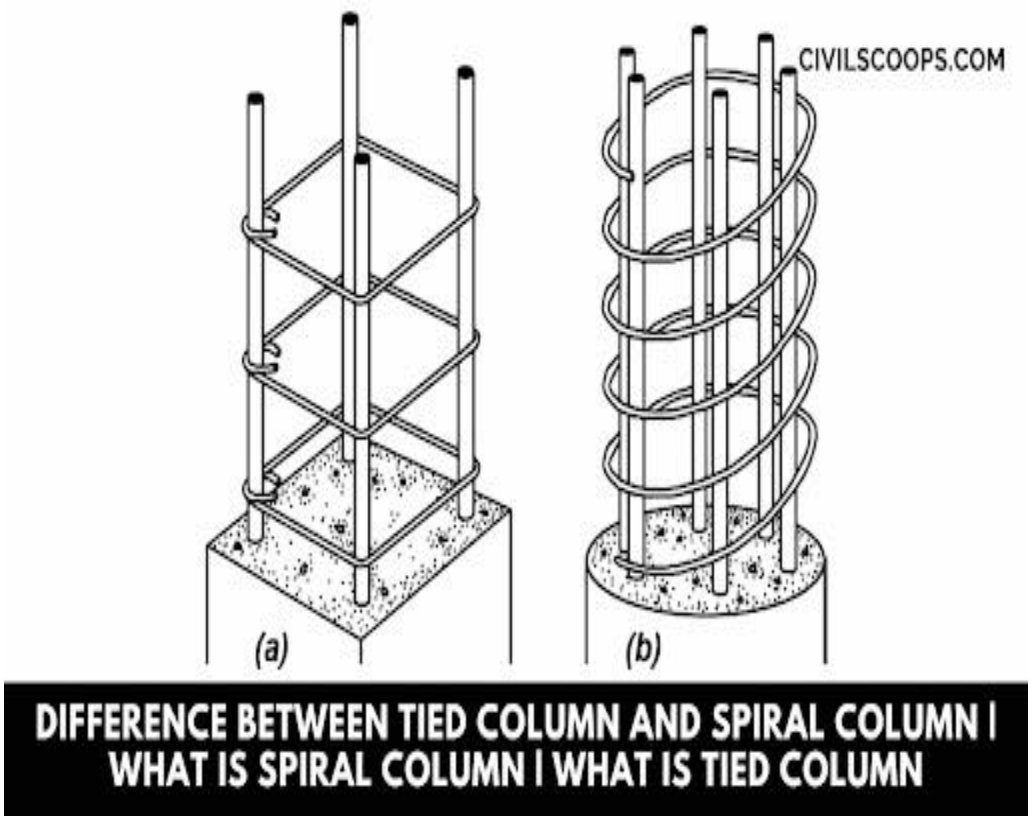
Axial load, Uniaxial & Biaxial bending in columns

How to identify From floor plans

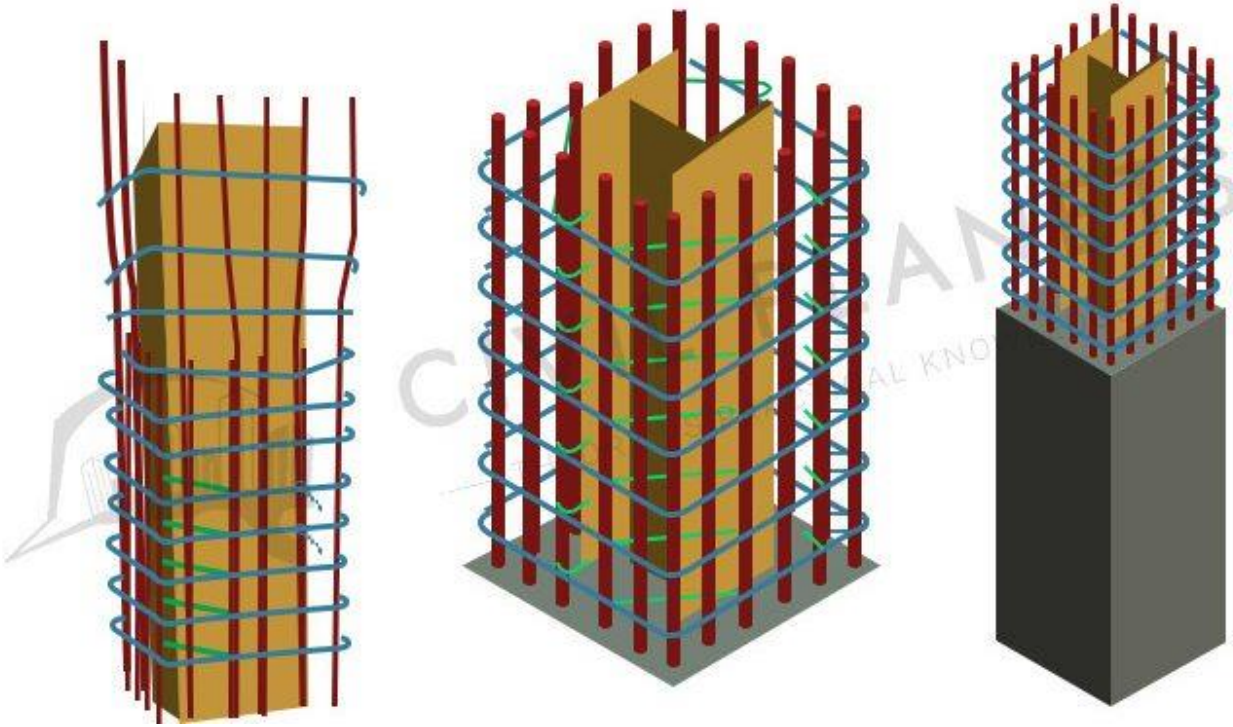


ON BASIS OF ITS LONGITUDINAL REINFORCEMENT




CIVILSCOOPS.COM
(a)
(b)
DIFFERENCE BETWEEN TIED COLUMN AND SPIRAL COLUMN | WHAT IS SPIRAL COLUMN | WHAT IS TIED COLUMN

COMPOSITE/ ENCASED COLUMN



LINTEL

Lintel is a form of beam provided above the door and window openings to sustain the overlying load and transfer the same to the adjacent wall or column

Classification Of Lintels Based On Span

- Lintel Beam Or Cut Lintel
- Lintel Band Or Continuous Lintel

Classification Of Lintels Based On Materials

- Timber lintel
- Stone lintel
- Reinforced brick lintel
- Steel lintel

LINTEL BEAM OR CUT LINTEL

Thee lintels are supported by bearings to ensure that the weight is effectively transferred to the door and window frames.

These lintels are frequently used in load-bearing constructions.

Following are the minimum dimensions of the bearing:

10 cm

Height of the lintel beam

1/10th to 1/12th of the span of the lintel

LINTEL BAND OR CONTINUOUS LINTEL

This lintel functions as a second tie beam, joining the columns of the structure together. These are mostly composed of reinforced cement concrete and are appropriate for use in

Framed structures.

Buildings with expansive soils.

Areas prone to earthquakes.

TIMBER LINTEL

- Timber Lintels have been used since earlier times and are still used across the globe.
- They are primarily used in hilly places where wood is easily available.

Advantages of Timber Lintel

- Simple to construct.
- These can be employed in temporary structures.
- No requirement of Formwork.
- No curing time.

Disadvantages of Timber Lintel

- Compared to the materials used in lintels, timber is highly expensive.
- If not properly maintained, timber lintels may degrade over time.
- It is prone to damage caused by fires.
- Timber lintels cannot be used in permanent constructions.
- The forces exerted on the lintel beam by tension, compression, and shear cannot be resisted b by wood.

STONE LINTEL

Stone Lintels are extensively used due to the abundance of stone.

The most crucial aspect of the design of the Stone Lintel is thickness.

The **depth of a Stone Lintel is 10 cm per metre of span**, with a **minimum overall depth of 15 cm**.

Stone Lintels are used up to a span of **2 m**.

Advantages of Stone Lintels

- Stone Lintels offer an attractive look and give a nice appearance.
- Due to the easy availability of stones, these lintels are extensively used.
- They can be used in both temporary and permanent structures.
- No requirement of curing.
- No formwork is needed in such lintels.

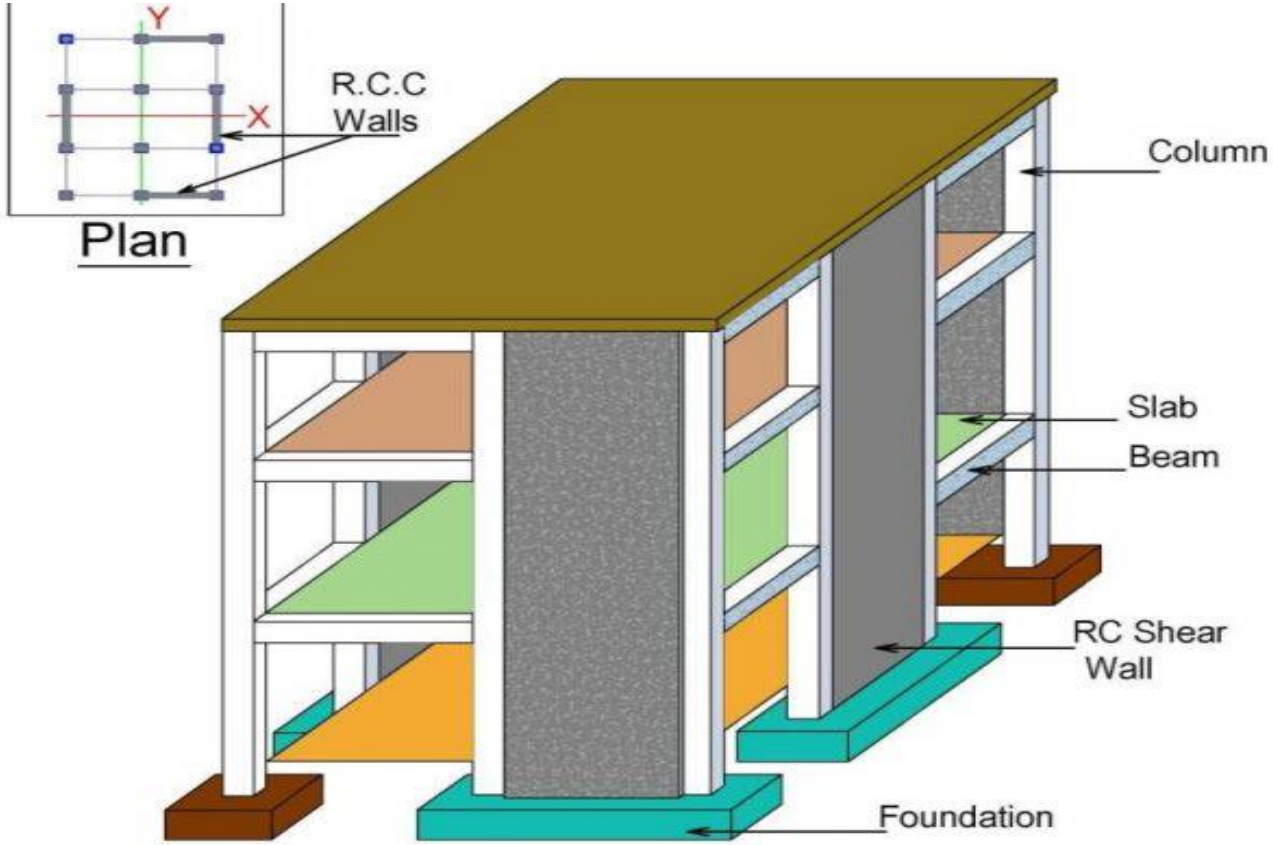
Disadvantages of Stone Lintels

- The tensile strength of Stone lintel is low.
- Timber lintels are prone to failure and cracks when subjected to shock waves or vibrations caused by earthquakes.

REINFORCED BRICK LINTEL

Reinforced Brick lintel beam is employed when the span is **greater than 1 m** and the overlying load is heavy.

The **depth of the reinforced brick lintel should be a multiple of 10 cm.**



Reinforced Concrete Shear Wall

Thank You!!