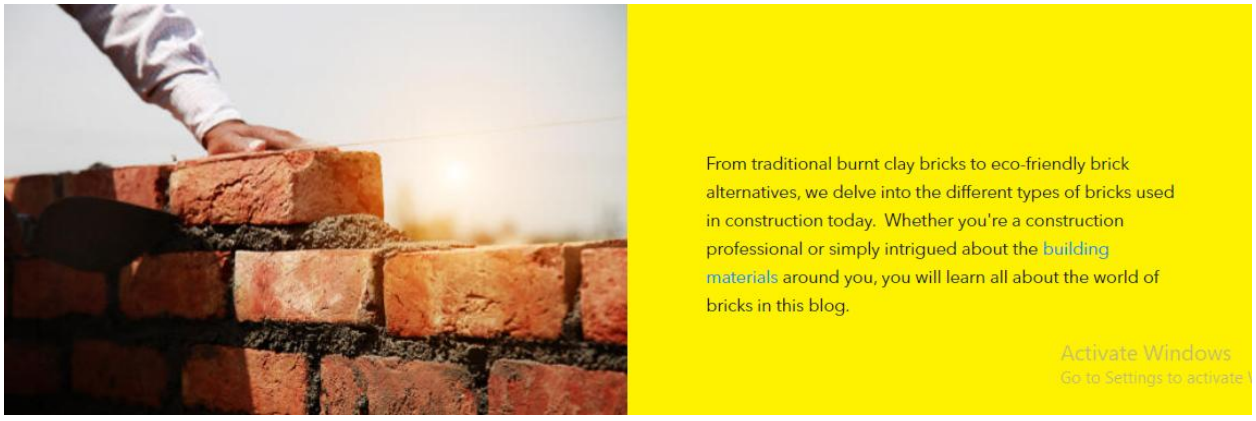
BRICKS

What are bricks ?

Bricks are a type of building material typically made of concrete, sand, lime, or clay. They are generally used to construct walls, pavements, and other types of architecture. Bricks can be produced in a variety of shapes and types depending on the materials used to make them and the use for which they are intended. It is because of their sturdiness, strength, and fire resistance, that they continue to be a popular building material

On the basis of quality, Bricks are of the following kinds:

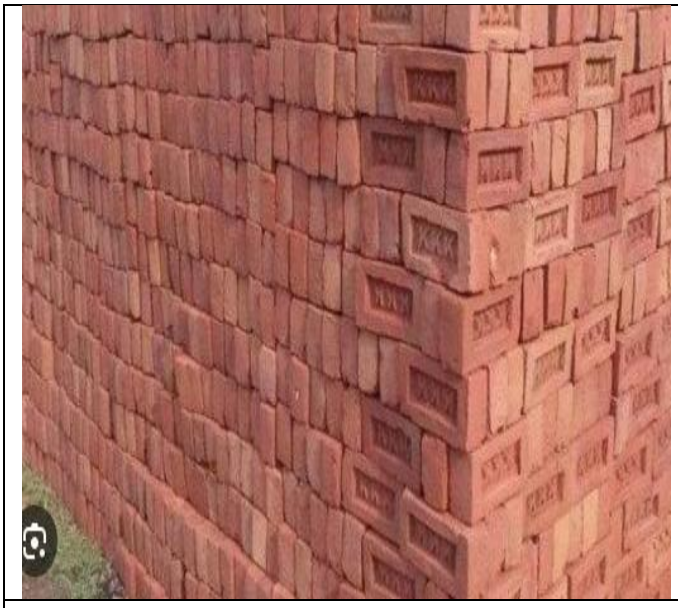
1. **First Class Brick**: The size is standard. The color of these bricks is uniform yellow or red. It is well burnt, regular texture, uniform shape. The absorption capacity is less than 10%, crushing strength is, 280kg/cm^2 (mean) where it is 245 kg/cm^2 (minimum).
2. **Second Class Brick**: The size is standard, color is uniform yellow or red. It is well burnt, slightly over burnt is acceptable. It has a regular shape; efflorescence is not appreciable. The absorption capacity is more than 10% but less than 15%. Crushing strength is 175kg/cm^2(mean) where the minimum is 154 kg/cm^2
3. **Third Class Brick**: The shape and size are not regular. The color is soft and light red colored. It is under burnt, slightly over burnt is acceptable. It has extensive efflorescence. The texture is non-uniform. The absorption capacity is more than 15% but less than 20%.
4. **Fourth class bricks :**These are over-burnt or under-burnt and have poor quality. They are unsuitable for any construction purposes as they may have cracks, distortions, and other defects.



Reference- Ultratech website

Properties of brick

i. The color of bricks should be bright and uniform.
ii. They should be well burned and having smooth surfaces and sharp edges.
iii. Thermal conductivity of bricks should be less and they should be sound proof.
iv. They shouldn’t absorb more than 20% by weight when we placed it in water.
v. When we struck two bricks together, ringing sound should be delivered.
vi. Structure of bricks should be homogeneous and uniform.
vii. The bricks should not break when we dropped it form 1m height.
viii. There should not be any scratch left on the brick when we scratched with finger nail.
ix. There should not be any white deposits on brick, when we soaked it in water for 24 hrs.

	
First Class Brick	**Fourth Class Brick**

The standard brick size in India is 190 mm x 90 mm x 90 mm, as per the BIS guidelines. When the mortar is thick, the bricks' dimensions shift to 200 mm x 100 mm x 100 mm, which is sometimes referred to as the nominal size of the modular brick.

CEMENT

Cement – Definition

Cement is defined as a binding agent that is used to bind various construction materials. Given its adhesive and cohesive properties, it is an essential ingredient of concrete and mortar. Cement is mixed with water to form a paste that binds aggregates like sand or crushed rocks. Calcium, silicon, iron and aluminium compounds are closely ground to form a fine powdered product – cement.

The usage of cement in various forms has been advent through the years. In the ancient times, crushed pottery, volcanic ashes, and other items were used as cement. In 1824, Joseph Aspdin created the precursor to modern-day cement – Portland cement

Types of Cement

Cement is mainly classified into two categories depending on the hardening and setting mechanism. These are-

1. Hydraulic Cement
2. Non-hydraulic Cement

Along with these main types, depending on the composition and characteristics there are many types of cement. Followings are the other cement types:

1. Ordinary Portland Cement (OPC)
2. Portland Pozzolana Cement (PPC)
3. Rapid Hardening Cement
4. Quick Setting Cement
5. Low Heat Cement
6. Sulphate Resisting Cement
7. Blast Furnace Cement
8. High Alumina Cement
9. White Cement
10. Colored Cement

Hydraulic cement is formed by the reaction of powdered cement with water. You can use it for all types of construction, including underwater construction projects. Non-hydraulic cement sets and becomes adhesive due to carbonation. You can use it for various construction projects, except underwater construction projects.

Hydraulic cement is the most commonly used cement. Portland cement is a type of hydraulic cement that's been a preferred choice for architects, engineers, and constructors. The primary reason behind its popularity is its ability to harden quickly.

Per the Bureau of Indian Standards (BIS)[2], predominately we use OPC 53 grade cement for construction purpose:

Ordinary Portland Cement (OPC)[3]

When Portland cement clinker is mixed with gypsum, it forms OPC. OPC 53:OPC with a compressive strength of 53MPa at 28 days is termed as OPC 53. OPC 53 is mostly used for precast concrete, prestressed concrete, long span structures like bridges, tall buildings

PROPERTIES OF CEMENT

1) Initial setting time of cement should not be less than 30 minutes.
2) Final setting time should not be more than 10 hours.
3) After 3 days compressive force should not be less than 16 N/mm^2.
4) After 7 days compressive force should not be more than 22 N/mm^2.
5) After 3 days Tensile force should be 2 N/mm^2.
6) After 7 days Tensile force should be 2.5 N/mm^2.
7) The residue should not be more than 10%. When sieved in I.S. 90 micron Sieve.
8) Should not expand more than 19 mm in L-chatlier test.

WALL

What is a Wall?
A wall is a vertical structure, usually made of brick, concrete, or stone, that serves as a physical barrier or divider between spaces. Walls can be found in various settings, including residential, commercial, and industrial buildings, and outdoor environments, such as gardens and parks. In addition to providing a physical barrier, walls can offer security, privacy, and insulation from noise and weather.

Types of Wall Used in Construction:

1. Load Bearing Wall: A load-bearing wall also called a bearing wall supports the roof and upper floors above it. The building would collapse without these walls, which distribute weight to the base. Load-bearing walls usually contain concrete, masonry, or heavy-duty wood framing

2. Non-Load Bearing Wall:
A non-load-bearing inner wall does not support the building above it. It is called a partition wall because it divides a building rather than supporting it. Walls of plasterboard, plaster, or wood framing can be relocated or removed without impacting the building's stability. Non-load-bearing walls can be customized to divide a space into rooms, offices, or storage areas.

Load bearing wall

Non load bearing/partition wall

STAIRCASE

What Is Stair?

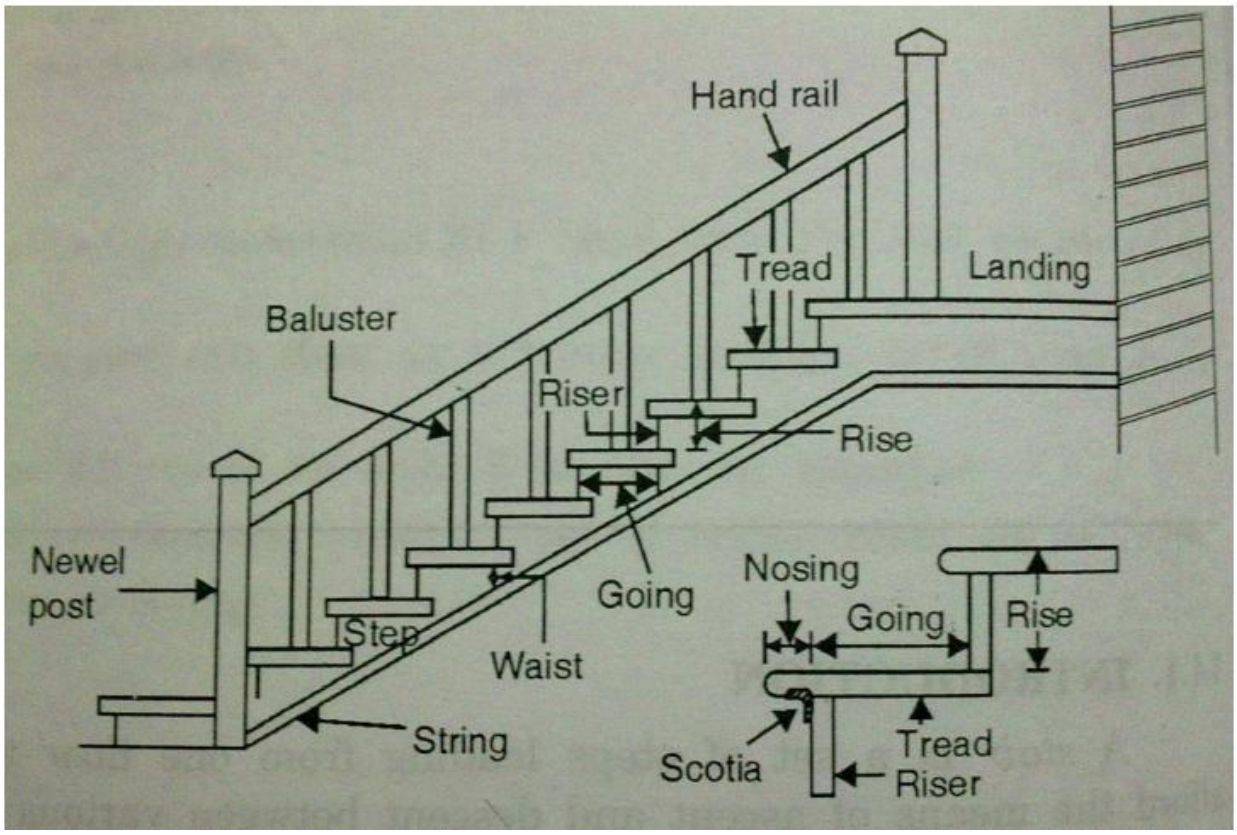
Stairs are the most important components in a building. They are used to access various floors. There are different types of stairs such as spiral stairs, dog legged stairs, open newel stairs, etc, used in commercial, residential buildings, and industrial buildings.

Stairs is a set of steps which give access from floor to floor. ′ The room or enclosure of the building, in which stair is located is known as staircase. ′ Staircase provide access & communication between floors in multi-storey buildings and are a path by which fire can spread from one floor to another. ′ Therefore it must be enclosed by fire resisting walls, floors, ceilings and doors. ′ It must be designed to carry certain loads, which are similar to those used for design of the floors. ′ Stairs may be constructed of Timber, Bricks, Stone, Steel or Reinforced Cement Concrete.

TECHNICAL TERMS

STEP:- It is a portion of stair which permits ascent or descent. A stair is composed of a set of steps. ′
TREAD:- It is a upper horizontal portion of a step upon which foot is placed while ascending or descending. ′
RISER:- It is a vertical portion of a step providing support to the tread. ′
LANDING:- It is level platform at the top or bottom of a flight between the floors. ′
FLIGHT:- This is an unbroken series of steps between landing.
RISE:-
It is a vertical distance between two successive tread faces. ′
GOING:- It is a horizontal distance between two successive riser faces. ′
NOSING:- It is the projecting part of the tread beyond the face of riser. ′ S
COTIA:- It is a moulding provided under the nosing to provide strength to nosing. ′
SOFFIT:- it is the underside of a stair. ′
PITCH OR SLOPE:- It is the angle which the line of nosing of the stair makes with the horizontal.

TECHNICAL TERMS



Depending upon the various arrangement of steps, stairs can be classified into the following types:

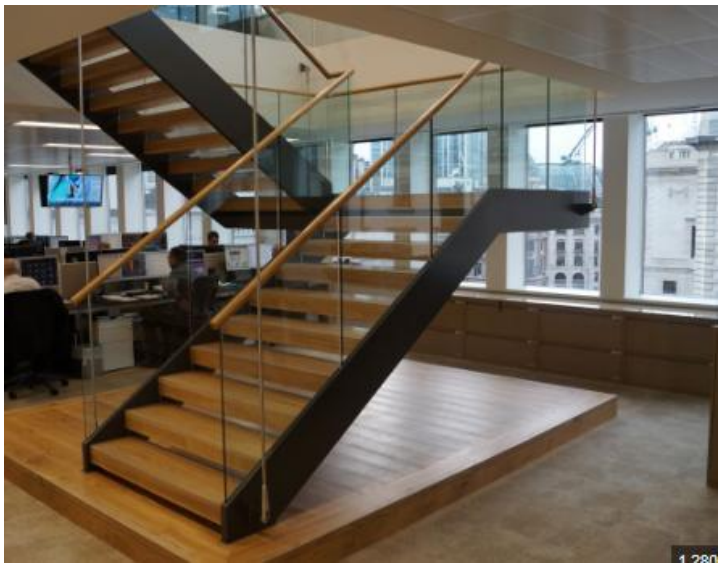
- *Straight Stair,*
- *Dogged-legged Stair,*
- *Open Newel Stair,*
- *Geometrical Stair,*
- *Circular Stair,*
- *Spiral Stair,*
- *Quarter-turn Stair,*
- *Bifurcated Stair.*

1. Straight Stair:

In these types of stairs, all the steps are arranged continuously along in one direction. One flight may be split into one or more than one flight by interposing a landing. This stair can be used where narrow and long space is available for a staircase such as entrance, porch etc.

2. **Dog-legged Stair***:*

This stair types consist of two straight flights of steps with direct turns between them. Dog-legged stair is very useful where the total width of the stair is just twice the width of the steps.



3. Open Newel Stair:

This type of stairs consists of two or more flights arranging a well or opening between the backward and forward flights.

When all the steps are difficult to arrange in two flights, a short third flight of 3 to 6 steps may be provided along the direction perpendicular to the hall. Open newel stair is mostly adopted in the lift.

4. Geometrical Stair:

This is another type of open newel stair where the open well between the forward and the backward flight is curved. This stair may contain different geometrical shapes. Here the change in direction is achieved by using winders.

6. **Spiral Stair:**

The spiral stair is very similar to a circular stair. It consists of individual steps or treads, connecting to a center column. The overall diameter of the stair may range from 1 to 2.5 m. Such stairs are provided where space available for stairs is very much limited. ′ Figure shows a typical spiral stair. Cast iron, steel or R.C.C. is used for building these stairs

7. **Quarter-turn Stair:**

REQUIREMENTS OF GOOD STAIRCASE

LOCATION

(a)They should be located near the main entrance to the building.

(b)There should be easy access from all the rooms without disturbing the privacy of the rooms.

(c)There should be spacious approach.

(d)Good light and ventilation should be available.

WIDTH OF STAIR

(a)It should be wide enough to carry the user without much crowd on inconvenience.

(b)In Residential building, a 90 cm wide stair is sufficient while in public 1.5 to 1.8 m width may required. ′ **LENGTH OF FLIGHT**

(a)The number of steps should not be more than 12 & less than 3 from comfort point of view.

STEP DIMENSION

(a)The rise and going should be of such dimensions as to provide comfort to users.

(b)The going should not be less than 25 cm, though 30 cm going is quite comfortable.

(c)The rise should be between 10 to 15 cm.

(d)The width of landing should not be less than width of stair.

MASONRY

Masonry

- Masonry may be defined as the construction of building units bonded together with mortar.

- The building units may be stones, bricks, or precast blocks of concrete.
- Masonry is normally used for the construction of foundations, walls and other similar structural components of the buildings.
- Masonry has got the highest importance in building industry.

- It performs variety of functions, such as:

(i) supporting loads (ii) subdividing space

(iii) providing thermal and acoustic insulation.

(iv) affording fire and weather protection, Etc.,.

Definition of terms used in Masonry

1. **Course**: A course is a horizontal layer of masonry units. Thus, in stone masonry , the thickness of course will be equal to the height of the stones plus thickness of one mortar joint.

2.Header: A header is a full stone unit or brick which is laid that its length is perpendicular to the face of the wall. Thus , the longest length of a header lies at right angles to the face of the work.

3. Stretcher: A stretcher is a full stone unit or brick which is so laid that its length is along or parallel to the face of the wall. Thus, the longest length of stretcher lies parallel to the face of the work.

4.Natural Bed: Stones are obtained from rocks which have distinct planes of divisions along which the stones can easily be split. This plane is known as natural bed.

5. Through stone: A through stone is a stone header. Through stones are placed across the wall at regular interval

6. Sill: The bottom surface of a door or window opening is known as Sill.

7. Lintel: It is a horizontal member of stone, brick , wood, steel or reinforced concrete, used to support the masonry and the super-imposed load above an opening.

LINTEL

What is Lintel?

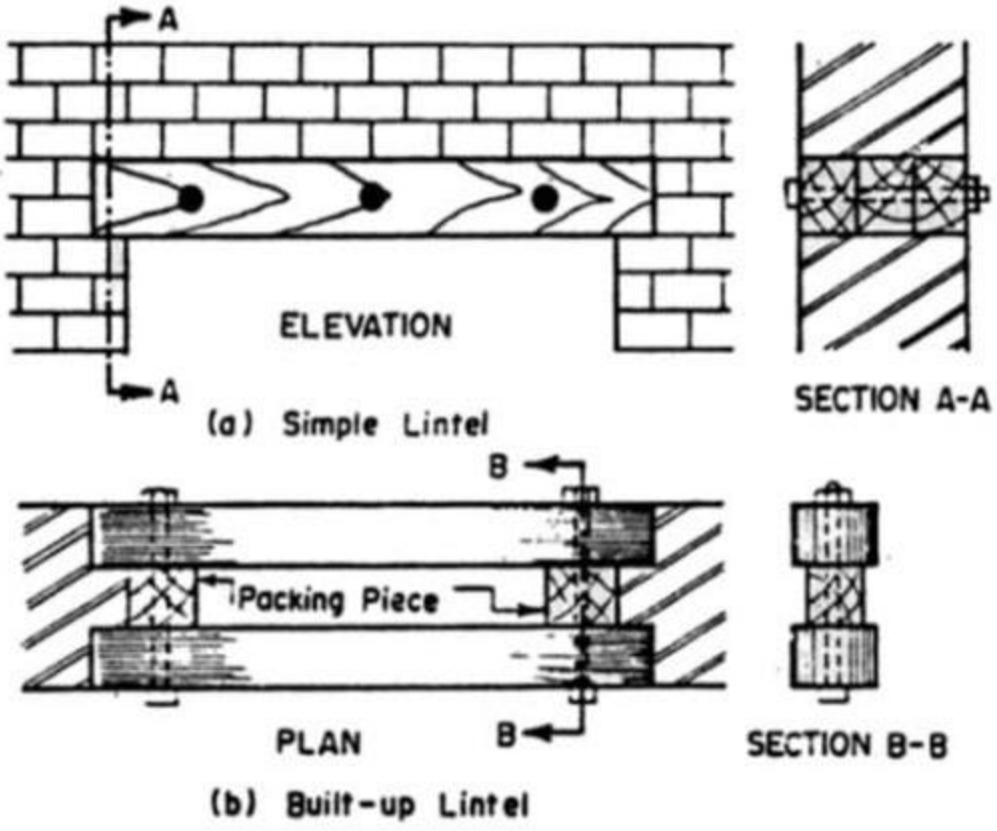
A lintel is a beam placed across the openings like doors, windows etc. in buildings to support the load from the structure above. Lintel is provided above the door and window to transfer the upward wall load to the surrounding wall. Lintel is generally made up of Reinforced concrete or cement mortar. The width of lintel beam is equal to the width of wall, and the ends of it is built into the wall. Lintels are classified based on their material of construction.

Types of Lintel used in Building Construction

1. Timber Lintel

In olden days of construction, Timber lintels were mostly used. But now a days they are replaced by several modern techniques, however in hilly areas these are using. The main disadvantages with timber are more cost and less durable and vulnerable to fire.

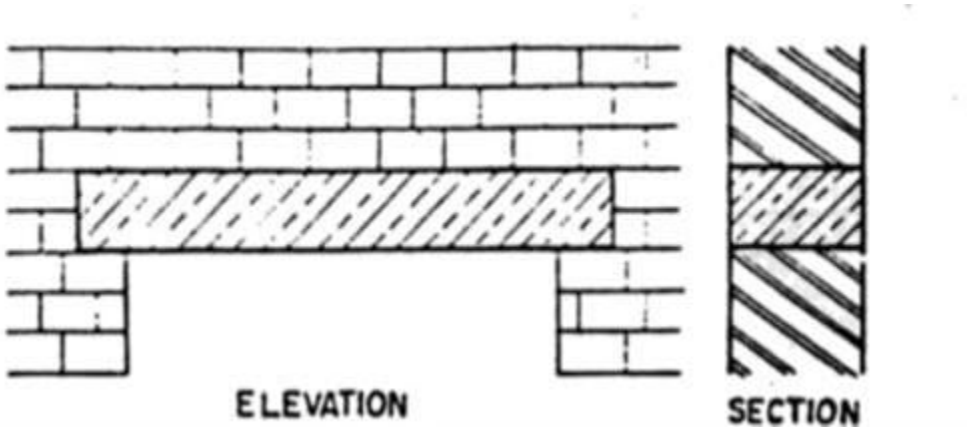
If the length of opening is more, then it is provided by joining multiple number of wooden pieces with the help of steel bolts which was shown in fig (a). In case of wider walls, it is composed of two wooden pieces kept at a distance with the help of packing pieces made of wood. Sometimes, these are strengthened by the provision of mild steel plates at their top and bottom, called as flitched lintels



2. Stone Lintel

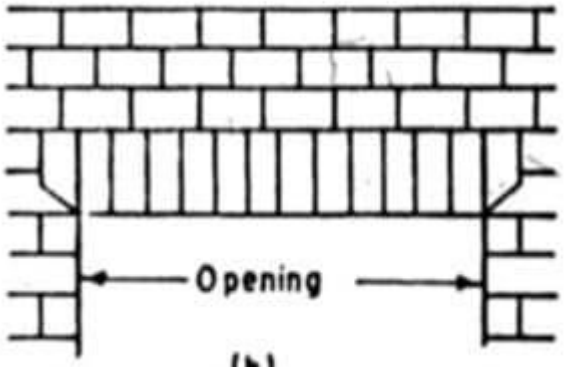
These are the most common type, especially where stone is abundantly available. The thickness of these are most important factor of its design. These are also provided over the openings in brick walls. Stone lintel is provided in the form of either one single piece or more than one piece.

The depth of this type is kept equal to 10 cm / meter of span, with a minimum value of 15 cm. They are used up to spans of 2 meters. In the structure is subjected to vibratory loads, cracks are formed in the stone lintel because of its weak tensile nature. Hence caution is needed.



3. Brick Lintel

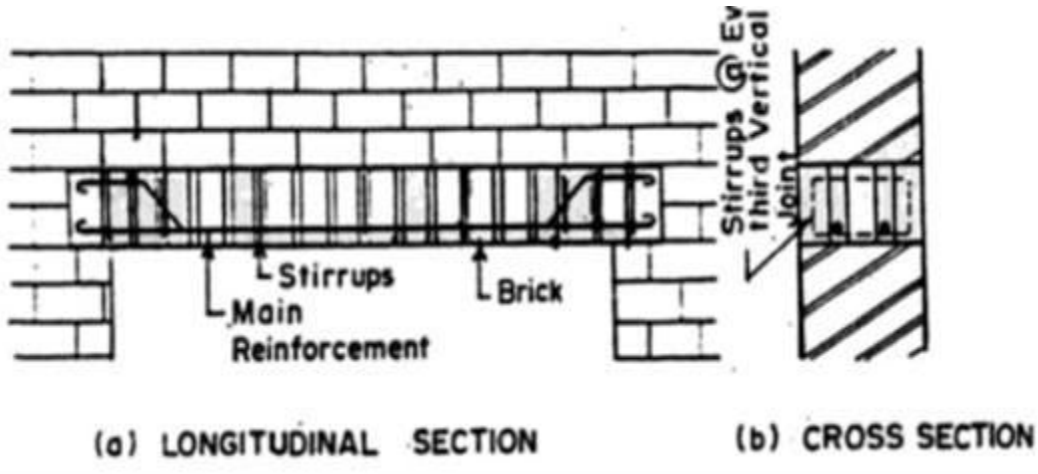
These are used when the opening is less than 1m and lesser loads are acting. Its depth varies from 10 cm to 20 cm, depending up on the span.



4. Reinforced Brick Lintel

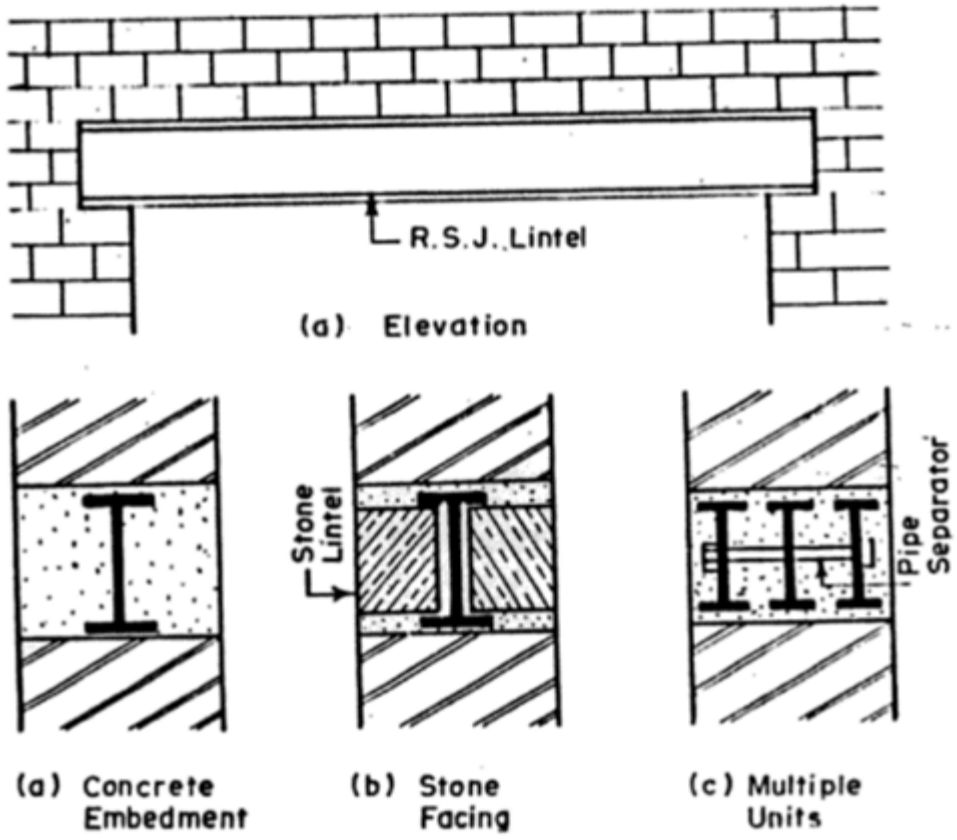
These are used when loads are heavy and span is greater than 1m. The depth of reinforced brick lintel should be equal to 10 cm or 15 cm or multiple of 10 cm. the bricks are so arranged that 2 to 3 cm wide space is left length wise between adjacent bricks for the insertion of mild steel bars as reinforcement. 1:3 cement mortar is used to fill up the gaps.

Vertical stirrups of 6 mm diameter are provided in every 3rd vertical joint. Main reinforcement is provided at the bottom consists 8 to 10 mm diameter bars, which are cranked up at the ends



5. Steel Lintel

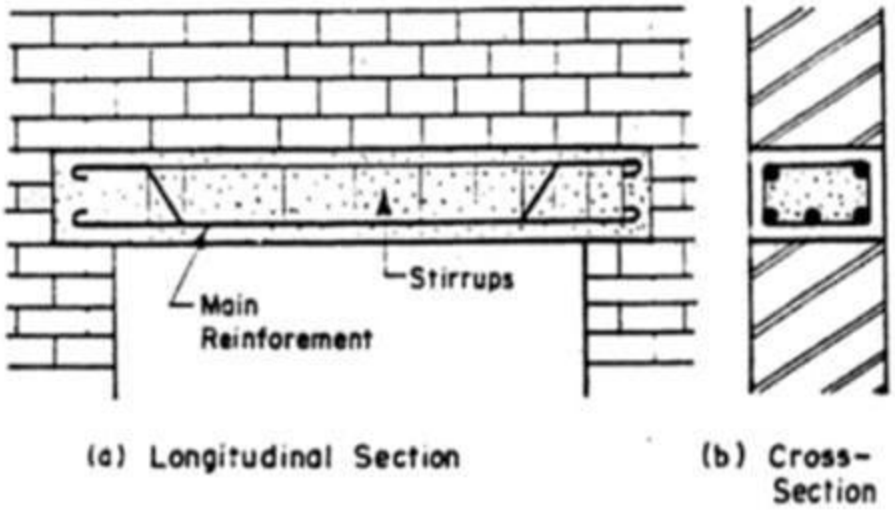
These are used when the superimposed loads are heavy and openings are large. These consist of channel sections or rolled steel joists. We can use one single section or in combinations depending up on the requirement.



6. Reinforced Cement Concrete Lintel

t present, the lintel made of reinforced concrete are widely used to span the openings for doors, windows, etc. in a structure because of their strength, rigidity, fire resistance, economy and ease

in construction. These are suitable for all the loads and for any span. The width is equal to width of wall and depth depends on length of span and magnitude of loading.



(a) Longitudinal Section

(b) Cross-Section

Plinth Level | Sill Level

Plinth Level:-

The level at which Substructure ends and superstructure starts is called **Plinth level**. It is the part of the superstructure between natural ground level and Finished floor level. the plinth is provided to restrict the seepage of stormwater and rainwater into the building.

The plinth height is in between 300mm – 450 mm from ground level. It is recommended that the **minimum plinth height of 150 mm** is adopted from the top of the road.

Damp proof course (DPC) is laid on Plinth level. The purpose of applying DPC is to restrict the movement of moisture through walls and floors.

In Simple when you climb 3-4 steps to reach the building ground level is called Plinth height.

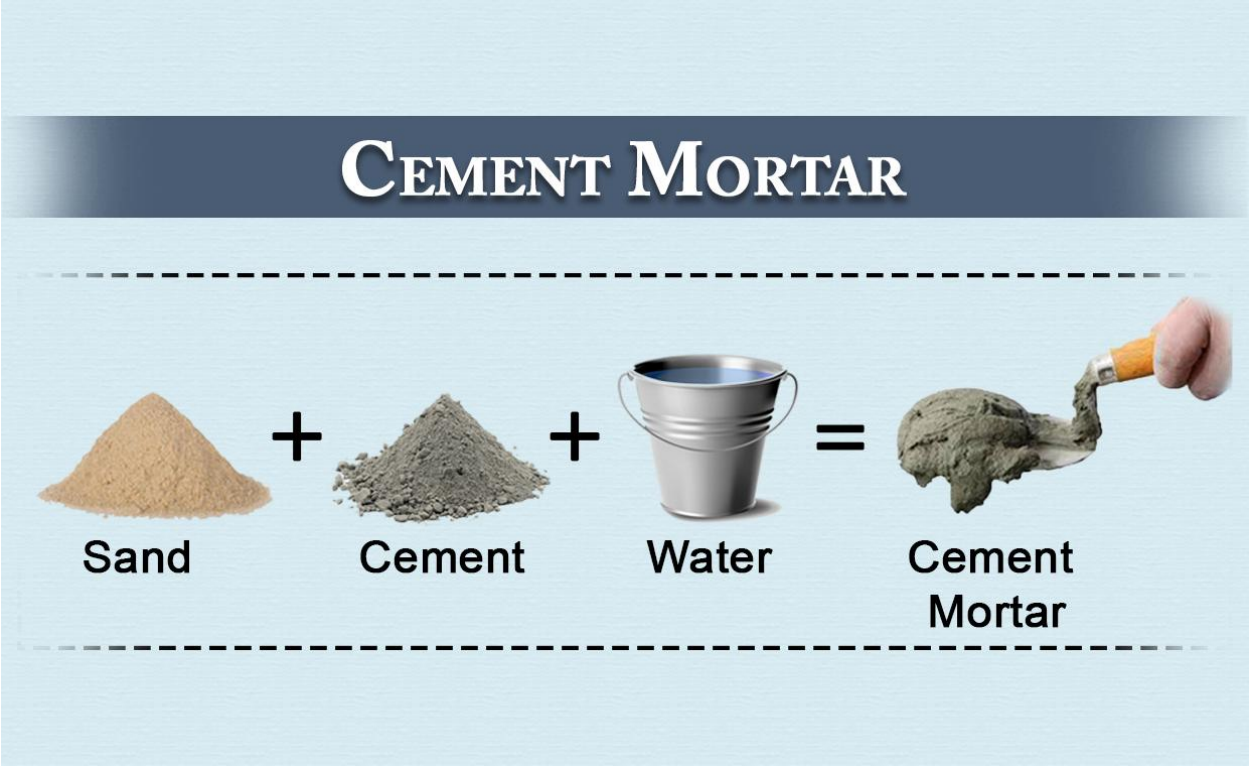
Sill level or Window Sill level:-

The level between the base portion of the window and portion of the floor above ground level (upwards) is called **Sill level.** Mortar bed or concrete bed is laid at the base of the window.

The height of sill level depends upon the type of room for bedroom & bathroom the height may kept around minimum 1100mm due to privacy concrens and in the living room the window sill level is kept at minimum 600-650mm from the floor level.

It is recommended that the **minimum sill level height of 44 inches**

Cement Mortar: Its Proportion, Preparation, and Uses



Mortar is a homogenous mixture of cement, sand and water. Different types of mortars are used in **masonry construction** based on their applications, binding materials, strength, bulk density and their purposes.

According to '**Frederick S. Merritt**', (Author of Building Design and Construction Handbook), mortars are composed of a cementitious material, fine aggregate, sand, and specific amount of water. Mortar can be used for a number of purposes such as plastering over bricks or other forms of masonry, for flooring etc., and with the addition of coarse aggregate, it can also be used to make concrete. Cement mortar also provides a superior medium to create a smooth surface on walls made from bricks or other forms of masonry.

Proportion of Cement Mortar

The Proportion means the relative quantity of different components to be mixed to make good mortar, or simply the ratio between different materials.

Following are the proportions of cement mortar which is commonly recommended for different works:

01. Masonry Construction:

- For ordinary masonry work with brick/ stone as a structural unit. – **1:3** to **1:6**
- Forreinforced brick work – **1:2** to **1:3**.
- For all work in moist situations – **1:3**
- For Architectural work – **1:6**
- For **Load Bearing structures** – **1:3 or 1:4**

02. Plaster Work:

- For External Plaster and Ceiling Plaster – 1:4
- Internal Plaster (If sand is not fine i.e. Fineness Modulus> 3) – 1:5
- For Internal Plaster (if fine sand is available) – 1:6

Curing of Cement Mortar

Cement gains strength with hydration. So, it is necessary to see that the mortar remains wet until hydration occurs. After placing the mortar/concrete, the process of ensuring sufficient moisture for hydration is called curing. Curing is ensured by spraying water. Generally, curing begins 6–24 hours after using mortar. Initially, more water is required for hydration, which can be reduced gradually. Curing for cement mortar is recommended for 7 days.

PLAIN CEMENT CONCRETE

Plain cement concrete is the mixture of cement, fine aggregate(sand) and coarse aggregate without steel. PCC is an important component of a building which is laid on the soil surface to avoid direct contact of reinforcement of concrete with soil and water.

Material Used in Plain Cement Concrete

1. Coarse Aggregate

Coarse aggregate used in the PCC must be of hard broken stone of granite or similar stone, free from dust, dirt and other foreign matter. The stone shall be 20 mm in size and smaller. All the coarse material should be retained in a 5mm square mesh and should be well graded so that the voids do not exceed 42%.

2. Fine Aggregate

Fine aggregate shall be of coarse sand consisting of hard, sharp and angular grains and shall pass through a screen of 5 mm square mesh. Sand shall be of standard specifications, clean and free from dust, dirt and organic matter.

3. Cement

Portland Pozzolana cement (P.P.C) is normally used for plain cement concrete. It should conform to the specifications and shall have the required tensile and compressive stresses and fineness.

4. Water

Water used shall be clean and reasonably free from injurious quantities of deleterious materials such as oils, acids, alkalis, salts and vegetable growth. Generally, potable water shall be used having a pH value not less than 6.

Proportioning of Plain Cement Concrete

1. The proportioning is done based on the requirement or given specification. Generally 1:2:4 or 1:3:6 mix is used.

Reinforced Cement Concrete

Reinforced cement concrete (R.C.C) is the combination of ordinary concrete with the steel reinforcement to increase its compressive and tensile strength to a great extent.

Nature of Reinforced Cement Concrete:
The main principle in the preparation of the reinforced cement concrete is to make a structural material in which

(i) Steel serves the purpose of bearing the main tensile stresses;
(ii) concrete bears the main compressive forces, both acting in complete unison;
Some common types of reinforcement are:

(i) Mild Steel Bars:
This steel bar used as reinforcement can be commonly bent easily without cracking at the bends.

(ii) Hot Rolled Bars and Cold Worked Bars:
Hot Rolled Bars has a characteristic strength in tension which is almost double than that of mild steel bars.

They can be bent by heating (up to 100°C) without developing any defects.

Similarly, the cold worked steel bars come in twisted or stretched forms having elongated ribs or such structures along their length.

(iii) Steel Fabric:
This is made from a variety of bars and wires.

These may include plain round wires, indented and deformed wires, deformed steel bars of cold-worked type.

PRECAST CONCRETE

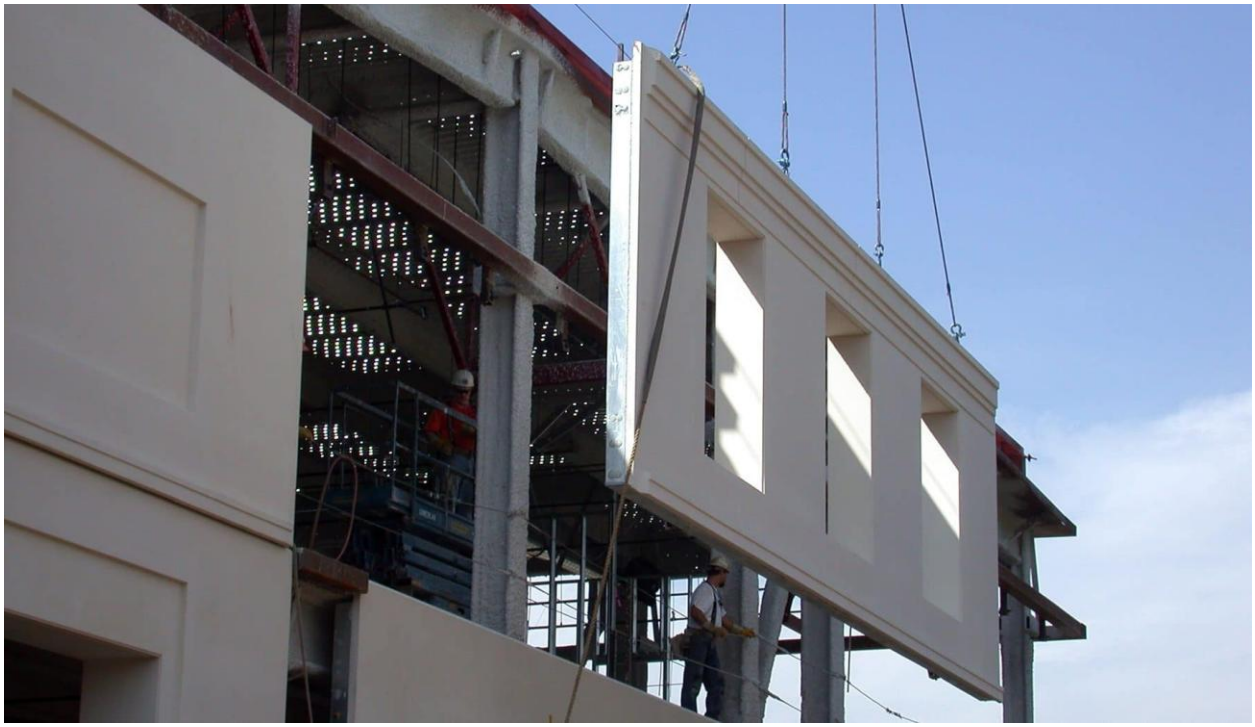
The form of construction where concrete is cast in a reusable mould and then cured in a controlled environment (precast plant) is called *precast concrete*. The casted structural member is then transported to the construction site and then erected. Structural members such as concrete frames, concrete walls, and concrete floors, etc. can be constructed using precast concrete.

Advantages of Precast Concrete

There are many precast concrete advantages. They are discussed below.

1. **Saves Construction Time**:.
2. **Quality Assurance**:
3. **Cost-effective**:.
4. **Durability**:
5. **Aesthetics**:
6. **Safe Construction Platform**

Photograph of precast concrete



Photograph of constructing precast building

STRUCTURAL STEEL

Structural Steel is a special kind of Steel. It is used for construction purposes. Due to its rigidity and high strength-to-weight ratio, structural Steel is mainly employed in buildings. Structural Steel is used in houses, warehouses, airplane hangars, educational facilities, bridges, stadiums, etc.

Structural Steel is Steel that contains carbon, not more than 2.1%. These are also called Carbon Steel, and structural Steel typically has a carbon content of less than 0.6%.

Properties of Structural Steel

- **Density**: The density of Structural Steel is 7750 to 8100 kg/m^3.
- **Young's Modulus of Elasticity:** Typical values for structural steel range from 190-210 GPa
- **Poisson's ratio**: For structural Steel, the acceptable value ranges from 0.27 to 0.3.
- **Tensile strength:** Structural Steel has high tensile strength, so it is preferred over other construction materials.
- **Yield strength:** The yield strength, also known as the yield point, is the stress at which an object permanently deforms. When stress is removed, it does not revert to its former shape. Carbon structural steel has a yield strength ranging from 187 to 758 MPa. The values of structural Steel constructed of alloys range from 366 to 1793 MPa.
- **Shear strength:** The shear strength of steel structure is specified at the failure under shear stress, and it is about 0.57 times the yield stress of structural Steel.
- **Hardness:** The resistance of an object to shape change when force is applied is referred to as hardness. There are three different types of hardness tests. Scratch, indentation, and rebound are all terms used to describe the process of scratching and indenting, and the hardness of structural Steel manufactured with alloys ranges from 149 to 627 kg. Carbon structural steels have a weight range of 86 to 388 kg.

Types of Structural Steel

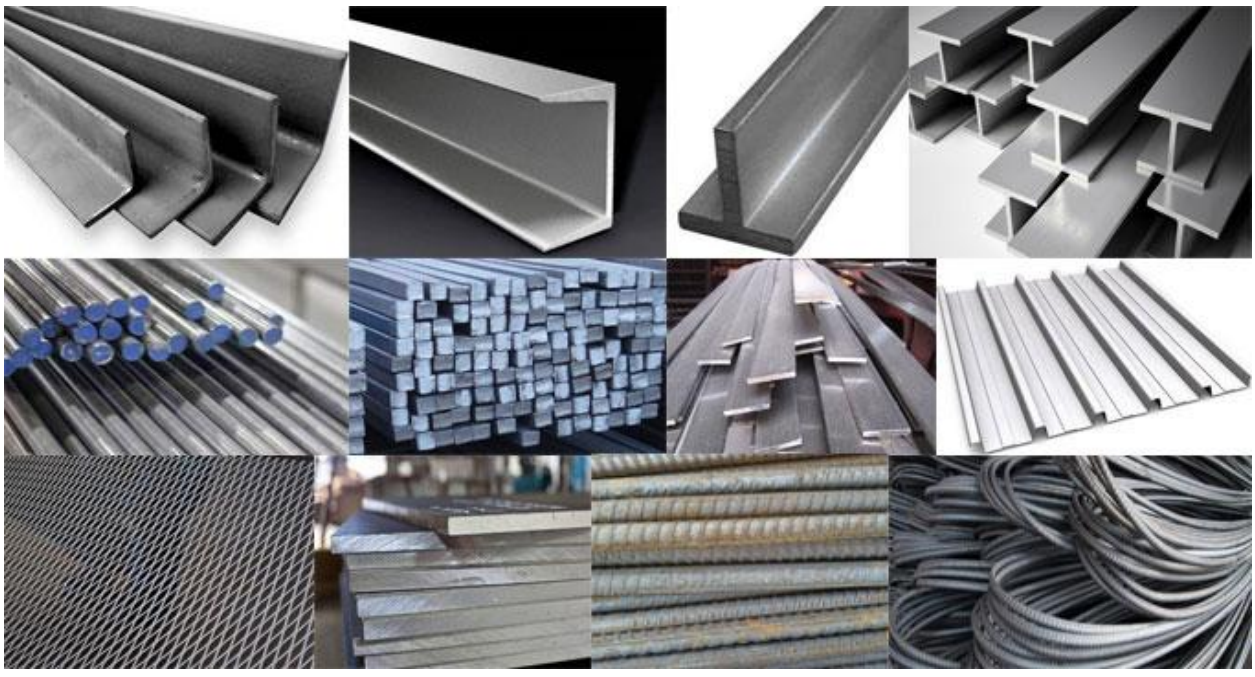
- **Carbon steel:** Steel in which the carbon content is upto 2% is known as carbon steel. The Specified ultimate tensile strength is 410 to 440 MPa, and the yield strength is 350 to 400 MPa.
- **High-strength carbon steel:** These steels are used in structures such as transmission lines and microwave towers. The specified ultimate tensile strength is 480 to 550 MPa, and the yield strength is 350 to 400 MPa.
- **Medium and high strength micro-alloyed steel:** Alloys such as chromium, nickel, molybdenum, etc., are used to increase the strength while retaining the desired ductility. The specified ultimate tensile strength is 440 to 590 MPa, and the yield strength is 300 to 450 MPa.
- **High strength quenched and tempered Steel: Heat treatment increases strength in** this type of Steel. The specified ultimate tensile strength is 440 to 590 MPa; the yield strength is 300 to 450 MPa.

- **Weathering Steel:** These are corrosion-resistant Steel and are often not Painted. The specified ultimate tensile strength is 480 MPa, and the yield strength is 350 MPa.
- **Fire-resistant Steel:** These steels are also known as thermo mechanically treated (TMT) steel and are used where the structures are more prone to fire.

Types of Steel Sections

Structural steel members are fabricated in factories according to their intended use. Continuous casting molds are used to cast rolled steel parts with no joints. The following sections describe the various shapes and forms of rolled steel sections.

1. Rolled Steel I-sections (Beam sections).
2. Rolled Steel Channel Sections.
3. Rolled Steel Tee Sections.
4. Rolled Steel Angles Sections.
5. Rolled Steel Bars.
6. Rolled Steel Tubes.
7. Rolled Steel Flats.
8. Rolled Steel Sheets



Photograph of different types of steel sections

Different Types of Construction Chemicals

Construction chemicals have always been playing important roles in virtually all sorts of construction projects, be it industrial projects, residential building projects, commercial building projects and so on. These chemicals are often used in various elements of projects in order to achieve various important qualities such as workability, durability etc. Construction chemicals exist in many varieties from a large number of manufacturers worldwide.

Concrete curing compounds

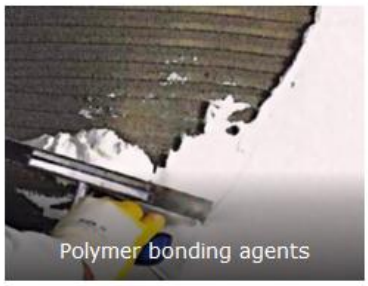
Concrete curing compound consists essentially of waxes, natural and synthetic resins, and solvents of high volatility at atmospheric temperatures. The compound forms a moisture retentive film shortly after being applied on a fresh concrete surface.

Polymer bonding agents

Polymer Bonding Agent is an aqueous emulsion of a polymer and chemical admixtures. It is designed for use as a bonding agent with concrete and cement-based products in interior or exterior applications.

Mould releasing agents

Mould release agents come in handy when you have materials that are shaped and constructed in moulds. Without the releasing agent, your mould may become damaged or even break when it is time to remove it.



Form release agents

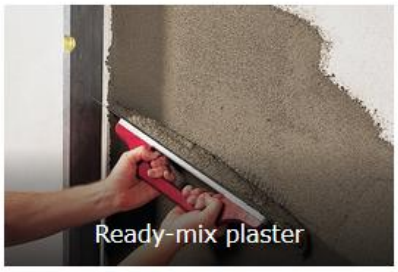
These compounds are applied on the inner surfaces of forms, not only facilitate stripping of formwork but also render concrete surfaces smoother. They also help enhance the life-span of the forms. Form releasing agents can be oil based, resin based, water based, organic chemical based etc.

Concrete floor hardeners

These are chemicals added in floor concrete in order to render it denser and more durable. They also usually enhance chemical resistance, impact & abrasion resistance, waterproofing capability etc. besides reducing dusting.

Tile fixing

Tile fixers and tile adhesives form the backbone of your home. A quality tile fixer connects all your tiles together, to create a beautiful canvas from individual pieces. Tile fixing products are used for floorings, bathtubs, washbasins, kitchen tops and any other area where two surfaces need to stick together.



Waterproofing chemicals

These chemicals can be quite useful when a structure's waterproofing capability is to be given a boost which is especially required for structures constantly dealing with liquids. There are many varieties.

Adhesives

These construction chemicals are readily used in all sorts of projects, be it commercial, residential, industrial etc. construction projects. Adhesives are expected to have strong bonding capacity besides good waterproofing, weatherproofing etc. qualities.

COLUMNS

The most commonly encountered compression member in building constructions is a column. A column is a compression member that transfers load from beam and slab to the structure's foundation. The IS code refers to the column as a compression member, with an effective length 3 times the least lateral dimension.

What are the Different Types of Columns?

There are many distinct kinds of columns that are utilised in various portions of construction. A column is a vertical structural component that primarily supports compression loads. It may distribute the weight from a beam to a floor or foundations, or from a ceiling, floor slab, roof slab, or other slabs. The bending moments about one or both of the cross-section axes are frequently present in columns. The different types of columns based on several factors are listed below.

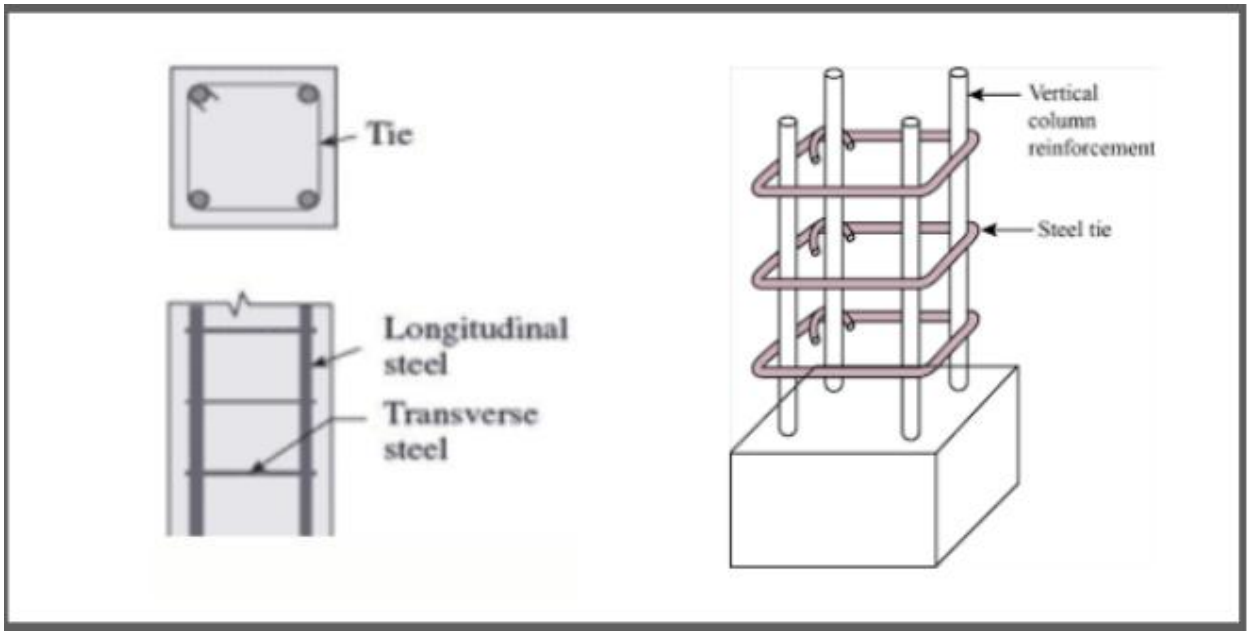
- Based on shape
- Based on the type of reinforcement
- Based on the type of loading
- Based on the slenderness ratio
- Based on the type of material

Types of Columns Based on Shape

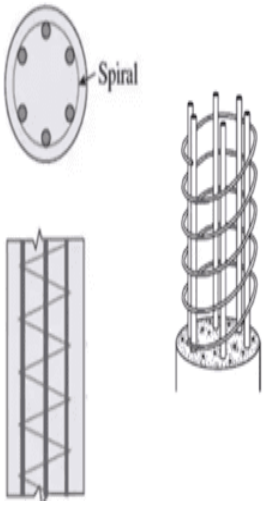
- **Square/Rectangular columns-** These are generally used in building constructions. Due to the ease of shuttering and reinforcement placement, these types of columns are both cost-effective and simple to construct.
- **Circular columns-** Circular columns are commonly used in piling and elevation of buildings. It is also used as bridge pillars. They provide better bending resistance than square or rectangular column
- **L-type columns-** These types of columns are commonly used at the corners of boundary walls.
- **T-type columns-** These types of columns are quite commonly used in bridge construction.
- **Y-type columns-** They are used in bridge and flyover construction

Types of Columns Based on the Type of Reinforcement

Tied Columns- These are the types of columns in which the main longitudinal bars are enclosed within closely and uniformly spaced lateral ties. These are the most commonly used types of reinforced columns



- **Spiral Columns-** In these types of columns, the main longitudinal bars are confined within continuously wound spiral reinforcement. The spiral reinforcements provide lateral support and delay failure due to axial load.



- **Composite Columns-** These are the types of columns where the reinforcement is in the form of structural steel sections or pipes with or without longitudinal bars.

Types of Columns Based on the Slenderness Ratio

The slenderness ratio of a compression member is defined as the ratio of its effective length to its lateral dimensions. It provides a measure of the column's susceptibility to buckling failure. Columns can be divided into two types of columns based on the slenderness ratio.

- **Short column-** The column is referred to as a short column if the ratio of the effective length of the column to the least lateral dimension is less than 12. The failure of a short column is due to crushing (pure compression failure).
- **Long columns-** A long column is defined as one in which the ratio of the effective length of the column to the least lateral dimension is more than 12. Bending or buckling is how a long column fails.

SLABS

What is a concrete slab?

A concrete slab is one of the structural members of buildings or infrastructure. The slab is constructed generally in uniform thickness, but it may vary in some cases. The slab is usually constructed with concrete ingredients. It consists of coarse aggregate, fine aggregate, cement material and structural steel. Steel-reinforced slabs, typically between 100 and 500 mm thick, are most often used to construct floors and ceilings

Why is a concrete slab constructed?

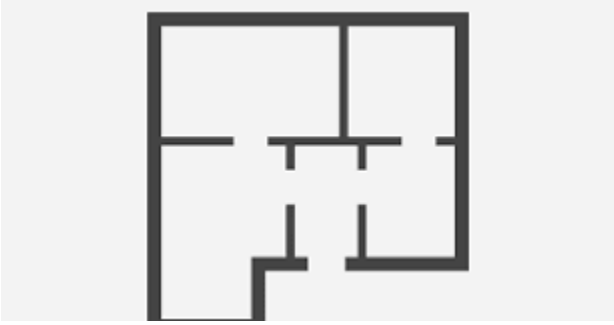
The concrete slab is constructed the supporting the walls, beams and columns of the structures. It plays an important role in the structures. It is usually constructed with uniform thickness, but it may be constructed with varying thicknesses.

Classification of slabs

Slabs are generally classified into one-way slab and two-way slab. The former is supported on two sides and the ratio of long to short span is greater than two. However, the latter is supported on four sides and the ratio of long to short span is smaller than two.

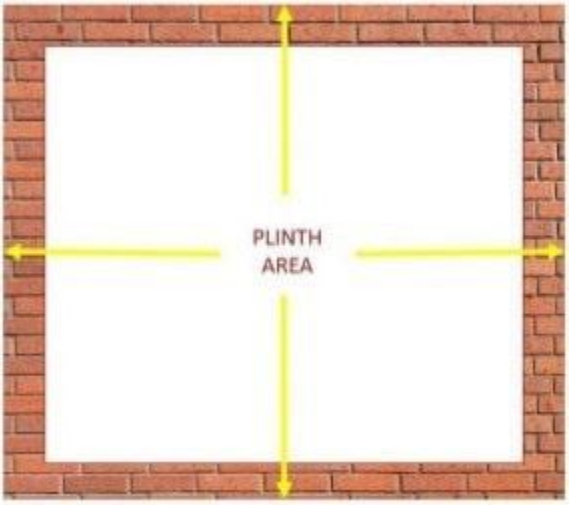
PLINTH AREA AND CARPET AREA

How do you calculate plinth area?

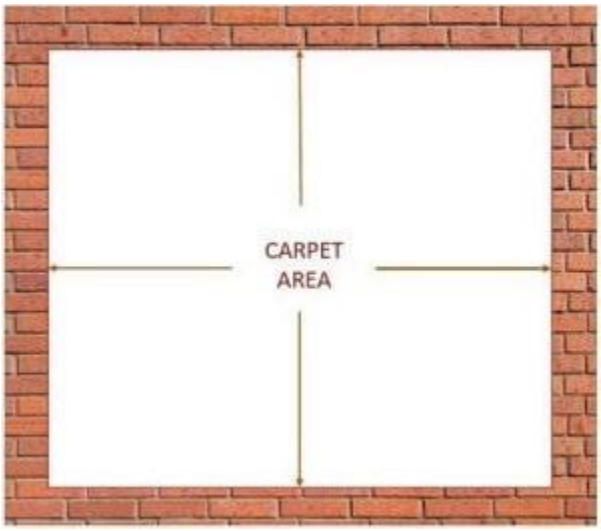


Plinth area = building carpet area + wall area (both internal and exterior walls) + parasitic area + elevator openings, etc. The plinth area is the space between the building's exterior and outer bounds or its walls. The carpet area is the sum of the actual areas of the rooms that you can carpet.

Plinth area and carpet area of a building is measured for estimation and calculation of building cost. It is also a measure of usable space of building. **Plinth area** is the covered built-up area measured at the floor level of any storey or at the floor level of the basement. Plinth area is also called as built-up area and is the entire area occupied by the building including internal and external walls. Plinth area is generally 10-20% more than carpet area.



Carpet area the covered area of the usable spaces of rooms at any floor. It is measured between walls to walls within the building and is the sum of the actual areas of the rooms where you can carpet



.

BEAMS

A beam is a structural element or member that largely transfers loads placed along its axis to its supports, such as walls, columns, foundations, and so on, with bending being the primary way of deflections

TYPES OF BEAM

1.SimplySupportedBeam:

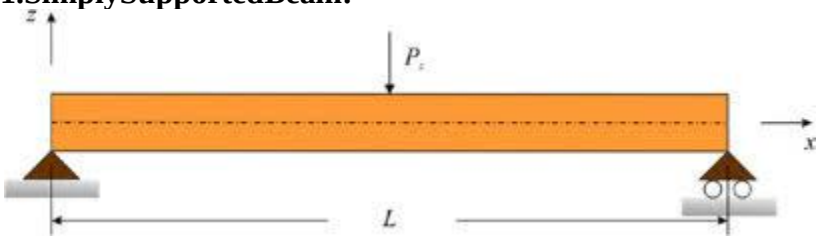


Fig1:SimplySupportedBeam

It is one of the most basic structural elements because both ends are supported, but it can rotate freely. There are pinned support at one end, and at the other, there is roller support. It can withstand shearing and bend depending on the strain.

2.CantileverBeam:

Fig2:CantileverBeam

A cantilever beam is defined as a fastened beam at one end and set to be free at the other. The load is distributed back to the support, subjected to moment and shear stress. Bay windows, balconies, and some bridges are all possible using cantilever beams.

3.FixedBeam:

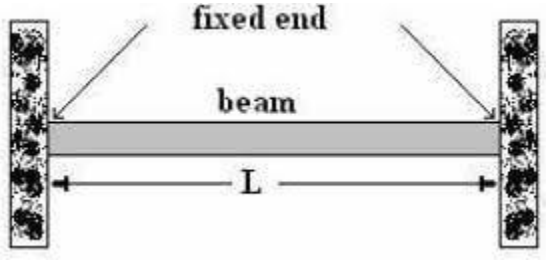


Fig 3: Fixed Beam

This type of beam has fixed ends on both ends. In addition, the fixed beam's rotating movement is controlled. The fixed beam's end cannot be rotated because it is fixed at both ends. The fixed beam is positioned to withstand high pressure. There is no reaction from this type of beam. It is employed in the construction of high-rise buildings and industrial structures.

4.OverhangingBeam:

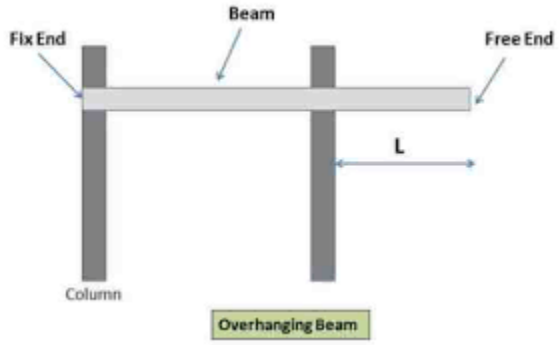


Fig4:OverhangingBeam

A simple supporting beam-like structure is commonly used for this sort of beam. In an overhanging beam, however, one end extends beyond the support. The beam is often delivered at each end of the column to transfer the load. A column supports one end of an overhanging beam, while the other is overhung away from the support. In residential buildings, overhanging beams are typically employed to create shade or balconies. Both ends of the Double Overhanging Beam overhang somewhat away from the support.

5.ContinuousBeam:

Fig5:ContinuousBeam

A continuous beam contains more than two or more supports. It’s similar to a supported beam. When a beam is maintained at both ends with intermediate support, it is referred to as a continuous beam. There are multiple spans in these types of beams. In bridge construction, a continuous beam is most usually employed. This sort of beam has more than two supports running its length.