

## MODULE 2

### **ENVIRONMENT-FRIENDLY AND COST-EFFECTIVE BUILDING TECHNOLOGIES**

**MASONRY WALL:** - Masonry is the term used to refer to construction using pieces of construction materials made into blocks and bonded together using different binding mechanisms.

- Strong in **compressive** strength and weak in **tension** loads because of the weak points at the joints between blocks.
- It is labour-intensive and time taking,
- Economical
- It can be shaped into different forms fairly easily.
- Mostly have naturally rich colour and texture.
- Most masonry materials are also durable.

Types of masonries:

- a. Brick Masonry
- b. Stone Masonry

### **DIFFERENT TYPES OF BRICK BONDS**

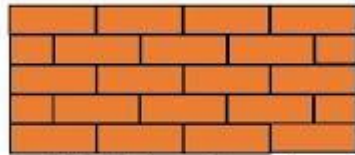
The following are the brick bonds.

- English bond
- Flemish bond
- Heading bond
- Stretching bond
- Rat trap bond

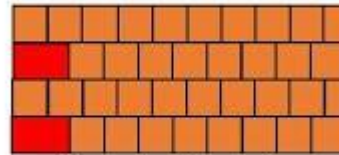
**Stretcher Bond:**

- All the bricks are arranged in stretcher courses.
- The stretcher bond is useful for one brick partition as there are no headers.
- As the internal bond is improper, this is not used for walls of thickness greater than one brick.

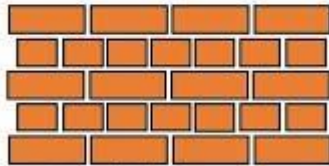
## Types of Bond



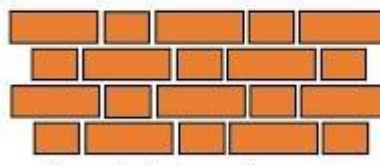
Stretcher bond



Header bond



English Bond



Flemish Bond

Header Bond: - All bricks are arranged in header courses. It is used for curved surfaces since the length will be less.

English Bond:-

- It is the most commonly used type of bond.
- It is the strongest type of bond
- It is used for all wall thicknesses.
- English bond consists of headers and stretchers in alternative courses of elevation. A queen closer is placed next to the quoin header in each header course to the full thickness of wall. Each alternative header lies centrally over a stretcher of the stretcher course.

Flemish Bond: - The peculiarities of a Flemish bond are as follows.

- In every course headers and stretchers are placed alternatively.
- The queen closer is put next to the queen header in an alternate course to develop the lap.
- Every header is centrally supported over a stretcher below it.
- The Flemish bond may be either a double Flemish or Single Flemish bond.

### **RULES FOR GOOD BRICK BONDING**

- The bricks are uniform in size.
- Bricks arranged uniformly throughout the wall
- Bats are used as little as possible
- Bricks in the wall's interiors were laid as headers across the wall.

- The vertical joints in every other course should be vertically over one other.
- The facing bricks are laid in alternate courses of headers and stretchers.
- English bond is the strongest bond.

### **Rat trap bond**



- It is made by placing the bricks on their sides having a cavity of 10cm.
- It consists of an Alternate course of stretchers and headers.
- It is used as an economical bond.
- Maintains thermal comfort inside the building due to air medium.

Rat trap bond is a brick masonry method of all construction, in which bricks are placed in vertical position instead of the conventional horizontal position thus creating a cavity (hollow space) within the wall. Walls constructed using rat trap bonds can be used as both load-bearing walls as well as thick partition walls. The rat trap bond technique is relatively durable and maintenance costs are also lower. It is also known as a Chinese brick bond. The purpose of using this type of masonry bond is to reduce the number of bricks and mortar required as compared to the English/Flemish bond because of the cavity formed in the wall.

The rat-trap bond was invented and popularised the famous architect Laurie Baker. This system uses bricks on edge with a cavity behind every face brick. Each course of

brickwork is 115mm high, comprising two parallel facers followed by brick places at 90° to lock the bond.

### **Advantages of Rat-trap bond**

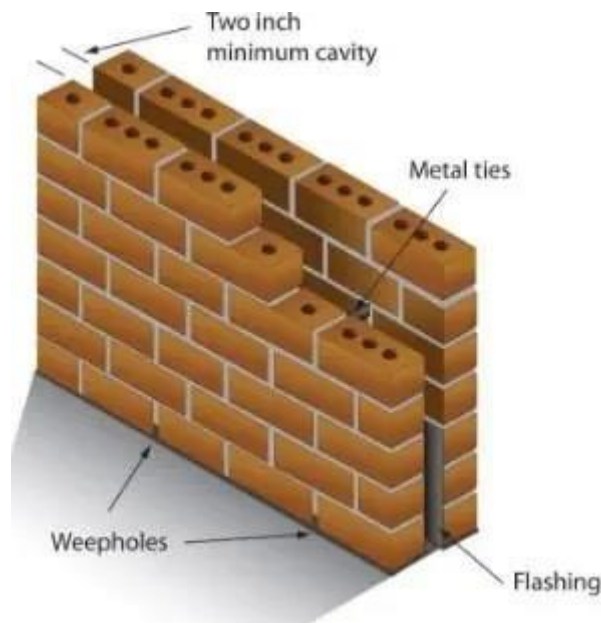
It is highly economical because:

- Can make a wall of one brick thickness with fewer bricks than a solid bond.
- Strength is equal to the standard brick wall, but consumes 20% less bricks.
- Cost saving on material is 26% as compared to the traditional brick wall.
- Maintains thermal comfort inside the building due to air medium.

### **Cavity wall:-**

- 1) A cavity wall is constructed with two separate walls for single-wall purposes with some space or cavity between them.
- 2) These two separate walls are called as leaves of the cavity wall.
- 3) The inner wall is called as internal leaf and the outer wall is called as external leaf.
- 4) A cavity wall is also called a Hollow wall.
- 5) For non-load-bearing cavity walls, two leaves are of equal thickness or sometimes internal leaf with more thickness is provided.
- 6) The cavity size should be in between 4 to 10cm.
- 7) The internal and external leaves should have at least 10 mm thickness.
- 8) The two leaves are interconnected by metal ties or links as shown in above figure.
- 9) For half brick thickness, stretcher bond is provided, and for one brick thickness or more thickness, English bond or Flemish bonds type constructions are provided.
- 10) While laying bricks, care should be taken without filling the cavity with cement mortar.
- 11) To prevent mortar dropping in cavity, wooden battens are provided in the cavity with suitable dimensions.

12) These battens are supported on wall ties and whenever the height of next wall tie location is reached, then the battens are removed using wires or ropes and wall ties are provided.



### **Advantages of Cavity Walls over Solid Walls**

- 1) Cavity walls give better thermal insulation than solid walls. It is because of the space provided between two leaves of cavity walls which is full of air and reduces heat transmission into the building from outside.
- 2) Economically they are cheaper than solid walls.
- 3) Moisture content in the outer atmosphere is not allowed to enter because of the hollow space between leaves. So, they also prevent dampness.
- 4) They also act as good sound insulators.
- 5) They also reduce the weights on foundation because of their lesser thickness.
- 6) Outer Efflorescence is also prevented.

### **Main functions of walls**

- 1) Strength
- 2) Stability
- 3) Weather exclusion
- 4) Thermal insulation
- 5) Sound insulation

6) Durability

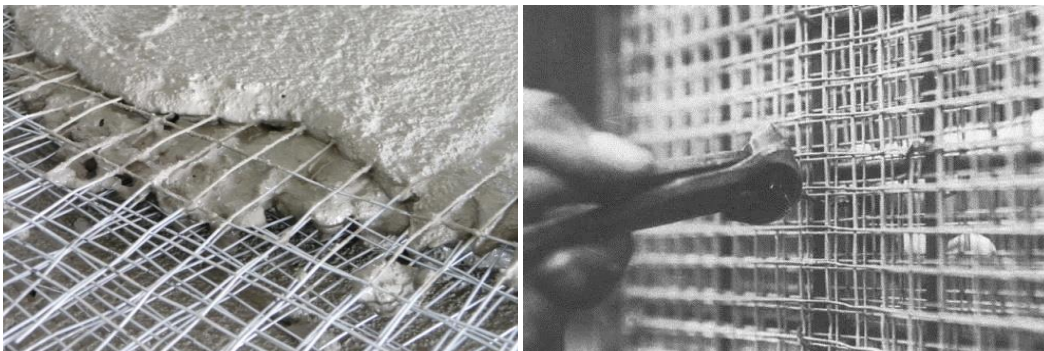
7) Fire resistance

## **FERRO-CEMENT**

Ferro cement is a construction material consisting of wire meshes and cement mortar. Applications of Ferro cement in construction are vast due to the low self-weight, lack of skilled workers, no need for a framework, etc. The quality of Ferro cement works is assured because the components are manufactured on machinery set up and execution time at the work site is less. The cost of maintenance is low. It's a type of thin reinforced concrete construction, in which a large amount of small-diameter wire meshes uniformly throughout the cross-section. The mesh may be metal or a suitable material. Instead of concrete, Portland cement mortar is used. Strength depends on two factors quality of sand/cement mortar mix and quantity of reinforcing materials used.

### **Constituent Materials for Ferro cement:-**

1. Cement
2. Fine Aggregate
3. Water
4. Admixture
5. Mortar Mix
6. Reinforcing mesh
7. Skeletal Steel
8. Coating





### Process of Ferro cement Construction

- fabricating the skeletal framing system.
- Applying steel bars and meshes.
- Plastering.
- Curing



### Properties of Ferro cement

- Highly versatile form of reinforced concrete.
- It's a type of thin reinforced concrete construction, in which a large amount of small diameter wire meshes uniformly laid throughout the cross-section.
- The mesh may be metal or suitable material.
- Instead of concrete, Portland cement mortar is used.
- Strength depends on two factors: quality of sand/cement mortar mix and quantity of

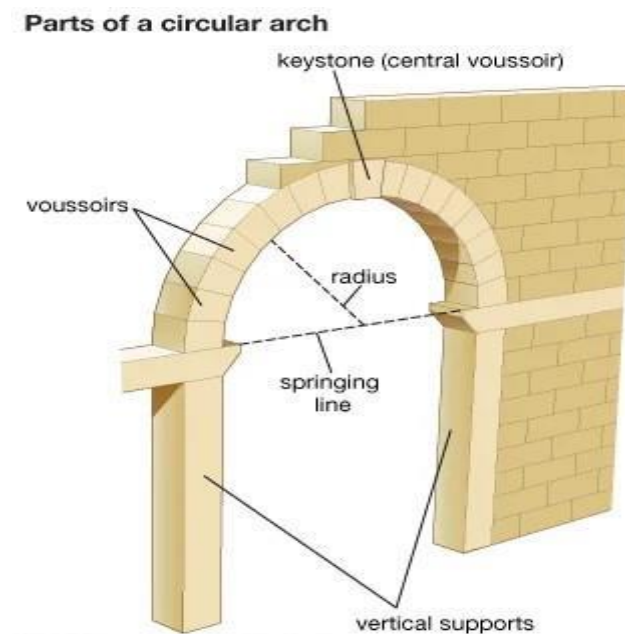
reinforcing materials used.

### **Advantages of Ferro cement**

- Basic raw materials are readily available in most countries.
- Fabricated into any desired shape.
- Low labour skills are required.
- Ease of construction, low weight, and long lifespan.
- Low construction material cost.
- Better resistance against earthquakes.

### **ARCHES**

An arch is a structure constructed of wedge shaped units, jointed together with mortar & spanning an opening to support the wall above it with other super –imposed loads. Due to wedge like form, the units support each other, the load tends to make them compact & enables them to transmit the pressure downwards to their supports.



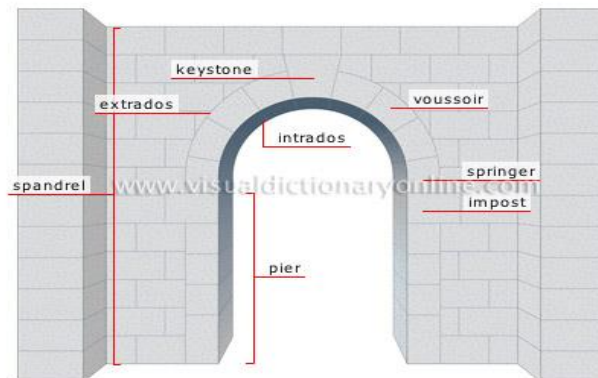
Arch, in architecture and civil engineering, a curved member that is used to span an opening and to support loads from above.

Arches can be classified based on their shape, the materials used, or the way they are constructed. The classification is generally broken down into several categories:

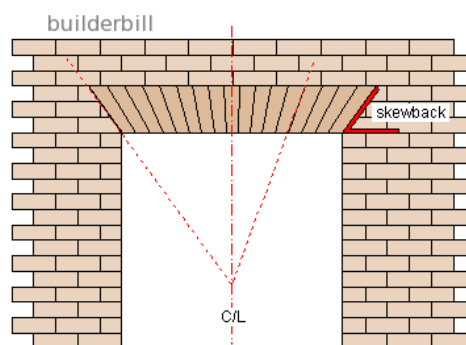


## 1. Classification by Shape

- **Semi-Circular Arch (Roman Arch):** This is the most common arch shape, with a consistent curve that forms a half-circle. It was widely used by the Romans in their architecture and engineering.



- **Flat Arch:** Also known as a jack arch, this arch has a very small rise relative to its span and is almost flat. It's typically used for smaller openings.



- **Pointed Arch (Gothic Arch):** A key feature of Gothic architecture, this arch has a pointed apex. It provides greater height and stability than the semi-circular arch, which was beneficial for the large windows typical of Gothic cathedrals.



- **Segmental Arch:** This arch is a portion of a circle, with a flatter curve compared to the semi-circular arch. It is commonly used in bridges and small structures.



- **Horseshoe Arch:** This arch has a shape that curves inwards before expanding outward again, resembling a horseshoe. It is characteristic of Islamic architecture, particularly in Spain and North Africa.



- **Elliptical Arch:** The curve of this arch follows an ellipse rather than a circle, giving it a more elongated appearance.



- **Parabolic Arch:** This arch follows the shape of a parabola. It is often used in modern engineering, especially in bridges and certain roof structures, as it can better distribute weight.

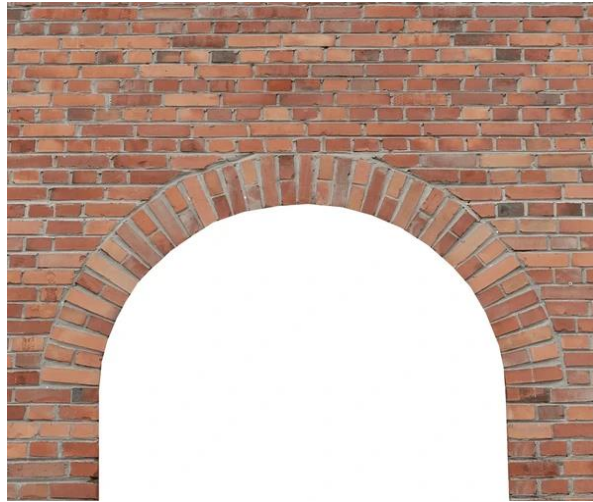


#### Classification based on material of construction and workmanship:-

- 1) **Stone Arch:** - A **stone arch** is a structure made of stones arranged in a curved shape, typically used in bridges, doorways, and aqueducts, among other architectural features. The key characteristic of a stone arch is its ability to distribute weight evenly along its curve, transferring the load to the supports (called *abutments*) on either side. This allows for the construction of larger openings without the need for heavy support beams or columns in the middle.



- 2) **Brick Arch:** - A **brick arch** is a structural element made of bricks laid in a curved shape to span an opening, such as a door or window, and bear the weight above it. Brick arches have been used in architecture for thousands of years and are known for their strength and durability. The shape of the arch distributes the weight evenly across its curve, which allows the structure to support heavy loads.



- 3) **Concrete Arch:** A concrete arch is a type of structural element made of concrete that takes advantage of the inherent strength of arches to carry loads, unlike flat or horizontal beams, which experience bending forces, an arch transfers compressive forces along its curve to its supports, allowing it to support heavy loads efficiently. Concrete arches are commonly used in bridges, dams, tunnels, and other engineering projects where long spans or the ability to withstand heavy loads are required.



**Merits of Arch over lintel:**

The main function of arch or lintel is to support the loads of a portion of the wall above the openings and to transmit such load to ends of walls/ piers/ columns over; they are supported. Lintels are easy to construct, but for arch, exceptional centering or formwork is required.

1. An arch can definitely sustain a higher amount of load than usual, a horizontal Beam can also support.
2. In masonry construction, Arches have great advantages over the simplest horizontal beams known as lintels.
3. Arches may rest on light supports but lintels can't.
4. Because of the higher loading capacity of the Arch, the pressure downward on an Arch has the effect of forcing the voussoirs together instead of apart.

### **Precast Components in a construction:-**

Growing emphasis on reducing the overall construction time and costs is turning out to be the primary factor driving the adoption of structural building components, such as beams, piles, and foundation pillars, in the residential & non-residential construction sector.

Major factors that are driving the growth of the Precast Concrete market are:

- a) Rapid urbanization and industrialization
- b) Increasing investment in new construction projects and infrastructure development.
- c) Need for reduction in construction time and cost.

Precast panels can be moulded for a variety of functions, which is why we can find all types of precast components in buildings of all types, including industrial units, superstructures such as bridges and flyovers, and commercial and residential homes.

Formwork is the name for the mould which provides the method used to create the precast concrete. The concrete is poured in and is supported by the formwork until it is strong enough to stand alone. Each unit can be manufactured to meet the architect's requirements and can incorporate different joining and fixing solutions.

### **Advantages of prefabricate construction**

1. Construction time is shortened
2. Quantities of materials required are reduced
3. Manual labour is substantially reduced
4. More machine
5. Better quality of the products
6. Construction can proceed almost independently of weather conditions.



### **Precast elements:-**

- Precast Beams
- Precast Columns
- Precast floor slabs
- Precast walls
- Precast staircases

### **Precast Beams**

- Precast concrete beams are an integral feature of many buildings today.
- They are particularly suited to floor construction in houses, flats and commercial buildings and provide a low-cost flooring solution.
- Precast concrete lintel beams can be used over doors and frames generally and T Beams are often incorporated into building design.
- Manoeuvring of these beams though sometimes is not easy. However, automatic Lifting devices handle this process more effectively and above all, much safer.



### **Precast Columns:-**

- Precast concrete columns add strength and flexibility and increase the life of any building.
- Columns can be made to the architect's design and incorporate any special features or fittings.
- These columns can be erected as much as five times faster than in-situ methods of concrete production, so are labour saving.
- A high-quality finish can be achieved and furthermore they can be erected at night, even



in residential areas, because there is none of the noise associated with making concrete on site.



### **Partition Walls:-**

- Partition walls made from precast concrete can be lifted into position or the panels cemented together on site to provide a wall to ceiling partition. This type of assembly can be as much as six times quicker than alternative brick work. Panels are particularly suited to sound insulation, so are suitable for use in hotels, kitchens, hospitals, schools and apartments anywhere a degree of privacy is required, or noise from machinery needs to be reduced.
- They also act as excellent fire retardants and the thicker the panels, the greater the level of protection offered. Precast concrete panels also have good resistance to moisture so are suitable for use in wet rooms, bathrooms and kitchens. With most partition wall solutions, no plastering is required as the surface is already finished. Panels are strong enough to hang fittings from and the interiors can include ducts for wiring.



### **Precast footings: -**

- Precast footings are foundations that are easy to install and use as soon as they arrive on site. They are extremely strong and provide a stable and level base from which to build.



### **Advantages of precast concrete:**

Precast concrete has several advantages over cast-in-situ concrete:-

- 1) When identical members are cast, it is advantageous for the same formwork to be used.
- 2) As better quality control can be exercised in the factory or yard site, concrete of superior quality can be produced.
- 3) Smoother exposed surfaces can be produced, which may not require plastering.
- 4) Precasting work can be carried out under all weather conditions if adequate protection is provided in the casting yard.
- 5) Precast units can be made to the required shape without much difficulty.
- 6) When required, they may be dismantled without any breakage.
- 7) Curing can be done more effectively and economically
- 8) Constructions can be erected mostly under all climatic conditions.
- 9) Buildings may be constructed at a greater speed.

### **Disadvantages of Precast Concrete:**

There are certain aspects that discourage the use of precast concrete units under the following conditions:

- 1) Special types of equipment are needed for handling, transportation, and erection. This is of particular concern for large-size units like beams, slabs, columns, etc.
- 2) The cost of construction may increase due to the employment of skilled labour and due to mechanized construction.
- 3) There is more chance of damage to the precast units while loading, transporting, and erecting.
- 4) Combining different units and making them function as per the design is really difficult, particularly if different types of units are involved.
- 5) Future modification to the building constructed using precast units is difficult.

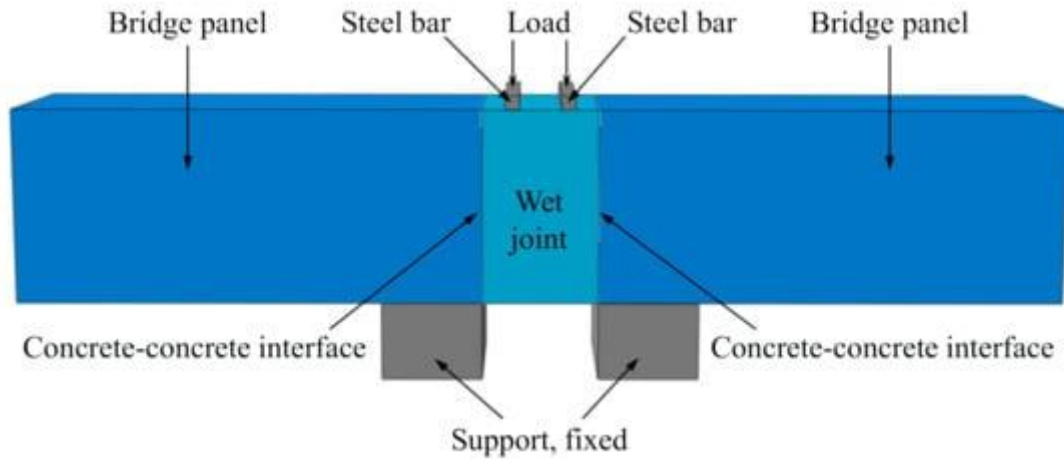
### **Choice of connections:-**

In precast concrete construction, the connections between the elements are of utmost importance. There are two types of connections, one "Wet" connection (with mortar or in-site concrete), second is 'Dry' connections (with welding or bolting). While choosing a connection, there are so many factors we have to consider. The connection should satisfy technical, economical, and if required - aesthetical respect.

#### Hybrid connections

Combine dry and wet methods to meet specific connection needs. For example, dry connections can be used for initial alignment and stability, then followed by grouting or embedding in concrete.





## **ROOFING:-**

### **Different roofing systems**

Roofs have been constructed in a wide variety of forms—flat, pitched, domed, or in combinations, lean—as per technical, economic, or aesthetic considerations.

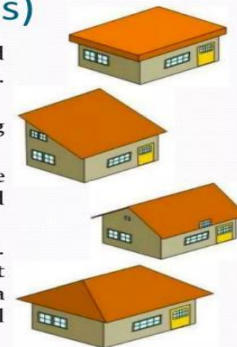


### **Requirements of a Roof:-**

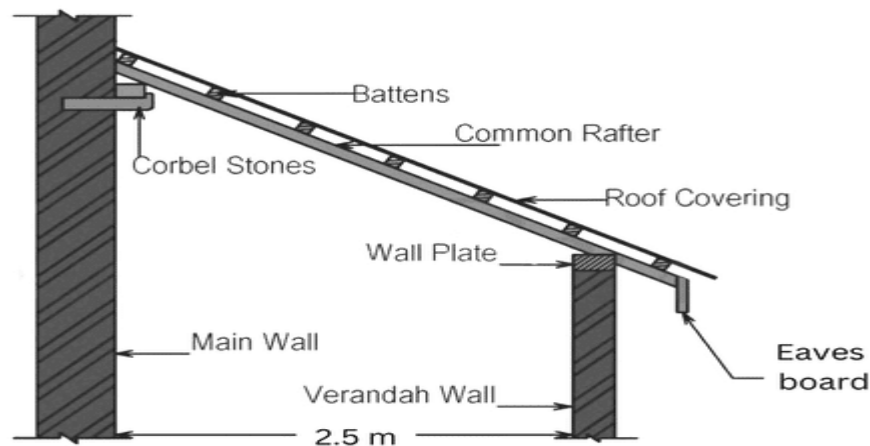
- 1) It should be durable against the adverse effects of various agencies such as wind, rain, sun etc.
- 2) It should be structurally stable and sound.
- 3) It should be capable of taking the loads likely to come over it.
- 4) It should be well-drained.
- 5) It should have efficient water-proofing arrangement.

### **Types of Roof (Roof Styles)**

1. **Flat** : Flat roofs are the simplest roof to build because they have little to no pitch. (commercial buildings)
2. **Shed** : Shed roof is basically a flat roof having some pitch. ( Staircase room )
3. **Gable** : Gable roofs are the simple style of the roofs. The gable roof are looks like an inverted alphabet V.
4. **Hip** : A hip roof style roof has four sloping sides. This type of roof is more difficult to construct compared to the above roof because they have a more complicated truss. (common residential style roof)



### **Lean-to Roof:-**



- A lean-to roof is a single-sloped roof that attaches to an existing building. Homeowners most often use lean-to roofs for home and outbuilding additions.
- The most significant advantage of a lean-to roof is the easy construction. Since these roofs only have one slope, they don't require a lot of material or labour costs.

A **lean-to roof** is one of the simplest types of roof designs. It's characterised by a single slope that pitches in one direction, typically supported by one wall or structure. Below are the main characteristics of a lean-to roof:

#### **1. Single Sloped Design**

- A lean-to roof has only one slope, unlike traditional gable or hip roofs, which have multiple slopes. This makes the roof relatively simple to construct.

#### **2. Low Pitch or Steep Pitch**

- The pitch of the roof can vary depending on the climate and design preferences. In regions with heavy rainfall or snow, the slope may be steeper to allow quick drainage.

#### **3. Support from One Wall**

- Typically, one side of the roof is attached to an existing wall, which supports the roof's weight, while the opposite edge is supported by posts or other structural elements.

#### **4. Minimalistic Structure**

- Due to its simplicity, lean-to roofs are often used in shed, extension, or porch designs. They are ideal for small, single-story buildings.

#### **5. Easy to Build**

- The straightforward design makes lean-to roofs one of the easiest types of roofs to construct, with fewer materials and labour required compared to more complex roof styles.

#### **6. Versatile and Adaptable**

- A lean-to roof can be adapted to various building types and configurations. It can be used for attached structures like carports, sheds, or as an addition to an existing building.

#### **7. Good for Drainage**

- The single slope allows for effective water runoff, making lean-to roofs suitable for areas with heavy rainfall. However, careful consideration is needed to direct the runoff away from the building.

#### **8. Cost-Effective**

- Given its simple design, a lean-to roof tends to be more cost-effective than other roof types, as fewer materials are needed for construction.

#### **9. Potential for Skylights or Windows**

- The slope can provide opportunities for skylights or windows along the sloped side, which can help bring in natural light and reduce the need for artificial lighting.

#### **10. Limited Aesthetic Appeal**

- While functional, the lean-to roof may not be as visually appealing as more complex roof designs, which can limit its use in higher-end or more architecturally intricate projects.



Overall, a lean-to roof is a practical and straightforward option for many types of buildings, offering ease of construction, cost savings, and efficient water drainage.

### **Different Types of Roofing Material:-**

When choosing roofing materials for a home or building, it's important to consider factors like climate, durability, aesthetics, and cost. Here's a rundown of some common types of roofing materials, each with its own set of benefits and drawbacks:

#### **1. Asphalt Shingles**

- **Overview:** Asphalt shingles are one of the most popular roofing materials due to their affordability and ease of installation. They are made from a fiberglass base coated with asphalt and mineral granules.
- **Advantages:**
  - Cost-effective.
  - Easy to install and replace.
  - Available in various colours and styles.
  - Provides good protection in most weather conditions.
- **Dis-Advantages:**
  - Less durable than other materials (typically lasts 15-30 years).
  - Can be prone to damage from high winds or extreme temperatures.



## 2. Wood Shingles or Shakes

- **Overview:** Wood shingles are made from cedar, pine, or redwood, while shakes are typically thicker and more textured than shingles. Both offer a natural, rustic aesthetic.
- **Advantages:**
  - Attractive, natural look.
  - Good insulation properties.
  - Can last 30-50 years with proper maintenance.
- **Dis-advantages:**
  - Requires regular maintenance (e.g., cleaning and sealing).
  - Prone to rot, insect damage, and fire unless treated.
  - Can be more expensive than asphalt.



## 3. Metal Roofing

- **Overview:** Metal roofs are made from materials like steel, aluminium, copper, or zinc. They can come in panels or shingles.
- **Advantages:**
  - Extremely durable and long-lasting (up to 50 years or more).
  - Resistant to fire, rot, and insects.
  - Reflects heat, which can reduce energy costs.
  - Lightweight compared to other materials.
- **Disadvantages:**
  - More expensive upfront than asphalt shingles.
  - Can be noisy during rain or hail.

- Installation can be more complex and requires skilled contractors.



#### 4. Clay and Concrete Tiles

- **Overview:** Clay and concrete tiles are popular in Mediterranean, Spanish, and Southwestern architectural styles. They are often used in areas with hot, dry climates.
- **Advantages:**
  - Very durable, with a lifespan of 50+ years.
  - Excellent at withstanding heat and protecting against fire.
  - Low maintenance once installed.
- **Disadvantages:**
  - Heavy and may require additional structural support.
  - Expensive upfront cost.
  - Fragile and can break under impact (e.g., from falling tree branches).



#### 5. Slate Roofing

- **Overview:** Slate is a natural stone material that is highly durable and aesthetically appealing. It's often used in high-end residential and historic buildings.
-

- **Advantages:**
  - Extremely long lifespan (100+ years).
  - Fire-resistant and water-resistant.
  - Low maintenance.
- **Disadvantages:**
  - Very expensive.
  - Heavy; requires additional structural support.
  - Difficult and expensive to install.



## 6. Synthetic Roofing Materials

- **Overview:** Synthetic roofing products are made to mimic the look of natural materials (like slate or wood) but are made from rubber, plastic, or polymer blends.
- **Advantages:**
  - Lighter and easier to install than natural materials.
  - Often more affordable than their natural counterparts.
  - Highly durable, weather-resistant, and low-maintenance.
- **Dis-advantages:**
  - Newer product, so long-term performance is still being evaluated.
  - Some cheaper options may not have the same aesthetic appeal.





### **Filler Slab: -**

Filler slab is alternate slab construction technology where part of concrete in bottom of slab is replaced by filler material. The basic principal is that the concrete in bottom half of RCC slab is structurally not required as concrete acts as compression material which is required in top half portion of slab.

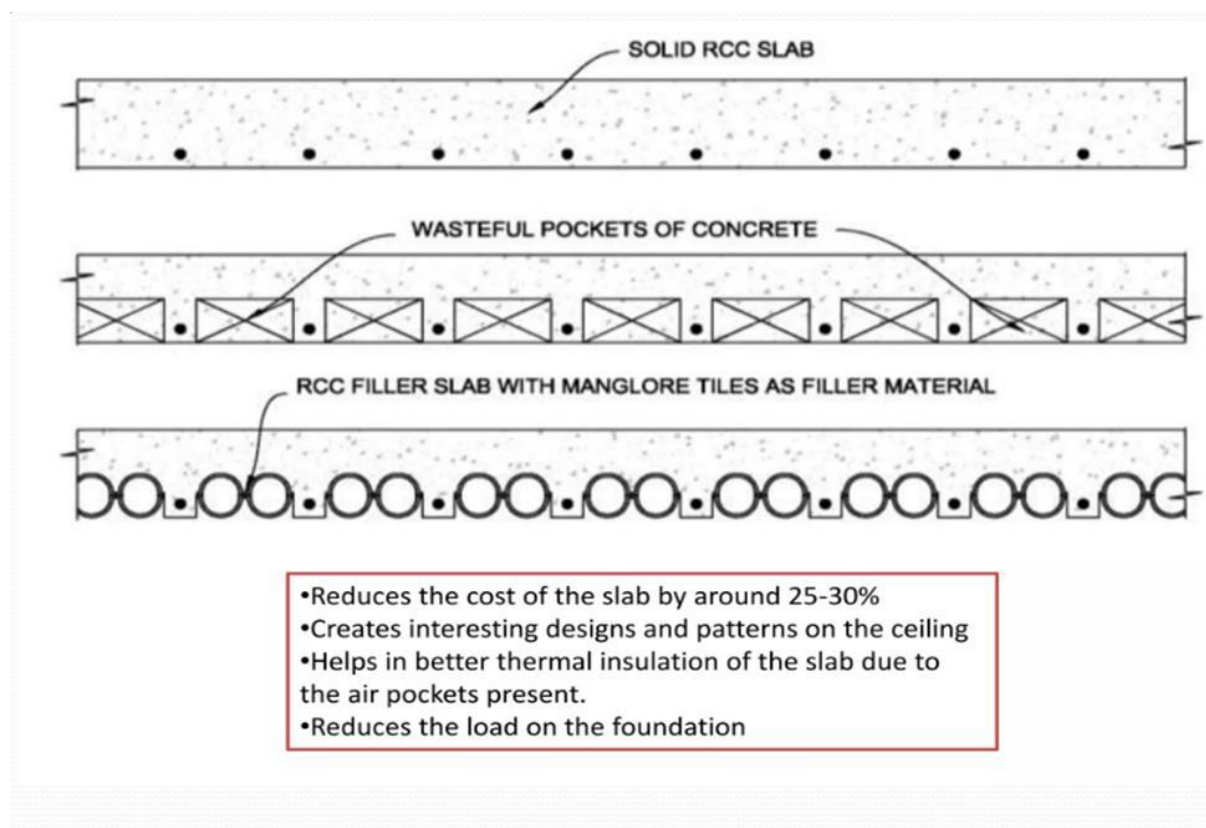


### **Advantages of filler slab**

- 1) It is 20% cheaper than a traditional RCC slab due to cheaper filler materials and less amount of steel and concrete.
- 2) It provides a great thermal insulation layer because of the air pocket formed by the contours of the tiles.
- 3) Filler slabs with better quality control are strong.
- 4) The heat-resistant air spaces between filler slabs offer pleasant living room temperatures.
- 5) When items like discarded plastic, and bottles are utilized as fillers, this technology automatically manages waste by reusing hazardous elements to the soil and earth.
- 6) The filler slab decreases carbon footprint by 20%.
- 7) Filler slabs with the right patterns improve the ceiling's appearance.

### Disadvantages of filler slab

- 1) The filler slab technique requires expertise. There is a probability of errors made in its construction unless an expert is consulted for its design and construction.
- 2) If the rebar's come in touch with filler products made of clay, they may rust. To avoid this, enough cover for reinforcement, sufficient care should be taken.
- 3) For the reasons stated above, the terrace slopes must be properly planned, and all rainwater downpipes must be clog free. Sufficient care must be made to ensure terrace maintenance.



### Composite Beam and Panel Roof

A structural member composed of two or more dissimilar materials joined together to act as a unit in which the resulting system is stronger.

Ex: steel-concrete composite beam in which a steel wide flange shape (I or W shape) is attached to a concrete floor slab

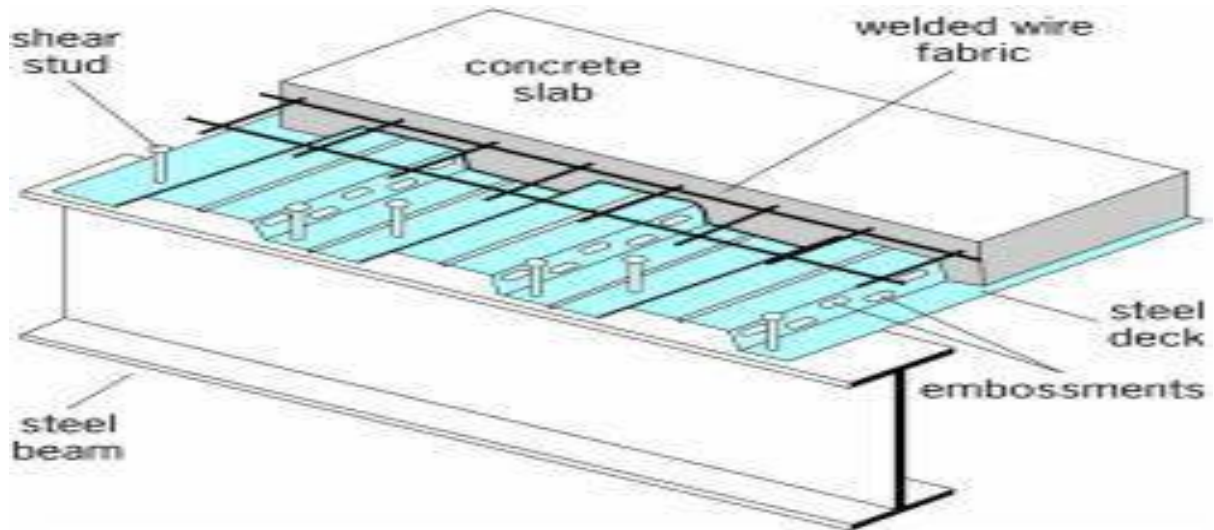
### Main benefits of composite action in structural members

- 1) By rigidly joining the two parts together, the resulting system is stronger.



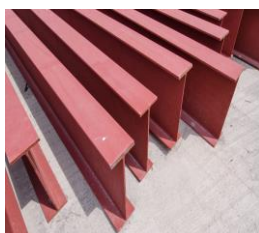
2) Composite action can better utilize the properties of each constituent material.

- For example: In steel-concrete composite member, the concrete is assumed to take most or all of the compression while the steel takes all the tension.



#### Pre-engineered and ready to use building materials :-

- **Steel products-** Plate Girders, Cellular Beams, Floor Beams, Standard Open Sections, Stainless Steel Products
- **Wood products-** Construction and Fencing, Household Uses, Art Industry
- **Plastic products-** Pipes : Electrical Conduits, Rain Water & Sewage pipes, Plumbing, Gas Distributions.
- **Cables:** PVC Insulation on cables, Insulation Tapes.
- **Floorings:** Flooring tiles & Rolls.
- **Domes / sky lights:** Opaque as well as transparent.
- **Roofing:** Coloured or Double skinned for insulation.
- **Windows & doors:** Extruded sections for Door and windows and panels.
- **Storage tanks:** Storage tanks.
- **Hardware accessories:** Washers, Nut bolts, Sleeves, Anchoring wires.
- **Temporary structures:** Guard cabins
- **Insulation materials:** PVC sheets, insulating membranes



## **NIRMITHI KENDRA:-**

Nirmithi Kendra is primarily an organization to disseminate information on low cost building technologies and materials. The Nirmithi Kendras are established under the Chairmanship of Deputy Commissioner of district and Vice chairmanship of Chief Executive Officer, Zilla panchayat.

- It Serve as seminal agency to generate and propagate innovative ideas in housing.
- A clearing house of information and data bank on housing which would bring the fruits of research from lab to land.
- A production centre to prefabricated standard housing materials.
- A training house to impart skills to local work men in inevitable housing techniques and create a cadre of trained workers in all the blocks in the districts.
- A chain of retail out lets for low cost housing materials.



### **Objectives**

- 1) Monitor, oversee, supervise and guide the Building Centre's (Nirmithi Kendras) activities in the State.
- 2) To promote Cost-effective, Environmental Friendly, Alternative Building Materials and Technologies through the network of Nirmithi Kendras in the field of Training.
- 3) Co-ordination, Monitor & Regulating the activities of the Nirmithi Kendras set up in the districts and associated / affiliated agencies.
- 4) Providing guidance to Government on emerging housing concepts and policy options from time to time.

- 5) Developing replicable housing infrastructure models.
- 6) Enabling community to have access to cost effective building materials and technologies through Nirmithi Kendra's and its affiliated self-help affinity groups of construction workers.
- 7) Networking with local level bodies involved in developing and promoting cost effective construction materials and technologies through sustainable approaches.
- 8) Promoting quality in the implementation of the programs through continuous improvement in the systems and service.

#### **Technical Services provided by Nirmithi Kendra:-**

##### **1) Walling: -**

Stabilized Mud Blocks, Concrete Block (Hallow & Solid),  
Rat trap bond, Ferro cement Portion & Selves, Fly ash Blocks.

##### **2) Roofing:-**

Filler Slab, Ferro cement Channel, Jack Arch Roofing, Mud Block Roofing, Ribbed  
Slab Roofing, Mud Block Jock arch Roofing, High Volume Fly ash Roofing.

##### **3) Openings:-**

Steel Doors & Windows, Arches, Corbels, RCC Doors, Window frames, FRP & Coir  
Shutter.

##### **4) Consultancy and Housing Guidance:-**

Nirmithi Kendra has provided technical assistance on innovative technologies to  
private builders and contractors.

#### **Centre of Science and Technology for Rural Development- (COSTFORD)**

It is Located in Thrissur (Kerala). Thrissur city-based organisation that gives technological assistance to people in alternative building technology. It attempts to use some of the construction materials such as lime, bamboo, mud and exposed bricks and architectural elements such as the rat-trap bond, filler slab (void former) roofing used often by Laurie Baker in his work in Kerala.

#### **Features of COSTFORD**

- Effective utilization of locally available materials.
- Reuse of old materials.

- Effective utilization of space, max. Natural light and ventilation.
- Respecting the topography, vegetation and micro-climate of a site.
- Traditional construction techniques.
- Minimal utilization of concrete and cement.
- Mud construction.
- Bamboo and wood in construction.
- Arch supports as replacements for R.C.C beams, Bay spaces, built - in furniture.
- A perfect blend of traditional and modern architecture.
- Rainwater harvesting, solar powered lights and water heating system, bio-gas plants, waste management systems, landscaping etc.
- COSTFORD ensures better services at affordable cost for a better living.
- COSTFORD continually seeks to extend its reach in the areas of advocacy, campaigns for societal improvement, and emergency response.
- COSTFORD Empowers Poor Communities by building up capacity of poor people to generate ideas and to influence development process, thereby increasing their access to and involvement in management of resources and institutions.
- They do the Design and construction of houses for Tribals and Weaker Sections public buildings like panchayat offices, agricultural offices and primary health centres, institutional buildings, Energy saving devices, Drudgery reduction devices
- It aids in development of low cost tissue culture techniques, Evaluation and adaptation of new technologies.
- COSTFORD explore, identify and diagnose both rural and urban conditions with active involvement and participation of people at local level.
- They disseminate information through
- Publication of manuals, booklets, and handbooks,
- Conducting workshops, seminars, exhibitions, training sessions, and site visits
- Maintaining a presence on the Internet
- Helping establish local educational institutions.